

11/23/09 519-11230902 1000 ppm SO<sub>2</sub> (ICV/CCV)  
JW 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt; H25469; EXP 8/11/14)  
↑ 100ml w/DI  
EXP: 5/23/10

11/23/09 519-11230903 A, B, C, D PH REFERENCE  
JW PURCHASED  
ERA CAT # 977  
LOT # 129934  
EXP: 1/2012

11/24/09 519-11240901 1000 ppm SO<sub>4</sub> Standard  
JW PURCHASED CAT # ICC-006  
LOT # K60794  
EXP: 9/30/13

11/25/09 519-<sup>82 11/25/09</sup> H/25 11250901 0.1N H<sub>2</sub>SO<sub>4</sub>  
JW 50ml conc H<sub>2</sub>SO<sub>4</sub> (END 47050 EXP: 9/13/10)  
EXP: <sup>82 11/25/09</sup> H/25 9/13/10

11/30/09 519-11300901 Cr<sup>6+</sup> Coloring Reagent  
JW 0.2500g diphenylcarbohydrazide (END 4710327; EXP:  
1/30/13) ↑ 50ml w/ Acetone (END 47154D; EXP: 9/24/12)  
EXP: 12/30/09

11/30/09 519-11300902 25133 ppb Stock for O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)  
↑ 500ml deionized H<sub>2</sub>O  
EXP: 12/14/09

11/30/09 519-11300903 25133 ppb ICV/CCV for O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-carboxaldehyde (TET LOT # I61INC; EXP: 8/10/12)  
↑ 500ml w/DI H<sub>2</sub>O  
EXP: 12/14/09

Reviewed And Approved By:  
Initial: JL Date: 12/22/09

1/27/10 524-01271001 1000PPM SO<sub>3</sub> (STOCK)  
 Sol 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627 EXP: 8/31/14)  
 ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

1/27/10 524-01271002 1000PPM SO<sub>3</sub> (ICV/CCV)  
 Sol 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt H25469; EXP:  
 8/11/14) ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr<sup>6+</sup> Sol'n T.V = 0.579PPM  
 Sol 0.5ml 519-04090904 (115.8PPM; EXP: 12/20/10) ↑ 100ml  
 w/ DI H<sub>2</sub>O  
 EXP: 2/15/10

2/1/10 524-02011002 Cr<sup>6+</sup> Coloring Reagent  
 Sol 0.2500g Diphenylcarbohydrazide (EMD ~~47103~~ 47103721  
 EXP: 1/30/13) ↑ 50 ml w/ Acetone (EMD 471540; EXP: 9/24/11)  
 EXP: 2/15/10

2/2/10 524-02021001 Cr<sup>6+</sup> 1000PPM STOCK  
 Sol Purchased Inorganic Ventures C6CR(6)I-1  
 LOT # C2-CR03026  
 EXP: 3/1/11

14

3/1/10 524-03011001 PH 4.000 Buffer  
SV Purchased 500 ml CAT# 5657-01  
JT BAKER LOT # H31526  
EXP 8/31/11

3/1/10 524-03011002 PH 7.000 Buffer  
SV Purchased 500 ml CAT# 5656-01  
JT BAKER LOT # H47531  
EXP: 1/31/12

3/1/10 524-03011003 1000 ppm Cl (LCS)  
SV Purchased 120 ml Cat # 1955-4  
RICA CHEM CO LOT # 1001395  
EXP: 7/20/11

3/1/10 524-03011004 NH3 Filling Soln  
SV Purchased 60 ml Oriox 951202  
Thermo Scientific LOT # MT1  
P/N: 702613-A04  
EXP: 3/1/11

3/2/10 524-03021001 PH 10.000 buffer  
SV Purchased 500 ml Cat # 5655-01  
JT Baker LOT H34508  
EXP: 9/30/11

10/19/10  
 524-10191001 10PPM Cr<sup>6+</sup> Sol'n  
 1.0 ml 524-02021001 (1000PPM Cr<sup>6+</sup>; EXP: 3/1/11) ↑ 100ml  
 W/DI H<sub>2</sub>O  
 EXP: 3/1/11

10/19/10  
 524-10191002 ION/CON CV<sup>6+</sup> T.V = 0.579PPM  
 0.5ml 519-04090904 (T.V = 115.8<sup>mg/l</sup>; EXP 12/2010)  
 ↑ 100ml W/DI  
 EXP: 11/2/10

10/19/10  
 524-10191003 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g 1,5-Diphenylcarbohydrazide (END 47103721; EXP:  
 11/30/13) ↑ 50ml Acetone (END 471524; EXP: 9/24/12)  
 EXP: 11/2/10



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## LABORATORY REPORT

November 19, 2010

David Conner  
Battelle  
4800 Oak Grove Dr. M/S 180-801  
Pasadena, CA 91109

**RE: JPL GW Mon. 4Q10 / G486090**

Dear David:

Enclosed are the results of the samples submitted to our laboratory on November 8, 2010. For your reference, these analyses have been assigned our service request number P1004171.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Sue Anderson  
Project Manager

Client: Battelle  
Project: JPL GW Mon. 4Q10 / G486090

CAS Project No: P1004171

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### **CASE NARRATIVE**

The samples were received intact under chain of custody on November 8, 2010 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

#### Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*

## DETAIL SUMMARY REPORT

Client: Battelle  
 Project ID: JPL GW Mon. 4Q10 / G486090

Service Request: P1004171

Date Received: 11/8/2010  
 Time Received: 14:15

7196A - Cr6

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
MW-19-5	P1004171-001	Water	11/8/2010	08:57	X
MW-19-4	P1004171-002	Water	11/8/2010	09:19	X
MW-19-3	P1004171-003	Water	11/8/2010	09:50	X
MW-19-2	P1004171-004	Water	11/8/2010	10:14	X
MW-19-1	P1004171-005	Water	11/8/2010	10:39	X
EB-14-11/08/10	P1004171-006	Water	11/8/2010	10:30	X

## Columbia Analytical Services, Inc.

### Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl <i>tert</i> -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	<i>Standard Methods for the Examination of Water and Wastewater</i> , 19th Ed., 1995.
SW	<i>Test Methods for Evaluating Solid Waste, Physical/Chemical Methods</i> , SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

### Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.



2655 Park Center Drive, Suite A  
 Simi Valley, California 93065  
 Phone (805) 526-7161  
 Fax (805) 526-7270

# Water & Soil - Chain of Custody Record & Analytical Service Request

Requested Turnaround Time in Business Days (Surcharges) please circle  
 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day - Standard

CAS Project No. P1024171  
 CAS Contact:

Company Name & Address (Reporting Information) BATELLE 3990 OLD TOWN AVE., C-205 SAN DIEGO, CA 92110		Project Name SPL GW MON. 4810		Project Number 6486090		PO. # / Billing Information 24319/BATELLE ATTN: GEORGE TAMPKINS 505 KINE AVE. COLUMBUS, OH 43201		Analysis Method and/or Analytes		Preservative Code		Preservative Key	
Project Manager DAVID CONYER		Date Collected		Time Collected		Matrix		Number of Containers		Volatile Organics GC/MS 624 <input type="checkbox"/> 8260B <input type="checkbox"/> Oxygenates <input type="checkbox"/> TPH Gas <input type="checkbox"/>		TPH Gas 8015B <input type="checkbox"/>	
Phone (619) 726-7311		Date Collected		Time Collected		Matrix		Number of Containers		BTEX 8021B <input type="checkbox"/> MTBE 8021B <input type="checkbox"/>		TPH Diesel 8015B <input type="checkbox"/> (Subcontracted)	
Fax		Date Collected		Time Collected		Matrix		Number of Containers		TPH Diesel Low Level 8015B <input type="checkbox"/> (Subcontracted)		TPH FC <input type="checkbox"/> 8015M (Subcontracted)	
Email Address for Result Reporting		Date Collected		Time Collected		Matrix		Number of Containers		Semi-Volatile Organics GC/MS 625 <input type="checkbox"/> 8270C <input type="checkbox"/> (Subcontracted)		Cr VI (796)	
Client Sample ID		Laboratory ID Number		Date Collected		Matrix		Number of Containers		TPH FC <input type="checkbox"/> 8015M (Subcontracted)		Semi-Volatile Organics GC/MS 625 <input type="checkbox"/> 8270C <input type="checkbox"/> (Subcontracted)	
MW-19-5		1		11/08/10		W		1		X		X	
MW-19-4		2		0919				1		X		X	
MW-19-3		3		0950				2		X		X	
MW-19-2		4		1014				1		X		X	
MW-19-1		5		1039				1		X		X	
EB-14-11/08/10		6		11/08/10		W		1		X		X	
Remarks		Laboratory ID Number		Date Collected		Matrix		Number of Containers		Volatile Organics GC/MS 624 <input type="checkbox"/> 8260B <input type="checkbox"/> Oxygenates <input type="checkbox"/> TPH Gas <input type="checkbox"/>		TPH Gas 8015B <input type="checkbox"/>	
Empty Blank		Laboratory ID Number		Date Collected		Matrix		Number of Containers		BTEX 8021B <input type="checkbox"/> MTBE 8021B <input type="checkbox"/>		TPH Diesel 8015B <input type="checkbox"/> (Subcontracted)	
Empty, at Level III		Laboratory ID Number		Date Collected		Matrix		Number of Containers		TPH Diesel Low Level 8015B <input type="checkbox"/> (Subcontracted)		TPH FC <input type="checkbox"/> 8015M (Subcontracted)	

Report Tier Levels - please select  
 Tier I - (Results/Default if not specified) \_\_\_\_\_  
 Tier II - (Results + QC) \_\_\_\_\_  
 Tier III - (Data Validation Package) 10% Surcharge \_\_\_\_\_  
 Tier V - (client specified) \_\_\_\_\_

MRL required Yes / No \_\_\_\_\_  
 MDL / PQL / J required Yes / No \_\_\_\_\_  
 EDD required Yes / No \_\_\_\_\_  
 Type: \_\_\_\_\_

Project Requirements (MRLs, GAPP)  
 Cooler / Blank / Ice / No Ice  
 Temperature 30C °C

Reinquired by: (Signature) \_\_\_\_\_ Date: 11/08/10 Time: 14:30  
 Received by: (Signature) \_\_\_\_\_ Date: 11/08/10 Time: 14:15

**Client:** Battelle **Service Request:** P1004171  
**Project:** JPL GW Mon. 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1004171-001.01	7196A	11/8/10	1455	SMO / MZAMORA	
		11/8/10	1457	P-37 / MZAMORA	
		11/8/10	1508	In Lab / SANDERSON	
		11/8/10	1637	P-37 / SANDERSON	
P1004171-002.01	7196A	11/8/10	1455	SMO / MZAMORA	
		11/8/10	1457	P-37 / MZAMORA	
		11/8/10	1508	In Lab / SANDERSON	
		11/8/10	1637	P-37 / SANDERSON	
P1004171-003.01	7196A	11/8/10	1455	SMO / MZAMORA	
		11/8/10	1457	P-37 / MZAMORA	
		11/8/10	1508	In Lab / SANDERSON	
		11/8/10	1637	P-37 / SANDERSON	
P1004171-003.02		11/8/10	1456	SMO / MZAMORA	
		11/8/10	1457	P-37 / MZAMORA	
		11/8/10	1508	In Lab / SANDERSON	
		11/8/10	1637	P-37 / SANDERSON	
P1004171-004.01	7196A	11/8/10	1455	SMO / MZAMORA	
		11/8/10	1457	P-37 / MZAMORA	
		11/8/10	1508	In Lab / SANDERSON	
		11/8/10	1637	P-37 / SANDERSON	
P1004171-005.01	7196A	11/8/10	1455	SMO / MZAMORA	
		11/8/10	1457	P-37 / MZAMORA	
		11/8/10	1508	In Lab / SANDERSON	
		11/8/10	1637	P-37 / SANDERSON	
P1004171-006.01	7196A	11/8/10	1455	SMO / MZAMORA	
		11/8/10	1457	P-37 / MZAMORA	
		11/8/10	1508	In Lab / SANDERSON	
		11/8/10	1637	P-37 / SANDERSON	

Client: Battelle

Work order: P1004171

Project: JPL GW Mon. 4Q10 / G486090

Sample(s) received on: 11/8/10

Date opened: 11/8/10

by: MZAMORA

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |  | Yes                                 | No                                  | N/A                                 |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by CAS</b> ?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Was a <b>chain-of-custody</b> provided?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was the <b>chain-of-custody</b> properly completed?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was <b>sample volume</b> received adequate for analysis?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8 Are samples within specified holding times?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cooler Temperature _____ °C    Blank Temperature <u>3</u> °C   |                                     |                                     |                                     |
| 10 Was a <b>trip blank</b> received?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Trip blank supplied by CAS: _____  |                                     |                                     |                                     |
| 11 Were <b>custody seals</b> on outside of cooler/Box?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Tubes:</b> Are the tubes capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 14 <b>Badges:</b> Are the badges properly capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1004171-001.01	125mL Plastic NP					
P1004171-002.01	125mL Plastic NP					
P1004171-003.01	125mL Plastic NP					
P1004171-003.02	125mL Plastic NP					
P1004171-004.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

\*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);

Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12)

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)





COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle  
Project Name : JPL GW Mon. 4Q10  
Project Number : G486090  
Sample Matrix : WATER

Service Request : P1004171  
Date Collected : 11/08/10  
Date Received : 11/08/10

Chromium, Hexavalent

Prep Method : None  
Analysis Method : 7196A  
Test Notes :

Units : mg/L (ppm)  
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-19-5	P1004171-001	0.010	0.004	1	NA	11/08/10 16:00	ND	
MW-19-4	P1004171-002	0.010	0.004	1	NA	11/08/10 16:00	ND	
MW-19-3	P1004171-003	0.010	0.004	1	NA	11/08/10 16:00	ND	
MW-19-2	P1004171-004	0.010	0.004	1	NA	11/08/10 16:00	ND	
MW-19-1	P1004171-005	0.010	0.004	1	NA	11/08/10 16:00	ND	
EB-14-11/08/10	P1004171-006	0.010	0.004	1	NA	11/08/10 16:00	ND	
Method Blank	P1004171-MB	0.010	0.004	1	NA	11/08/10 16:00	ND	

Approved By

*Karu Rya*

Date :

*11/9/10*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL GW Mon. 4Q10 / G486090

**Service Request:** P1004171  
**Date Analyzed:** 11/08/10

**Title:** Initial and Continuing Calibration Blank (ICB and CCB) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: \_\_\_\_\_  
ICCBMDL/120594

*Kanu Rya*

Date: \_\_\_\_\_

*11/9/10*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL GW Mon. 4Q10 / G486090

**Service Request:** P1004171  
**Date Analyzed:** 11/08/10

**Title:** Initial and Continuing Calibration Verification (ICV and CCV) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0565	98	90-110
CCV1	0.0579	0.0565	98	90-110
CCV2	0.0579	0.0574	99	90-110

Approved By: \_\_\_\_\_  
CCV1A/120594

*Kasee Rya*

Date: \_\_\_\_\_

*11/9/10*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client : Battelle  
Project Name : JPL GW Mon. 4Q10  
Project Number : G486090  
Sample Matrix : WATER

Service Request : P1004171  
Date Collected : NA  
Date Received : NA  
Date Extracted : NA  
Date Analyzed : 11/08/10

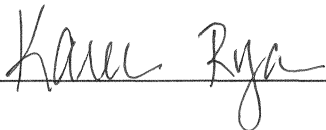
Laboratory Control Sample Summary  
Inorganic Parameters

Sample Name : Laboratory Control Sample  
Lab Code : P1004171-LCS  
Test Notes :

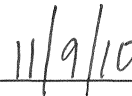
Units : mg/L (ppm)  
Basis : NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0404	101	90-109	

Approved By



Date :



QA/QC Report

Client : Battelle  
 Project Name : JPL GW Mon. 4Q10  
 Project Number : G486090  
 Sample Matrix : WATER

Service Request : P1004171  
 Date Collected : 11/08/10  
 Date Received : 11/08/10  
 Date Extracted : NA  
 Date Analyzed : 11/08/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-19-3 Units : mg/L (ppm)  
 Lab Code : P1004171-003MS P1004171-003DMS Basis : NA  
 Test Notes :

Analyte	Prep Method	Analysis Method	PQL	Spike Level		Sample Result	Spike Result		Spike Recovery		CAS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0503	0.0512	101	102	78-112	2	

Approved By Karen Rya Date : 11/9/10

pH Run Log

Service Request #(s): 3708 4171

Time: 1230

Sample	VWR lot #	Exp.
pH 2 Buffer	<u>524-11041002</u>	<u>1/20/12</u>
pH 4 Buffer	<u>524-03011001</u>	<u>8/31/12</u>
pH 7 Buffer	<u>524-11041004</u>	<u>9/30/12</u>
pH 10 Buffer	<u>524-03021001</u>	<u>9/30/11</u>

Slope	Prep.Run #
} <u>99.3%</u>	_____
	Run#
	_____

pH in liquid: (1) 9040B, (2) 9040C pH in solid: (3) 9045C, (4) 9045D (Note method number in column labeled # below )

pH adjustment:(5) 7196A,(6) 7199 (Note method # in column labeled # )

Sample	#	pH	Temp. °C	Sample	#	pH	Temp. °C
pH 2.000	<u>5</u>	<u>2.000</u>	<u>22.4°</u>	<u>3708-1.01</u>	<u>5</u>	<u>2.014</u>	<u>21.9°</u>
pH 4.000		<u>4.001</u>	<u>22.4°</u>	<u>pH 2.000</u>	<u>5</u>	<u>2.015</u>	<u>22.9°</u>
pH 7.000		<u>7.002</u>	<u>22.5°</u>				
pH 10.000		<u>10.004</u>	<u>22.6°</u>				
Ref#: <u>519-11236903C</u>		<u>6.364</u>	<u>22.6°</u>				
DI H <sub>2</sub> O		<u>2.020</u>	<u>21.1°</u>				
pH 2.000	<u>5</u>	<u>2.005</u>	<u>22.6°</u>				
TIME: <u>1515</u>							
pH 2.000	<u>5</u>	<u>2.014</u>	<u>22.8°</u>				
<u>4171-1.01</u>		<u>1.811</u>	<u>7.2°</u>				
<u>-2.01</u>		<u>1.823</u>	<u>9.2°</u>				
<u>3.01</u>		<u>1.741</u>	<u>9.6°</u>				
<u>-4.01</u>		<u>1.727</u>	<u>10.2°</u>				
<u>-5.01</u>		<u>1.815</u>	<u>10.4°</u>				
<u>-6.01</u>		<u>1.780</u>	<u>11.2°</u>				
<u>pH 2.000</u>	<u>5</u>	<u>2.021</u>	<u>21.8°</u>				
<u>3708-1.01</u>							

pH Adjustments:  7196A: Diluted/Conc H<sub>2</sub>SO<sub>4</sub> EMD 49284 EXP: 11/20/14

7199A: Diluted NaOH \_\_\_\_\_ EXP: \_\_\_\_\_

Comments: \_\_\_\_\_

\* Soil or Solid prep: 1:1(wt:vol) with DI water: \*\* Samples received past recommended hold time.

Date buffers and filling solution changed: 11/8/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: SK  
 Reviewer: KR

Date: 11/8/10  
 Date: 11/9/10

Method EPA 7196A

Service Request#(s): 3708 4171  
 Stock#: 524-10191001 T.V.=10PPM EXP: 3/1/11  
 CVICCV#: 524-11011001 T.V.=0.579PPM EXP: 11/15/10

Run#: 224292  
 Prep Run#: SA 11/8/10  
 Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP: 11/30/14  
 Coloring Reagent Ref#: 524-11011002 EXP: 11/15/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999975640
Absorbance @ 540 nm	0.000	0.011	0.055	0.112	

Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1 ICB	10ml	—	✓	0.000	0.000	0.000	0.000245	10.004
2 ICN 0.0579PPM	—	—	✓	0.000	0.063	0.063	0.0565	98%
3 MB	—	—	✓	0.000	0.000	0.000	0.000245	10.004
4 MS 0.040 PPM	—	—	✓	0.000	0.045	0.045	0.0404	101%
4171-1.01	—	—	✓	0.002	0.002	0.000	0.000245	10.004
—1.01 MS 0.03PPM	—	—	✓	0.002	0.033	0.031	0.0279	93%
6 -2.01	—	—	✓	0.003	0.005	0.002	0.00203	10.004
7 -3.01	—	—	✓	0.003	0.005	0.002	↓	↓
8 -3.01 MS 0.05PPM	—	—	✓	0.003	0.059	0.056	0.0503	101% 2% RPD
9 -3.01 MSD J	—	—	✓	0.003	0.060	0.057	0.0512	102% 5 RPD
10 -4.01	—	—	✓	0.005	0.005	0.000	0.000245	10.004
11 -5.01	—	—	✓	0.004	0.006	0.002	0.00203	↓
ICV 0.0579PPM	—	—	✓	0.000	0.063	0.063	0.0565	98%
2 CCBI	—	—	✓	0.000	0.000	0.000	0.00203	10.004
3 4171-6.01	—	—	✓	0.000	0.000	0.000	↓	↓
4 3708-1.01	—	—	✓	0.000	0.558	over range		
5 -1.01	—	1/10	✓	0.000	0.057	0.057	0.051167146	0.512 mg/L / 512 ug/L
6 -1.01 DUP	—	1/10	✓	0.000	0.058	0.058	0.052060518	0.521 mg/L / 521 ug/L
CVZ 0.0579 PPM	—	—	✓	0.000	0.064	0.064	0.0574	99%
7 CCBZ	—	—	✓	0.000	0.000	0.000	0.000245	10.004

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-101910 ↑ 50 ml of pH adjusted DI WATER (T.V.= 0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of 11/8/10 ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of CVZ ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: [Signature]  
 Analyzed By: [Signature]  
 Reviewed By: [Signature]

Date/Time: 11/8/10 @ 1545  
 Date/Time: 11/8/10 @ 1600  
 Date: 11/9/10

3708-1.01  
 $\bar{x} = 516.5 \text{ ug/L}$   
 2% RPD

- 4/8/09  
 SW  
 519-04080901 ION/W/1000PPM F FOR ILO3  
 PURCHASED. INORGANIC VENTURES ICF1-1  
 LOT# B2-F01052  
 EXP: 5/1/2010
- 4/8/09  
 SW  
 519-04080902 ION/COV (ILO3) 1000PPM NO<sub>2</sub>  
 PURCHASED INORGANIC VENTURES ICNO21-1  
 LOT# C2-NOX02069  
 EXP: 5/1/10
- 4/8/09  
 SW  
 519-04080903 NH<sub>3</sub> FIXING SOLN  
 PURCHASED. THERMO SCIENTIFIC 951202  
 LOT# MT 1 P/N 702613-A04  
 EXP 4/8/10
- 4/9/09  
 SW  
 519-04090901 0.1 N H<sub>2</sub>SO<sub>4</sub>  
 5.8 ml CONC H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10) ↑ 2L W/D.  
 EXP: 4/9/10
- 4/9/09  
 SW  
 519-04090902 TSS - LCS T.V = 193<sup>mg/L</sup>  
 0.0193g 518-09160603 (EXP: 2010) ↑ 100 ml W/DI H<sub>2</sub>O  
 EXP: 4/10/09
- 4/9/09  
 SW  
 519-04090903 1000PPM F STANDARD  
 PURCHASED. ERA CAT # 050 125ML  
 LOT# 200109  
 EXP: 1/2011
- 4/9/09  
 SW  
 519-04090904 ION/COV C<sub>6</sub>H<sub>6</sub> STD T.V = 115.8 PPM  
 PURCHASED. ERA CAT # 984  
 LOT# P161-984A  
 EXP: 12/2010



- 11/20/09  
 SA  
519-11200901 MBTH SOLUTION FOR O3-AIR  
 0.5000g MBTH (ANDRICH LOT 54696EK; EXP: 8/1/14)  
 ↑ 100 ml w/DI + 0.5 ml H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10)  
 EXP: 11/21/09
- 11/20/09  
 SA  
519-11200902 2N NaOH  
 2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑ 1L w/DI  
 H<sub>2</sub>O  
 EXP: 11/20/10
- 11/20/09  
 SA  
519-11200903 Ammonia PH ADJUSTING ISA  
 Purchased  
 Thermo Scientific Orion 951211  
 LOT CODE: NW1 P/N: 207475-A01  
 EXP: 11/20/10
- 11/20/09  
 SA  
519-11200904 PH 2.000 BUFFER  
 PURCHASED  
 BDH CAT NO 5010 - 500ml  
 LOT 1905343  
 EXP: 5/2011
- 11/20/09  
 SA  
519-11200905A-E PH FILLING SOLUTION  
 PURCHASED (3M KCl)  
 Thermo Scientific 810007  
 LOT CODE: NQ1  
 EXP: 11/20/10
- 11/23/09  
 SA  
519-11230901 1000PPM SO<sub>3</sub> (stock)  
 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627; EXP: 8/31/14) ↑ 100 ml  
 w/DI H<sub>2</sub>O  
 5/23/10

11/23/09 519-11230902 1000 ppm SO<sub>2</sub> (ICV/CCV)  
Ja 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt; H25469; EXP 8/11/14)  
↑ 100ml w/DI  
EXP: 5/23/10

11/23/09 519-11230903 A,B,C,D PH REFERENCE  
Ja PURCHASED  
ERA CAT # 977  
LOT # 129934  
EXP: 1/2012

11/24/09 519-11240901 1000 ppm SO<sub>4</sub> Standard  
Ja PURCHASED CAT # ICC-006  
LOT # K60794  
EXP: 9/30/13

11/25/09 519-<sup>82 11/25/09</sup> H/25 11250901 0.1N H<sub>2</sub>SO<sub>4</sub>  
Ja 56ml conc H<sub>2</sub>SO<sub>4</sub> (END 47050 EXP: 9/13/10)  
EXP: ~~H/25~~ 9/13/10  
<sup>82 11/25/09</sup>

11/30/09 519-11300901 Cr<sup>6+</sup> Coloring Reagent  
Ja 0.2500g diphenylcarbohydrazide (END 4710327; EXP:  
1/30/13) ↑ 50ml w/ Acetone (END 47154D; EXP: 9/24/12)  
EXP: 12/30/09

11/30/09 519-11300902 25133ppb Stock for O<sub>3</sub> in Air  
Ja 0.05ml Pyridine-4-carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)  
↑ 500ml deionized H<sub>2</sub>O  
EXP: 12/14/09

11/30/09 519-11300903 25133ppb ICV/CCV for O<sub>3</sub> in Air  
Ja 0.05ml Pyridine-4-carboxaldehyde (TCI LOT # I61INC; EXP: 8/10/12)  
↑ 500ml w/DI H<sub>2</sub>O  
EXP: 12/14/09

Reviewed And Approved By:

Initial: KL Date: 12/22/09

1/27/10 524-01271001 1000PPM SO<sub>3</sub> (STOCK)  
 0.1591g Na<sub>2</sub>SO<sub>3</sub> (ST Baker H10627 EXP: 8/31/14)  
 ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

1/27/10 524-01271002 1000PPM SO<sub>3</sub> (ICV/CCV)  
 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt H25469; EXP:  
 8/11/14) ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr<sup>6+</sup> Sol'n T.V = 0.579PPM  
 0.5ml 519-04090904 (1158PPM; EXP: 12/20/10) ↑ 100ml  
 w/ DI H<sub>2</sub>O  
 EXP: 2/15/10

2/1/10 524-02011002 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g Diphenylcarbohydrazide (EMD ~~47103721~~ 47103721  
 EXP: 11/30/13) ↑ 50 ml w/ Acetone (EMD 471540; EXP: 9/24/12)  
 EXP: 2/15/10

2/2/10 524-02021001 Cr<sup>6+</sup> 1000PPM STOCK  
 Purchased Inorganic Ventures CGCR(6)I-1  
 LOT # C2-CR03026  
 EXP: 3/1/11

3/1/10  
 SV 524-03011001 PH 4.000 Buffer  
 Purchased 500 ml CAT# 5657-01  
 JT BAKER LOT # H31526  
 EXP 8/31/11

3/1/10  
 SV 524-03011002 PH 7.000 Buffer  
 Purchased 500 ml CAT# 5656-01  
 JT BAKER LOT # H47531  
 EXP: 1/31/12

3/1/10  
 SV 524-03011003 1000 ppm Cl (LCS)  
 Purchased 120 ml Cat # 1955-4  
 RICA CHEM CO LOT # 1001395  
 EXP: 7/20/11

3/1/10  
 SV 524-03011004 NH<sub>3</sub> Filling Sol'n  
 Purchased 60 ml Oriox 951202  
 Thermo Scientific LOT # MT1  
 P/N: 702613-A04  
 EXP: 3/1/11

3/2/10  
 SV 524-03021001 PH 10.000 buffer  
 Purchased 500 ml Cat # 5655-01  
 JT Baker LOT H34508  
 EXP: 9/30/11

10/19/10  
 SR  
 524-10191001 10ppm Cr<sup>6+</sup> Sol'n  
 1.0 ml 524-02021001 (1000ppm Cr<sup>6+</sup>; EXP: 3/1/11) ↑ 100ml  
 w/DI H<sub>2</sub>O  
 EXP: 3/1/11

10/19/10  
 SR  
 524-10191002 ION/CON Cr<sup>6+</sup> T.V = 0.579ppm  
 0.5ml 519-04090904 (T.V = 115.8<sup>mg/l</sup>; EXP 12/2010)  
 ↑ 100ml w/DI  
 EXP: 11/2/10

10/19/10  
 SR  
 524-10191003 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP:  
 11/30/13) ↑ 50ml Acetone (EMD 471524; EXP: 9/24/12)  
 EXP: 11/2/10

10/22/10  
 SR  
 524-10221001 25133ppb Stock 03  
 0.05 ml Pyridine-4-carboxaldehyde Alfa Aesar  
 10140598 ; Exp: 8/11/12 ) up to 500 ml w/DI  
 Water.  
 EXP: 11/5/10

10/22/10  
 SR  
 524-10221002 25133ppb ION/CON Stock 03  
 0.05 ml Pyridine-4-carboxaldehyde TCI  
 IGENC ; Exp: 8/10/12 ) up to 500 ml w/DI  
 Water.  
 EXP 11/05/10

10/28/10  
JW

524-10781002

1000 PPM SO<sub>2</sub> ICV/CCV

0.1607 Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt Lot #H25469; Exp: 8/11/14) up to 100 ml w/ DI Water.

EXP: 11/11/10

11/1/10  
JW

524-11011001

ICV/CCV Cr<sup>6+</sup> T.V = 0.579 PPM

0.5 ml 519-04090904 (T.V = 115.8 mg/L; EXP: 12/2010)

↑ 100 ml w/ DI

EXP: 11/15/10

11/1/10  
JW

524-11011002

Cr<sup>6+</sup> Coloring Reagent

0.2500g 1,5-Diphenylcarbohydrazide (EMD 47103721; EXP: 1/30/13) ↑ 50 ml w/ Acetone (EMD 47154D; EXP: 9/24/12).

EXP: 11/15/10

11/4/10  
JW

524-11041001 A-SE

pH Filling Soln

PURCHASED (3M KCl)

P/N 702613-A02

Thermo Scientific

LOT Code: OR1

EXP: 11/4/11

11/4/10  
JW

524-11041002

pH 2.000 Buffer

Purchased

BDH CAT NO: 5010-500 ml

LOT # 1002199

EXP: 1/2012

11/4/10  
 Ja  
 524-11041003 PH 4.000 Buffer  
 Purchased  
 JT Baker Cat No: 5657-01 500 ml  
 LOT # J30507  
 EXP: 8/31/12

11/4/10  
 Ja  
 524-11041004 PH 7.000 Buffer  
 Purchased  
 J.T. Baker Cat No: 5656-01 500 ml  
 LOT # J35515  
 EXP: 9/30/12

11/5/10  
 Ja  
 524-11051001 MBTH Sol<sup>n</sup>  
 0.5000 g MBTH (Aldrich 521696EK; Exp: 8/7/14) up  
 to 100 ml w/ DI Water. Plus 0.5 ml Conc. H<sub>2</sub>SO<sub>4</sub> EMD 49836  
 EXP: 11/22/14  
 EXP: 11/6/10

11/8/10  
 Ja  
 524-11081001 1000 PPM NH<sub>3</sub>  
 0.2141g NH<sub>4</sub>Cl (EMD 4998931; EXP: 10/19/14) ↑ 100 ml  
 w/ 524-10221006 EXP: 10/22/11  
 EXP: 10/22/11

10/19/10  
 524-10191001 10PPM Cr<sup>6+</sup> Sol'n  
 1.0 ml 524-02021001 (1000PPM Cr<sup>6+</sup>; EXP: 3/1/11) ↑ 100ML  
 W/DI H<sub>2</sub>O  
 EXP: 3/1/11

10/19/10  
 524-10191002 ION/CON CV<sup>6+</sup> T.V = 0.579PPM  
 0.5ml 519-04090904 (T.V = 115.8<sup>mg/l</sup>; EXP 12/2010)  
 ↑ 100ml W/DI  
 EXP: 11/2/10

10/19/10  
 524-10191003 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g 1,5-Diphenylcarbohydrazide (END 47103721; EXP:  
 11/30/13) ↑ 50ml Acetone (END 471524; EXP: 9/24/12)  
 EXP: 11/2/10



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## LABORATORY REPORT

October 28, 2010

David Conner  
Battelle  
4800 Oak Grove Dr. M/S 180-801  
Pasadena, CA 91109

**RE: JPL-GW-4Q10 / G005862 / JPL GWM**

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 21, 2010. For your reference, these analyses have been assigned our service request number P1003929.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Sue Anderson  
Project Manager

Client: Battelle  
Project: JPL-GW-4Q10 / G005862 / JPL GWM

CAS Project No: P1003929

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### **CASE NARRATIVE**

The samples were received intact under chain of custody on October 21, 2010 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

#### Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*

## DETAIL SUMMARY REPORT

Client: Battelle  
 Project ID: JPL-GW-4Q10 / G005862 / JPL GWM

Service Request: P1003929

Date Received: 10/21/10  
 Time Received: 15:50

7196A - Cr6

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
MW-10	P1003929-001	Water	10/21/10	10:00	X
MW-5	P1003929-002	Water	10/21/10	12:04	X
MW-8	P1003929-003	Water	10/21/10	14:34	X

## Columbia Analytical Services, Inc.

### Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl <i>tert</i> -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	<i>Standard Methods for the Examination of Water and Wastewater</i> , 19th Ed., 1995.
SW	<i>Test Methods for Evaluating Solid Waste, Physical/Chemical Methods</i> , SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

### Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.



**Client:** Battelle

**Service Request:** P1003929

**Project:** JPL-GW-4Q10/G005862 / JPL GWM

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1003929-001.01	7196A	10/21/10	1612	SMO / MZAMORA	
		10/21/10	1613	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1754	P-37 / SANDERSON	
P1003929-002.01	7196A	10/21/10	1612	SMO / MZAMORA	
		10/21/10	1613	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1754	P-37 / SANDERSON	
P1003929-003.01	7196A	10/21/10	1612	SMO / MZAMORA	
		10/21/10	1613	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1754	P-37 / SANDERSON	



COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle  
Project Name : JPL-GW-4Q10  
Project Number : G005862 / JPL GWM  
Sample Matrix : WATER

Service Request : P1003929  
Date Collected : 10/21/10  
Date Received : 10/21/10

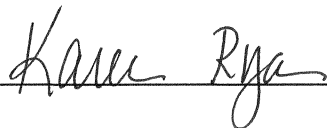
Chromium, Hexavalent

Prep Method : None  
Analysis Method : 7196A  
Test Notes :

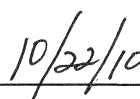
Units : mg/L (ppm)  
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-10	P1003929-001	0.010	0.004	1	NA	10/21/10 17:25	ND	
MW-5	P1003929-002	0.010	0.004	1	NA	10/21/10 17:25	ND	
MW-8	P1003929-003	0.010	0.004	1	NA	10/21/10 17:25	ND	
Method Blank	P1003929-MB	0.010	0.004	1	NA	10/21/10 17:25	ND	

Approved By



Date :





COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL-GW-4Q10 / G005862 / JPL-GWM

**Service Request:** P1003929  
**Date Analyzed:** 10/21/10

**Title:** Initial and Continuing Calibration Blank (ICB and CCB) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: Karen Rya Date: 10/22/10  
ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL-GW-4Q10 / G005862 / JPL-GWM

**Service Request:** P1003929  
**Date Analyzed:** 10/21/10

**Title:** Initial and Continuing Calibration Verification (ICV and CCV) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0586	101	90-110
CCV1	0.0579	0.0596	103	90-110
CCV2	0.0579	0.0596	103	90-110

Approved By: Kane Rya Date: 10/22/10  
CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client : Battelle  
 Project Name : JPL-GW-4Q10  
 Project Number : G005862 / JPL GWM  
 Sample Matrix : WATER

Service Request : P1003929  
 Date Collected : NA  
 Date Received : NA  
 Date Extracted : NA  
 Date Analyzed : 10/21/10

Laboratory Control Sample Summary  
 Inorganic Parameters

Sample Name : Laboratory Control Sample  
 Lab Code : P1003929-LCS  
 Test Notes :

Units : mg/L (ppm)  
 Basis : NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS	Result Notes
						Percent Recovery Acceptance Limits	
Chromium, Hexavalent	None	7196A	0.0400	0.0410	103	90-109	

Approved By Kase Rya Date : 10/22/10

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client : Battelle  
Project Name : JPL-GW-4Q10  
Project Number : G005862 / JPL GWM  
Sample Matrix : WATER

Service Request : P1003929  
Date Collected : 10/21/10  
Date Received : 10/21/10  
Date Extracted : NA  
Date Analyzed : 10/21/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-10 Units : mg/L (ppm)  
Lab Code : P1003929-001MS P1003929-001DMS Basis : NA  
Test Notes :

Analyte	Prep Method	Analysis Method	PQL	Spike Level		Sample Result	Spike Result		Spike Recovery		CAS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0517	0.0517	103	103	78-112	<1	

Approved By

*Karee Rya*

Date :

*10/22/10*

### pH Run Log

Service Request #(s): 3928 3929

Time: 0846

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/20/11
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-0301002	7/31/12
pH 10 Buffer	524-03021001	9/30/11

Slope	Prep.Run #
} 97.2%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C pH in solid: (3) 9045C, (4) 9045D (Note method number in column labeled # below )

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled # )

Sample	#	pH	Temp. °C
pH 2.000	5	1.995	22.3°
pH 4.000	T	4.012	22.2°
pH 7.000	J	7.005	22.2°
pH 10.000	J	10.012	22.2°
Ref#: 59-11230902L		6.406	22.2°
DI H2O	J	2.024	20.6°
pH 2.000	J	1.993	22.2°
TIME: 1640			
pH 2.000	5	2.003	22.6°
3928-1.01	J	1.997	12.5°
-2.01	J	1.832	18.1°
-3.01	J	1.962	15.1°
-4.01	J	2.093	14.5°
-5.01	J	2.045	14.7°
-6.01	J	2.041	14.6°
3929-1.01	J	1.872	17.5°
J -2.01	J	1.855	15.8°

Sample	#	pH	Temp. °C
3929-3.01	5	2.112	16.0°
pH 2.000	5	2.016	22.4°
<del>space not used</del>			

pH Adjustments:  7196A: Diluted/Conc H<sub>2</sub>SO<sub>4</sub> EMD 49284 EXP: 11/20/14

7199A: Diluted NaOH \_\_\_\_\_ EXP: \_\_\_\_\_

Comments: \_\_\_\_\_

\* Soil or Solid prep: 1:1(wt:vol) with DI water: \*\* Samples received past recommended hold time.

Date buffers and filling solution changed: 10/18/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: [Signature]

Date: 10/21/10

Reviewer: KR

Date: 10/22/10

Service Request#(s): 3928 3929  
 Stock#: 524-10191001 T.V.=10PPM EXP: 3/1/11  
 CV/CCV#: 524-10191002 T.V.=0.579PPM EXP: 11/2/10

Run#: 221823  
 Prep Run#: \_\_\_\_\_  
 Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 44284 EXP: 11/20/14  
 Coloring Reagent Ref#: 524-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.9997814
Absorbance @ 540 nm	0.000	0.009	0.049	0.102	

Sample #	Sample Vol.(mL)	Dilution	pH	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1 ICB	10ml	—	✓	0.000	0.000	0.000	0.000883	20.004
2 ICV 0.0579PPM	—	—	✓	0.000	0.059	0.059	0.0586	101%
3 MB	—	—	✓	0.000	0.000	0.000	0.000883	20.004
4 LCS 0.040PPM	—	—	✓	0.000	0.041	0.041	0.0410	103%
5 3928-1.01	—	—	✓	0.000	0.000	0.000	0.000883	20.004
6 -1.01 US 0.03PPM	—	—	✓	0.000	0.026	0.026	0.0263	88%
7 -2.01	—	—	✓	0.000	0.000	0.000	0.000883	20.004
8 -3.01	—	—	✓	0.000	0.000	0.000	↓	↓
9 -4.01	—	—	✓	0.000	0.000	0.000	↓	↓
10 -4.01 MS 0.05PPM	—	—	✓	0.000	0.051	0.051	0.0508	102% 2%
11 -4.01 MSD 5	—	—	✓	0.000	0.052	0.052	0.0517	103% 5%
12 -5.01	—	—	✓	0.000	0.001	0.001	0.00186	20.004
13 CCV 0.0579PPM	—	—	✓	0.000	0.060	0.060	0.0596	103%
14 CCV 1	—	—	✓	0.000	0.000	0.000	0.000883	20.004
15 3928-6.01	—	—	✓	0.000	0.000	0.000	↓	↓
16 3929-1.01	—	—	✓	0.000	0.002	0.002	0.00284	20.004
17 -1.01 US	✓	—	✓	0.000	0.052	0.052	0.0517	103%

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 + 50 ml of pH adjusted DI WATER (T.V.=0.0579ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 + 10 ml of pH adjusted sample (T.V.=0.05 ppm)

LCS spiked with 0.2 ml of ↓ + 50 ml of pH adjusted DI Water (T.V.=0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001 @ 5 + 10 ml of sample (T.V.=0.03 ppm)

Comments:

Prepared By: [Signature]

Date/Time: 10/21/10 @ 1710

Analyzed By: [Signature]

Date/Time: 10/21/10 @ 1725

Reviewed By: KR

Date: 11/22/10

Service Request#(s): 3928 3929

Run#: 221823

page 2 of 2

Stock#: S24-10191001 T.V.=10PPM EXP: 3/1/11

Prep Run#:         

ICV/CCV#: S24-10191002 T.V.=0.574PPM EXP: 11/2/10

Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP: 11/20/14

Coloring Reagent Ref#: S24-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999781142
Absorbance @ 540 nm	0.000	0.010	0.049	0.102	

Sample #	Sample Vol.(mL)	pH / Dilution	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	3929-1.01 MSD (0.0574ppm)	-	✓ 0.000	0.052	0.052	0.00517	103% 2.1% RPD
2	T-2.01	-	✓ 0.000	0.000	0.000	0.000883	10.004
3	-2.01 VS 0.0374ppm	-	✓ 0.000	0.028	0.028	0.0283	94%
4	✓ -3.01	-	✓ 0.000	0.000	0.000	0.000883	10.004
5	ICV2 0.0574ppm	-	✓ 0.000	0.060	0.060	0.0596	103%
6	CCV2	-	✓ 0.000	0.000	0.000	0.000883	10.004
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							

space not used

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of S24-10191002 50 ml of pH adjusted DI WATER (T.V.=0.0574 ppm)

MS/MSD spiked with 0.05 ml of S24-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of          ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of S24-10191001 @ 10 ml of sample (T.V.=          ppm)

Comments:

Prepared By: [Signature]

Date/Time: 10/21/10 @ 17:10

Analyzed By: [Signature]

Date/Time: 10/21/10 @ 17:25

Reviewed By: [Signature]

Date: 10/22/10

4/8/09  
 SV 519-04080901 ION/CON 1000PPM F FOR ION3  
 PURCHASED. INORGANIC VENTURES ICF1-1  
 LOT# B2-F01052  
 EXP: 5/1/2010

4/8/09  
 SV 519-04080902 ION/CON (ION3) 1000PPM NO<sub>2</sub>  
 PURCHASED INORGANIC VENTURES ICNO21-1  
 LOT# C2-NOX02069  
 EXP: 5/1/10

4/8/09  
 SV 519-04080903 NH<sub>3</sub> FIXING SOLN  
 PURCHASED. THERMO SCIENTIFIC 951202  
 LOT# MT 1 P/N 702613-A04  
 EXP 4/8/10

4/9/09  
 SV 519-04090901 0.1 N H<sub>2</sub>SO<sub>4</sub>  
 5.8 ml Conc H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10) ↑ 2L W/D  
 EXP: 4/9/10

4/9/09  
 SV 519-04090902 TSS - LCS T.V = 193 mg/L  
 0.0193g 518-09160603 (EXP: 2010) ↑ 100 ml W/DI H<sub>2</sub>  
 EXP: 4/10/09

4/9/09  
 SV 519-04090903 1000PPM F STANDARD  
 PURCHASED. ERA CAT# 050 125ML  
 LOT# 200109  
 EXP: 1/2011

4/9/09  
 SV 519-04090904 ION/CON Cr<sup>6+</sup> std T.V = 115.8 PPM  
 PURCHASED. ERA CAT# 984  
 LOT# P161-984A  
 EXP: 12/2010



11/20/09  
 SA 519-11200901 MBTH SOLUTION FOR O<sub>3</sub>-AIR  
 0.5000g MBTH (ANDRICH LOT 54696EK; EXP: 8/1/14)  
 ↑ 100 ml W/DI + 0.5 ml H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10)  
 EXP: 11/21/09

11/20/09  
 SA 519-11200902 2N NaOH  
 2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑ 1L W/DI  
 H<sub>2</sub>O  
 EXP: 11/20/10

11/20/09  
 SA 519-11200903 AMMONIA PH ADJUSTING ISA  
 Purchased  
 Thermo Scientific Orion 951211  
 LOT CODE: NW1 P/N: 207475-A01  
 EXP: 11/20/10

11/20/09  
 SA 519-11200904 PH 2.000 BUFFER  
 PURCHASED  
 BDH CAT NO 5010-500ML  
 LOT 1905343  
 EXP: 5/20/11

11/20/09  
 SA 519-11200905A-E PH FILLING SOLUTION  
 PURCHASED (3M KCl)  
 Thermo Scientific 810007  
 LOT CODE: NQ1  
 EXP: 11/20/10

11/23/09  
 SA 519-11230901 1000PPM SO<sub>3</sub> (stock)  
 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627; EXP: 8/31/14) ↑ 100 ml  
 W/DI H<sub>2</sub>O  
 5/23/10

11/23/09 519-11230902 1000 ppm SO<sub>2</sub> (ICV/CCV)  
JW 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt; H25469; EXP 8/11/14)  
↑ 100ml w/DI  
EXP: 5/23/10

11/23/09 519-11230903 A, B, C, D PH REFERENCE  
JW PURCHASED  
ERA CAT # 977  
LOT # 129934  
EXP: 1/2012

11/24/09 519-11240901 1000 ppm SO<sub>4</sub> Standard  
JW PURCHASED CAT # ICC-006  
LOT # K60794  
EXP: 9/30/13

11/25/09 519-<sup>82 11/25/09</sup>H/25 11250901 0.1N H<sub>2</sub>SO<sub>4</sub>  
JW 50ml conc H<sub>2</sub>SO<sub>4</sub> (END 47050 EXP: 9/13/10)  
EXP: <sup>82 11/25/09</sup>H/25 9/13/10

11/30/09 519-11300901 Cr<sup>6+</sup> Coloring Reagent  
JW 0.2500g Diphenylcarbohydrazide (END 4710327; EXP:  
1/30/13) ↑ 50ml w/ Acetone (END 47154D; EXP: 9/24/12)  
EXP: 12/30/09

11/30/09 519-11300902 25133 ppb Stock for O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)  
↑ 500ml deionized H<sub>2</sub>O  
EXP: 12/14/09

11/30/09 519-11300903 25133 ppb ICV/CCV FOR O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-carboxaldehyde (TET LOT # I61INC; EXP: 8/10/12)  
↑ 500ml w/DI H<sub>2</sub>O  
EXP: 12/14/09

Reviewed And Approved By:

Initial: JW Date: 12/24/09

1/27/10 524-01271001 1000PPM SO<sub>3</sub> (STOCK)  
 JAV 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627 EXP: 8/31/14)  
 ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

1/27/10 524-01271002 1000PPM SO<sub>3</sub> (ICV/CCV)  
 JAV 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt H25469; EXP:  
 8/11/14) ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr<sup>6+</sup> Sol'n T.V = 0.579PPM  
 JAV 0.5ml 519-04090904 (115.8PPM; EXP: 12/20/10) ↑ 100ml  
 w/ DI H<sub>2</sub>O  
 EXP: 2/15/10

2/1/10 524-02011002 Cr<sup>6+</sup> Coloring Reagent  
 JAV 0.2500g Diphenylcarbohydrazide (EMD ~~47103~~ 47103721  
 EXP: 1/30/13) ↑ 50 ml w/ Acetone (EMD 471540; EXP: 9/24/11)  
 EXP: 2/15/10

2/2/10 524-02021001 Cr<sup>6+</sup> 1000PPM STOCK  
 JAV Purchased Inorganic Ventures C6CR(6)I-1  
 LOT # C2-CR03026  
 EXP: 3/1/11

14

3/1/10 524-03011001 PH 4.000 Buffer  
SV Purchased 500 ml CAT# 5657-01  
JT BAKER LOT # H31526  
EXP 8/31/11

3/1/10 524-03011002 PH 7.000 Buffer  
SV Purchased 500 ml CAT# 5656-01  
JT BAKER LOT # H47531  
EXP: 1/31/12

3/1/10 524-03011003 1000 ppm Cl (LCS)  
SV Purchased 120 ml Cat # 1955-4  
RICA CHEM CO LOT # 1001395  
EXP: 7/20/11

3/1/10 524-03011004 NH3 Filling Soln  
SV Purchased 60 ml Oriol 951202  
Thermo Scientific LOT # MT1  
P/N: 702613-A04  
EXP: 3/1/11

3/2/10 524-03021001 PH 10.000 buffer  
SV Purchased 500 ml Cat # 5655-01  
JT Baker LOT H34508  
EXP: 9/30/11

10/19/10  
 524-10191001 10PPM Cr<sup>6+</sup> Sol'n  
 1.0ml 524-02021001 (1000PPM Cr<sup>6+</sup>; EXP: 3/1/11) ↑ 100ML  
 W/DI H<sub>2</sub>O  
 EXP: 3/1/11

10/19/10  
 524-10191002 ION/CON CV<sup>6+</sup> T.V = 0.579PPM  
 0.5ml 519-04090904 (T.V = 115.8<sup>mg/l</sup>; EXP 12/2010)  
 ↑ 100ml W/DI  
 EXP: 11/2/10

10/19/10  
 524-10191003 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g 1,5-Diphenylcarbohydrazide (END 47103721; EXP:  
 11/30/13) ↑ 50ml Acetone (END 471524; EXP: 9/24/12)  
 EXP: 11/2/10

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## LABORATORY REPORT

October 25, 2010

David Conner  
Battelle  
4800 Oak Grove Dr. M/S 180-801  
Pasadena, CA 91109

**RE: JPL GW Mon 4Q10 / G486090**

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 21, 2010. For your reference, these analyses have been assigned our service request number P1003928.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Sue Anderson  
Project Manager

Client: Battelle  
Project: JPL GW Mon 4Q10 / G486090

CAS Project No: P1003928

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### **CASE NARRATIVE**

The samples were received intact under chain of custody on October 21, 2010 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples) at the time of sample receipt.

#### Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*

**DETAIL SUMMARY REPORT**

Client: Battelle  
 Project ID: JPL GW Mon 4Q10 / G486090

Service Request: P1003928

Date Received: 10/21/10  
 Time Received: 15:50

7196A - Cr6

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
MW-18-5	P1003928-001	Water	10/21/10	09:48	X
MW-18-4	P1003928-002	Water	10/21/10	10:40	X
MW-18-3	P1003928-003	Water	10/21/10	11:22	X
MW-18-2	P1003928-004	Water	10/21/10	12:00	X
MW-18-1	P1003928-005	Water	10/21/10	12:31	X
EB-02-10/21/10	P1003928-006	Water	10/21/10	12:19	X



## Columbia Analytical Services, Inc.

### Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl <i>tert</i> -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	<i>Standard Methods for the Examination of Water and Wastewater</i> , 19th Ed., 1995.
SW	<i>Test Methods for Evaluating Solid Waste, Physical/Chemical Methods</i> , SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

### Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.



**Client:** Battelle **Service Request:** P1003928  
**Project:** JPL GW Mon 4Q10/G486090

Bottle ID	Tests	Date	Time	Sample Location / User	Disposed On
P1003928-001.01	7196A	10/21/10	1600	SMO / MZAMORA	
		10/21/10	1601	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1753	P-37 / SANDERSON	
P1003928-002.01	7196A	10/21/10	1600	SMO / MZAMORA	
		10/21/10	1601	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1753	P-37 / SANDERSON	
P1003928-003.01	7196A	10/21/10	1600	SMO / MZAMORA	
		10/21/10	1601	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1753	P-37 / SANDERSON	
P1003928-004.01	7196A	10/21/10	1600	SMO / MZAMORA	
		10/21/10	1601	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1753	P-37 / SANDERSON	
P1003928-004.02		10/21/10	1600	SMO / MZAMORA	
		10/21/10	1601	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1753	P-37 / SANDERSON	
P1003928-005.01	7196A	10/21/10	1600	SMO / MZAMORA	
		10/21/10	1601	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1753	P-37 / SANDERSON	
P1003928-006.01	7196A	10/21/10	1600	SMO / MZAMORA	
		10/21/10	1601	P-37 / MZAMORA	
		10/21/10	1634	In Lab / SANDERSON	
		10/21/10	1753	P-37 / SANDERSON	

Client: Battelle Work order: P1003928  
 Project: JPL GW Mon 4Q10 / G486090  
 Sample(s) received on: 10/21/10 Date opened: 10/21/10 by: MZAMORA

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |  | Yes                                 | No                                  | N/A                                 |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by CAS</b> ?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Was a <b>chain-of-custody</b> provided?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was the <b>chain-of-custody</b> properly completed?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was <b>sample volume</b> received adequate for analysis?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8 Are samples within specified holding times?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cooler Temperature _____ °C Blank Temperature <u>3</u> °C  |                                     |                                     |                                     |
| 10 Was a <b>trip blank</b> received?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Trip blank supplied by CAS: _____  |                                     |                                     |                                     |
| 11 Were <b>custody seals</b> on outside of cooler/Box?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Tubes:</b> Are the tubes capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 14 <b>Badges:</b> Are the badges properly capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003928-001.01	125mL Plastic NP					
P1003928-002.01	125mL Plastic NP					
P1003928-003.01	125mL Plastic NP					
P1003928-004.01	125mL Plastic NP					
P1003928-004.02	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

\*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);  
 Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)



COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle
Project Name : JPL GW Mon 4Q10
Project Number : G486090
Sample Matrix : WATER

Service Request : P1003928
Date Collected : 10/21/10
Date Received : 10/21/10

Chromium, Hexavalent

Prep Method : None
Analysis Method : 7196A
Test Notes :

Units : mg/L (ppm)
Basis : NA

Table with 9 columns: Sample Name, Lab Code, PQL, MDL, Dilution Factor, Date Extracted, Date/Time Analyzed, Result, Result Notes. Rows include MW-18-5, MW-18-4, MW-18-3, MW-18-2, MW-18-1, EB-02-10/21/10, and Method Blank.

Approved By [Signature] Date : 10/22/10

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL GW Mon 4Q10 / G486090

**Service Request:** P1003928  
**Date Analyzed:** 10/21/10

**Title:** Initial and Continuing Calibration Blank (ICB and CCB) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: \_\_\_\_\_

*Karen Ryan*

Date: \_\_\_\_\_

*10/22/10*

ICCBMDL120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL GW Mon 4Q10 / G486090

**Service Request:** P1003928  
**Date Analyzed:** 10/21/10

**Title:** Initial and Continuing Calibration Verification (ICV and CCV) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0586	101	90-110
CCV1	0.0579	0.0596	103	90-110
CCV2	0.0579	0.0596	103	90-110

Approved By: Karen Rya Date: 10/22/10  
CCV1A/120594



COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client : Battelle  
Project Name : JPL GW Mon 4Q10  
Project Number : G486090  
Sample Matrix : WATER

Service Request : P1003928  
Date Collected : NA  
Date Received : NA  
Date Extracted : NA  
Date Analyzed : 10/21/10

Laboratory Control Sample Summary  
Inorganic Parameters

Sample Name : Laboratory Control Sample  
Lab Code : P1003928-LCS  
Test Notes :

Units : mg/L (ppm)  
Basis : NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0410	103	90-109	

Approved By

*Karen Rya*

Date :

*10/22/10*



### pH Run Log

Service Request #(s): 3928 3929

Time: 0846

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/20/11
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-0301002	1/31/12
pH 10 Buffer	524-03021001	9/30/11

Slope	Prep.Run #
} 97.2%	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C pH in solid: (3) 9045C, (4) 9045D (Note method number in column labeled # below )

pH adjustment:(5) 7196A,(6) 7199 (Note method # in column labeled # )

Sample	#	pH	Temp. °C
pH 2.000	5	1.995	22.3°
pH 4.000	T	4.012	22.2°
pH 7.000	T	7.005	22.2°
pH 10.000	T	10.012	22.2°
Ref#: <sup>T.V.=6.46 EXP: 1/2012</sup> 59-11230902L		6.406	22.2°
DI H2O		2.024	20.6°
pH 2.000		1.993	22.2°
TIME: 1640 <i>SR</i>			
pH 2.000	5	2.003	22.6°
3928-1.01		1.997	12.5°
-2.01		1.832	18.1°
-3.01		1.962	15.1°
-4.01		2.093	14.5°
-5.01		2.045	14.7°
-6.01		2.041	14.6°
3929-1.01		1.872	17.5°
T. -2.01		1.855	15.8°

Sample	#	pH	Temp. °C
3929-3.01	5	2.112	16.0°
pH 2.000	5	2.016	22.4°
<del>space not used</del>			

pH Adjustments:  7196A: Diluted/Conc H<sub>2</sub>SO<sub>4</sub> EMD 49284 EXP: 11/20/14

7199A: Diluted NaOH \_\_\_\_\_ EXP: \_\_\_\_\_

Comments: \_\_\_\_\_

\* Soil or Solid prep: 1:1(wt:vol) with DI water: \*\* Samples received past recommended hold time.

Date buffers and filling solution changed: 10/18/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: *SR*

Date: 10/21/10

Reviewer: *KR*

Date: 10/22/10

Service Request#(s): 3928 3929

Run#: 221823

Stock#: 524-10191001 T.V.=10PPM EXP: 3/1/11

Prep Run#: \_\_\_\_\_

CV/CCV#: 524-10191002 T.V.=0.579PPM EXP: 11/2/10

Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP: 11/20/14

Coloring Reagent Ref#: 524-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.9997814
Absorbance @ 540 nm	0.000	0.009	0.049	0.102	

Sample #	Sample Vol.(mL)	Dilution	pH	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1 ICB	10ml	-	✓	0.000	0.000	0.000	0.000883	10.004
2 ICV 0.0579PPM		-	✓	0.000	0.059	0.059	0.0586	101%
3 MB		-	✓	0.000	0.000	0.000	0.000883	10.004
4 LCS 0.040PPM		-	✓	0.000	0.041	0.041	0.0410	103%
5 3928-1.01		-	✓	0.000	0.000	0.000	0.000883	10.004
6 -1.01 MS 0.03PPM		-	✓	0.000	0.026	0.026	0.0263	88%
7 -2.01		-	✓	0.000	0.000	0.000	0.000883	10.004
8 -3.01		-	✓	0.000	0.000	0.000		
9 -4.01		-	✓	0.000	0.000	0.000		
10 -4.01 MS 0.05PPM		-	✓	0.000	0.051	0.051	0.0508	102% 2%
11 -4.01 MSD		-	✓	0.000	0.052	0.052	0.0517	103% 5%
12 -5.01		-	✓	0.000	0.001	0.001	0.00186	10.004
13 CCV 0.0579PPM		-	✓	0.000	0.060	0.060	0.0596	103%
14 CCV1		-	✓	0.000	0.000	0.000	0.000883	10.004
15 3928-6.01		-	✓	0.000	0.000	0.000		
16 3929-1.01		-	✓	0.000	0.002	0.002	0.00284	10.004
17 -1.01 MS		-	✓	0.000	0.052	0.052	0.0517	103%

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: [Signature]

Date/Time: 10/21/10 @ 1410

Analyzed By: [Signature]

Date/Time: 10/21/10 @ 1725

Reviewed By: KR

Date: 10/22/10

Service Request#(s): 3928 3929

Run#: 221823

page 2 of 2

Stock#: S24-10191001 T.V.=10PPM EXP: 3/1/11

Prep Run#: \_\_\_\_\_

ICV/CCV#: S24-10191002 T.V.=0.579PPM EXP: 11/2/10

Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP: 11/20/14

Coloring Reagent Ref#: S24-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999781146
Absorbance @ 540 nm	0.000	0.010	0.049	0.102	

Sample #	Sample Vol.(mL)	Dilution	pH	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1	3929-1.01 MSD 0.0579ppm	-	✓	0.000	0.052	0.052	0.00517	103% 21% R
2	-2.01	-	✓	0.000	0.000	0.000	0.000883	10.004
3	-2.01 VS 0.03PPM	-	✓	0.000	0.028	0.028	0.0283	94%
4	-3.01	-	✓	0.000	0.000	0.000	0.000883	10.004
5	CCV2 0.0579PPM	-	✓	0.000	0.060	0.060	0.0596	103%
6	CCB2	-	✓	0.000	0.000	0.000	0.000883	10.004
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

space not used

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of S24-10191002 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of S24-10191001 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ✓ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of S24-10191001 @ 50 10 ml of sample (T.V.= \_\_\_\_\_ ppm)

Comments:

Prepared By: [Signature]

Date/Time: 10/21/10 @ 17:10

Analyzed By: [Signature]

Date/Time: 10/21/10 @ 17:25

Reviewed By: [Signature]

Date: 10/22/10

4/8/09 519-04080901 ION/CON 1000PPM F FOR ION3  
 SV PURCHASED. INORGANIC VENTURES ICF1-1  
 LOT# B2-F01052  
 EXP: 5/1/2010

4/8/09 519-04080902 ION/CON (ION3) 1000PPM NO<sub>2</sub>  
 SV PURCHASED INORGANIC VENTURES ICNO21-1  
 LOT# C2-NOX02069  
 EXP: 5/1/10

4/8/09 519-04080903 NH<sub>3</sub> FIXING SOLN  
 SV PURCHASED. THERMO SCIENTIFIC 951202  
 LOT# MT 1 P/N 702613-A04  
 EXP 4/8/10

4/9/09 519-04090901 0.1 N H<sub>2</sub>SO<sub>4</sub>  
 SV 5.8 ml Conc H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10) ↑ 2L W/D  
 EXP: 4/9/10

4/9/09 519-04090902 TSS - LCS T.V = 193 mg/L  
 SV 0.0193g 518-09160603 (EXP: 2010) ↑ 100 ml W/DI H<sub>2</sub>  
 EXP: 4/10/09

4/9/09 519-04090903 1000PPM F STANDARD  
 SV PURCHASED. ERA CAT# 050 125ml  
 LOT# 200109  
 EXP: 1/2011

4/9/09 519-04090904 ION/CON Cr<sup>6+</sup> std T.V = 115.8 ppm  
 SV PURCHASED. ERA CAT# 984  
 LOT# P161-984A  
 EXP: 12/2010

11/20/09  
 SA 519-11200901 MBTH SOLUTION FOR O<sub>3</sub>-AIR  
 0.5000g MBTH (ANDRICH LOT 54696EK; EXP: 8/1/14)  
 ↑ 100 ml W/DI + 0.5 ml H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10)  
 EXP: 11/21/09

11/20/09  
 SA 519-11200902 2N NaOH  
 2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑ 1L W/DI  
 H<sub>2</sub>O  
 EXP: 11/20/10

11/20/09  
 SA 519-11200903 AMMONIA PH ADJUSTING & ISA  
 Purchased  
 Thermo Scientific Orion 951211  
 LOT CODE: NW1 P/N: 207475-A01  
 EXP: 11/20/10

11/20/09  
 SA 519-11200904 PH 2.000 BUFFER  
 PURCHASED  
 BDH CAT NO 5010-500ML  
 LOT 1905343  
 EXP: 5/20/11

11/20/09  
 SA 519-11200905A-E PH FILLING SOLUTION  
 PURCHASED (3M KCl)  
 Thermo Scientific 810007  
 LOT CODE: NQ1  
 EXP: 11/20/10

11/23/09  
 SA 519-11230901 1000PPM SO<sub>3</sub> (stock)  
 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627; EXP: 8/31/14) ↑ 100 ml  
 W/DI H<sub>2</sub>O  
 5/23/10

11/23/09 519-11230902 1000 ppm SO<sub>2</sub> (ICV/CCV)  
JW 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt; H25469; EXP 8/11/14)  
↑ 100ml w/DI  
EXP: 5/23/10

11/23/09 519-11230903 A, B, C, D PH REFERENCE  
JW PURCHASED  
ERA CAT # 977  
LOT # 129934  
EXP: 1/2012

11/24/09 519-11240901 1000 ppm SO<sub>4</sub> Standard  
JW PURCHASED CAT # ICC-006  
LOT # K60794  
EXP: 9/30/13

11/25/09 519-<sup>82 11/25/09</sup>H/25 11250901 0.1N H<sub>2</sub>SO<sub>4</sub>  
JW 50ml conc H<sub>2</sub>SO<sub>4</sub> (END 47050 EXP: 9/13/10)  
EXP: <sup>82 11/25/09</sup>H/25 9/13/10

11/30/09 519-11300901 Cr<sup>6+</sup> Coloring Reagent  
JW 0.2500g diphenylcarbohydrazide (END 4710327; EXP:  
1/30/13) ↑ 50ml w/ Acetone (END 47154D; EXP: 9/24/12)  
EXP: 12/30/09

11/30/09 519-11300902 25133 ppb Stock for O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-Carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)  
↑ 500ml deionized H<sub>2</sub>O  
EXP: 12/14/09

11/30/09 519-11300903 25133 ppb ICV/CCV FOR O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-carboxaldehyde (TET LOT # I61INC; EXP: 8/10/12)  
↑ 500ml w/DI H<sub>2</sub>O  
EXP: 12/14/09

Reviewed And Approved By:

Initial: JW Date: 12/24/09



1/27/10 524-01271001 1000PPM SO<sub>3</sub> (STOCK)  
 JAV 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627 EXP: 8/31/14)  
 ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

1/27/10 524-01271002 1000PPM SO<sub>3</sub> (ICV/CCV)  
 JAV 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt H25469; EXP:  
 8/11/14) ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr<sup>6+</sup> Sol'n T.V = 0.579PPM  
 JAV 0.5ml 519-04090904 (115.8PPM; EXP: 12/20/10) ↑ 100ml  
 w/ DI H<sub>2</sub>O  
 EXP: 2/15/10

2/1/10 524-02011002 Cr<sup>6+</sup> Coloring Reagent  
 JAV 0.2500g Diphenylcarbohydrazide (EMD ~~47103~~ 47103721  
 EXP: 1/30/13) ↑ 50 ml w/ Acetone (EMD 471540; EXP: 9/24/11)  
 EXP: 2/15/10

2/2/10 524-02021001 Cr<sup>6+</sup> 1000PPM STOCK  
 JAV Purchased Inorganic Ventures C6CR(6)I-1  
 LOT # C2-CR03026  
 EXP: 3/1/11

14

3/1/10 524-03011001 PH 4.000 Buffer  
SV Purchased 500 ml CAT# 5657-01  
JT BAKER LOT # H31526  
EXP 8/31/11

3/1/10 524-03011002 PH 7.000 Buffer  
SV Purchased 500 ml CAT# 5656-01  
JT BAKER LOT # H47531  
EXP: 1/31/12

3/1/10 524-03011003 1000 ppm Cl (LCS)  
SV Purchased 120 ml Cat # 1955-4  
RICA CHEM CO LOT # 1001395  
EXP: 7/20/11

3/1/10 524-03011004 NH3 Filling Soln  
SV Purchased 60 ml Oriol 951202  
Thermo Scientific LOT # MT1  
P/N: 702613-A04  
EXP: 3/1/11

3/2/10 524-03021001 PH 10.000 buffer  
SV Purchased 500 ml Cat # 5655-01  
JT Baker LOT H34508  
EXP: 9/30/11

10/19/10  
 SV  
 524-10191001 10PPM Cr<sup>6+</sup> Sol'n  
 1.0ml 524-02021001 (1000PPM Cr<sup>6+</sup>; EXP: 3/1/11) ↑ 100ML  
 W/DI H<sub>2</sub>O  
 EXP: 3/1/11

10/19/10  
 SV  
 524-10191002 ION/CON Cr<sup>6+</sup> T.V = 0.579PPM  
 0.5ml 519-04090904 (T.V = 115.8<sup>mg/l</sup>; EXP 12/2010)  
 ↑ 100ml W/DI  
 EXP: 11/2/10

10/19/10  
 SV  
 524-10191003 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g 1,5-Diphenylcarbohydrazide (END 47103721; EXP:  
 11/30/13) ↑ 50ml Acetone (END 471524; EXP: 9/24/12)  
 EXP: 11/2/10

## LABORATORY REPORT

October 25, 2010

David Conner  
Battelle  
4800 Oak Grove Dr. M/S 180-801  
Pasadena, CA 91109

**RE: JPL-GW-4Q10 / G005862 / JPL GWM**

Dear David:

Enclosed are the results of the sample submitted to our laboratory on October 20, 2010. For your reference, this analysis has been assigned our service request number P1003880.

All analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Sue Anderson  
Project Manager

Client: Battelle  
Project: JPL-GW-4Q10 / G005862 / JPL GWM

CAS Project No: P1003896

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### **CASE NARRATIVE**

The sample was received intact under chain of custody on October 20, 2010 and was stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the sample at the time of sample receipt.

#### Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*

DETAIL SUMMARY REPORT

Client: Battelle  
Project ID: JPL-GW-4Q10 / G005862 / JPL GWM

Service Request: P1003896

Date Received: 10/20/10  
Time Received: 09:35

7196A - Cr6

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
MW-13	P1003896-001	Water	10/19/10	16:42	X

## Columbia Analytical Services, Inc.

### Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl <i>tert</i> -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	<i>Standard Methods for the Examination of Water and Wastewater</i> , 19th Ed., 1995.
SW	<i>Test Methods for Evaluating Solid Waste, Physical/Chemical Methods</i> , SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

### Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.





### Sample Acceptance Check Form

Client: Battelle

Work order: P1003896

Project: JPL-GW-4Q10 / G005862/JPL GWM

Sample(s) received on: 10/20/10

Date opened: 10/20/10

by: MZAMORA

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |  | Yes                                 | No                                  | N/A                                 |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by CAS</b> ?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Was a <b>chain-of-custody</b> provided?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was the <b>chain-of-custody</b> properly completed?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was <b>sample volume</b> received adequate for analysis?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8 Are samples within specified holding times?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Cooler Temperature _____ °C    Blank Temperature <u>3</u> °C   |                                     |                                     |                                     |
| 10 Was a <b>trip blank</b> received?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Trip blank supplied by CAS: _____  |                                     |                                     |                                     |
| 11 Were <b>custody seals</b> on outside of cooler/Box?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Tubes:</b> Are the tubes capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 14 <b>Badges:</b> Are the badges properly capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003896-001.01	125mL Plastic NP					
P1003896-001.02	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

\*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);

Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12)

RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Battelle  
Project Name : JPL-GW-4Q10  
Project Number : G005862 / JPL GWM  
Sample Matrix : WATER

Service Request : P1003896  
Date Collected : 10/19/10  
Date Received : 10/20/10

Chromium, Hexavalent

Prep Method : None  
Analysis Method : 7196A  
Test Notes :

Units : mg/L (ppm)  
Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-13	P1003896-001	0.010	0.004	1	NA	10/20/10 10:50	0.009	J
Method Blank	P1003896-MB	0.010	0.004	1	NA	10/20/10 10:50	ND	

J Estimated concentration. The result is less than the PQL but greater than the MDL.

Approved By Karu Rye Date : 10/20/10

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL-GW-4Q10 / G005862 / JPL GWM

**Service Request:** P1003896  
**Date Analyzed:** 10/20/10

**Title:** Initial and Continuing Calibration Blank (ICB and CCB) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND

Approved By: \_\_\_\_\_

*Karen Rya*

Date: \_\_\_\_\_

*10/20/10*

ICCBMDL/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL-GW-4Q10 / G005862 / JPL GWM

**Service Request:** P1003896  
**Date Analyzed:** 10/20/10

**Title:** Initial and Continuing Calibration Verification (ICV and CCV) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0589	102	90-110
CCV1	0.0579	0.0598	103	90-110

Approved By: \_\_\_\_\_  
CCV1A/120594

*Karen Rye*

Date: \_\_\_\_\_

*10/20/10*

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

Client : Battelle  
 Project Name : JPL-GW-4Q10  
 Project Number : G005862 / JPL GWM  
 Sample Matrix : WATER

Service Request : P1003896  
 Date Collected : NA  
 Date Received : NA  
 Date Extracted : NA  
 Date Analyzed : 10/20/10

Laboratory Control Sample Summary  
 Inorganic Parameters

Sample Name : Laboratory Control Sample  
 Lab Code : P1003896-LCS  
 Test Notes :

Units : mg/L (ppm)  
 Basis : NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0412	103	90-109	

Approved By                     *Kam Rya*                     Date :                     *10/20/10*

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

Client : Battelle  
 Project Name : JPL-GW-4Q10  
 Project Number : G005862 / JPL GWM  
 Sample Matrix : WATER

Service Request : P1003896  
 Date Collected : 10/19/10  
 Date Received : 10/20/10  
 Date Extracted : NA  
 Date Analyzed : 10/20/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-13 Units : mg/L (ppm)  
 Lab Code : P1003896-001MS P1003896-001DMS Basis : NA  
 Test Notes :

Analyte	Prep Method	Analysis Method	PQL	Spike Level		Sample Result	Spike Result		Spike Recovery		CAS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	0.0089	0.0569	0.0569	96	96	78-112	<1	J

J Estimated concentration. The result is less than the PQL but greater than the MDL.

Approved By                     *Karen Rya*                     Date :                     *10/20/10*

### pH Run Log

Service Request #(s): 3896

Time: 1000

Sample	VWR lot #	Exp.
pH 2 Buffer	519-11200904	5/30/11
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-03011002	11/31/12
pH 10 Buffer	524-03021001	9/30/11

Slope	Prep.Run #
} 97.5%	_____
	Run#
	_____

pH in liquid: (1) 9040B, (2) 9040C pH in solid: (3) 9045C, (4) 9045D (Note method number in column labeled # below )

pH adjustment:(5) 7196A.(6) 7199 (Note method # in column labeled # )

Sample	#	pH	Temp. °C	Sample	#	pH	Temp. °C	
pH 2.000	5	2.008	22.5°	/				
pH 4.000	T	4.013	22.7°					
pH 7.000		7.022	22.8°					
pH 10.000		10.008	23.0°					
Ref#: 519-11230903C		6.404	22.7°					
DI		1.992	21.1°					
3896-1.01		1.884	8.7°					
pH 2.000	J	2.011	22.6°					
Spade not used								

pH Adjustments:  7196A: Diluted/Conc H<sub>2</sub>SO<sub>4</sub> (EMD 49284) EXP: 11/20/14

7199A: Diluted NaOH \_\_\_\_\_ EXP: \_\_\_\_\_

Comments: \_\_\_\_\_

\* Soil or Solid prep: 1:1(wt:vol) with DI water: \*\* Samples received past recommended hold time.

Date buffers and filling solution changed: 10/18/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: JR

Date: 10/30/10

Reviewer: KR

Date: 10/20/10

Service Request#(s): 3896  
 Stock#: 524-10191001 T.V.=10PPM EXP: 3/1/11  
 CV/CCV#: 524-10191002 T.V.=0.579PPM EXP: 11/2/10

Run#: 221518  
 Prep Run#: \_\_\_\_\_  
 Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP: 11/20/11  
 Coloring Reagent Ref#: 524-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.9999828
Absorbance @ 540 nm	0.000	0.010	0.051	0.103	

Sample #	Sample Vol.(mL)	Dilution	pH	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD	
ICB	10 ml	—	✓	0.000	0.000	0.000	0.0000869	10.004%	
ICV 0.0579PPM	↓	—	✓	0.000	0.060	0.060	0.0589	102%	
MB		—	✓	0.000	0.000	0.000	0.0000869	10.004%	
LCS 0.0400PPM		—	✓	0.000	0.042	0.042	0.0412	103%	
3896-1.01		—	✓	0.000	0.009	0.009	0.00890		
-1.01 VS 0.03PPM		—	✓	0.000	0.039	0.039	0.0383	98%	
-1.01 MS 0.05PPM		—	✓	0.000	0.058	0.058	0.0569	96%	
-1.01 MSD		—	✓	0.000	0.058	0.058	0.0569	96%	
CCV1 0.0579PPM		—	✓	0.000	0.061	0.061	0.0598	103%	
CCB1		✓	—	✓	0.000	0.000	0.000	0.0000869	10.004%
Space not used									

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.=0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.=0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: [Signature]  
 Analyzed By: [Signature]  
 Reviewed By: [Signature]

Date/Time: 10/20/10 @ 1035  
 Date/Time: 10/20/10 @ 1050  
 Date: 10/20/10



4/8/09  
 SV 519-04080901 ION/CON 1000PPM F FOR ICD3  
 PURCHASED. INORGANIC VENTURES ICF1-1  
 LOT# B2-F01052  
 EXP: 5/1/2010

4/8/09  
 SV 519-04080902 ION/CON (ICD3) 1000PPM NO<sub>2</sub>  
 PURCHASED INORGANIC VENTURES ICND21-1  
 LOT# C2-NOX02069  
 EXP: 5/1/10

4/8/09  
 SV 519-04080903 NH<sub>3</sub> FIXING SOLN  
 PURCHASED. THERMO SCIENTIFIC 951202  
 LOT# MT 1 P/N 702613-A04  
 EXP 4/8/10

4/9/09  
 SV 519-04090901 0.1 N H<sub>2</sub>SO<sub>4</sub>  
 5.8 ml Conc H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10) ↑ 2L W/D  
 EXP: 4/9/10

4/9/09  
 SV 519-04090902 TSS - LCS T.V = 193 mg/L  
 0.0193g 518-09160603 (EXP: 2010) ↑ 100 ml W/DI H<sub>2</sub>  
 EXP: 4/10/09

4/9/09  
 SV 519-04090903 1000PPM F STANDARD  
 PURCHASED. ERA CAT# 050 125ml  
 LOT# 200109  
 EXP: 1/2011

4/9/09  
 SV 519-04090904 ION/CON Cr<sup>6+</sup> std T.V = 115.8 ppm  
 PURCHASED. ERA CAT# 984  
 LOT# P161-984A  
 EXP: 12/2010

11/20/09  
 SA 519-11200901 MBTH SOLUTION FOR O<sub>3</sub>-AIR  
 0.5000g MBTH (ANDRICH LOT 54696EK; EXP: 8/1/14)  
 ↑ 100 ml W/DI + 0.5 ml H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10)  
 EXP: 11/21/09

11/20/09  
 SA 519-11200902 2N NaOH  
 2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑ 1L W/DI  
 H<sub>2</sub>O  
 EXP: 11/20/10

11/20/09  
 SA 519-11200903 AMMONIA PH ADJUSTING ISA  
 Purchased  
 Thermo Scientific Orion 951211  
 LOT CODE: NW1 P/N: 207475-A01  
 EXP: 11/20/10

11/20/09  
 SA 519-11200904 PH 2.000 BUFFER  
 PURCHASED  
 BDH CAT NO 5010-500ML  
 LOT 1905343  
 EXP: 5/20/11

11/20/09  
 SA 519-11200905A-E PH FILLING SOLUTION  
 PURCHASED (3M KCl)  
 Thermo Scientific 810007  
 LOT CODE: NQ1  
 EXP: 11/20/10

11/23/09  
 SA 519-11230901 1000PPM SO<sub>3</sub> (stock)  
 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627; EXP: 8/31/14) ↑ 100 ml  
 W/DI H<sub>2</sub>O  
 5/23/10

11/23/09 519-11230902 1000 ppm SO<sub>2</sub> (ICV/CCV)  
JW 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt; H25469; EXP 8/11/14)  
↑ 100ml w/DI  
EXP: 5/23/10

11/23/09 519-11230903 A, B, C, D PH REFERENCE  
JW PURCHASED  
ERA CAT # 977  
LOT # 129934  
EXP: 1/2012

11/24/09 519-11240901 1000 ppm SO<sub>4</sub> Standard  
JW PURCHASED CAT # ICC-006  
LOT # K60794  
EXP: 9/30/13

11/25/09 519-<sup>82 11/25/09</sup> H/25 11250901 0.1N H<sub>2</sub>SO<sub>4</sub>  
JW 50ml conc H<sub>2</sub>SO<sub>4</sub> (END 47050 EXP: 9/13/10)  
EXP: <sup>82 11/25/09</sup> H/25 9/13/10

11/30/09 519-11300901 Cr<sup>6+</sup> Coloring Reagent  
JW 0.2500g diphenylcarbohydrazide (END 4710327; EXP:  
1/30/13) ↑ 50ml w/ Acetone (END 47154D; EXP: 9/24/12)  
EXP: 12/30/09

11/30/09 519-11300902 25133 ppb Stock for O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)  
↑ 500ml deionized H<sub>2</sub>O  
EXP: 12/14/09

11/30/09 519-11300903 25133 ppb ICV/CCV for O<sub>3</sub> in Air  
JW 0.05ml Pyridine-4-carboxaldehyde (TET LOT # I61INC; EXP: 8/10/12)  
↑ 500ml w/DI H<sub>2</sub>O  
EXP: 12/14/09

Reviewed And Approved By:

Initial: JW Date: 12/24/09

1/27/10 524-01271001 1000PPM SO<sub>3</sub> (STOCK)  
 JAV 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627 EXP: 8/31/14)  
 ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

1/27/10 524-01271002 1000PPM SO<sub>3</sub> (ICV/CCV)  
 JAV 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt H25469; EXP:  
 8/11/14) ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

2/1/10 524-02011001 ICV/CCV Cr<sup>6+</sup> Sol'n T.V = 0.579PPM  
 JAV 0.5ml 519-04090904 (115.8PPM; EXP: 12/20/10) ↑ 100ml  
 w/ DI H<sub>2</sub>O  
 EXP: 2/15/10

2/1/10 524-02011002 Cr<sup>6+</sup> Coloring Reagent  
 JAV 0.2500g Diphenylcarbohydrazide (EMD ~~47103~~ 47103721  
 EXP: 1/30/13) ↑ 50 ml w/ Acetone (EMD 471540; EXP: 9/24/11)  
 EXP: 2/15/10

2/2/10 524-02021001 Cr<sup>6+</sup> 1000PPM STOCK  
 JAV Purchased Inorganic Ventures C6CR(6)I-1  
 LOT # C2-CR03026  
 EXP: 3/1/11

3/1/10 524-03011001 PH 4.000 Buffer  
 Purchased 500 ml CAT# 5657-01  
 JT BAKER LOT # H31526  
 EXP 8/31/11

3/1/10 524-03011002 PH 7.000 Buffer  
 Purchased 500 ml CAT# 5656-01  
 JT BAKER LOT # H47531  
 EXP: 1/31/12

3/1/10 524-03011003 1000 ppm Cl (LCS)  
 Purchased 120 ml Cat # 1955-4  
 RICA CHEM CO LOT # 1001395  
 EXP: 7/20/11

3/1/10 524-03011004 NH<sub>3</sub> Filling Sol'n  
 Purchased 60 ml Oriox 951202  
 Thermo Scientific LOT # MT1  
 P/N: 702613-A04  
 EXP: 3/1/11

3/2/10 524-03021001 PH 10.000 buffer  
 Purchased 500 ml Cat # 5655-01  
 JT Baker LOT H34508  
 EXP: 9/30/11

10/19/10  
 524-10191001 10PPM Cr<sup>6+</sup> Sol'n  
 1.0 ml 524-02021001 (1000PPM Cr<sup>6+</sup>; EXP: 3/1/11) ↑ 100ML  
 W/DI H<sub>2</sub>O  
 EXP: 3/1/11

10/19/10  
 524-10191002 ION/CON Cr<sup>6+</sup> T.V = 0.579PPM  
 0.5ml 519-04090904 (T.V = 115.8<sup>mg/l</sup>; EXP 12/2010)  
 ↑ 100ml W/DI  
 EXP: 11/2/10

10/19/10  
 524-10191003 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g 1,5-Diphenylcarbohydrazide (END 47103721; EXP:  
 11/30/13) ↑ 50ml Acetone (END 471524; EXP: 9/24/12)  
 EXP: 11/2/10

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## LABORATORY REPORT

October 21, 2010

David Conner  
Battelle  
4800 Oak Grove Dr. M/S 180-801  
Pasadena, CA 91109

**RE: JPL-GW-4Q10 / G005862 / JPL-GWM**

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 19, 2010. For your reference, these analyses have been assigned our service request number P1003880.

All analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Sue Anderson  
Project Manager

Client: Battelle  
Project: JPL-GW-4Q10 / G005862 / JPL-GWM

CAS Project No: P1003880

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### **CASE NARRATIVE**

The samples were received intact under chain of custody on October 19, 2010 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

#### Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*



## DETAIL SUMMARY REPORT

Client: Battelle  
 Project ID: JPL-GW-4Q10 / G005862 / JPL-GWM

Service Request: P1003880

Date Received: 10/19/10  
 Time Received: 15:40

7196A - Cr6

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
MW-7	P1003880-001	Water	10/19/10	11:08	X
MW-16	P1003880-002	Water	10/19/10	13:45	X

## Columbia Analytical Services, Inc.

### Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl <i>tert</i> -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	<i>Standard Methods for the Examination of Water and Wastewater</i> , 19th Ed., 1995.
SW	<i>Test Methods for Evaluating Solid Waste, Physical/Chemical Methods</i> , SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

### Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.



Client: Battelle Work order: P1003880  
 Project: JPL-GW-4Q10 / G005862 / JPL-GWM  
 Sample(s) received on: 10/19/10 Date opened: 10/19/10 by: MZAMORA

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |  | Yes                                 | No                                  | N/A                                 |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by CAS</b> ?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Was a <b>chain-of-custody</b> provided?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was the <b>chain-of-custody</b> properly completed?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was <b>sample volume</b> received adequate for analysis?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8 Are samples within specified holding times?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cooler Temperature _____ °C Blank Temperature <u>2</u> °C  |                                     |                                     |                                     |
| 10 Was a <b>trip blank</b> received?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Trip blank supplied by CAS: _____  |                                     |                                     |                                     |
| 11 Were <b>custody seals</b> on outside of cooler/Box?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Tubes:</b> Are the tubes capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 14 <b>Badges:</b> Are the badges properly capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003880-001.01	125mL Plastic NP					
P1003880-002.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

\*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);  
 Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)

Analytical Report

Client : Battelle  
 Project Name : JPL-GW-4Q10  
 Project Number : G005862 / JPL-GWM  
 Sample Matrix : WATER

Service Request : P1003880  
 Date Collected : 10/19/10  
 Date Received : 10/19/10

Chromium, Hexavalent

Prep Method : None  
 Analysis Method : 7196A  
 Test Notes :

Units : mg/L (ppm)  
 Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-7	P1003880-001	0.010	0.004	1	NA	10/19/10 17:00	ND	
MW-16	P1003880-002	0.010	0.004	1	NA	10/19/10 17:00	0.029	
Method Blank	P1003880-MB	0.010	0.004	1	NA	10/19/10 17:00	ND	

Approved By

*Kam Rya*

Date :

*10/20/10*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL-GW-4Q10 / G005862 / JPL-GWM

**Service Request:** P1003880  
**Date Analyzed:** 10/19/10

**Title:** Initial and Continuing Calibration Blank (ICB and CCB) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: \_\_\_\_\_

*Karen Rya*

Date: \_\_\_\_\_

*10/20/10*

ICCBMDL120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL-GW-4Q10 / G005862 / JPL-GWM

**Service Request:** P1003880  
**Date Analyzed:** 10/19/10

**Title:** Initial and Continuing Calibration Verification (ICV and CCV) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0598	103	90-110
CCV1	0.0579	0.0598	103	90-110
CCV2	0.0579	0.0608	105	90-110

Approved By: Karu Rya Date: 10/20/10  
CCV1A/120594

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client : Battelle  
 Project Name : JPL-GW-4Q10  
 Project Number : G005862 / JPL-GWM  
 Sample Matrix : WATER

Service Request : P1003880  
 Date Collected : NA  
 Date Received : NA  
 Date Extracted : NA  
 Date Analyzed : 10/19/10

Laboratory Control Sample Summary  
 Inorganic Parameters

Sample Name : Laboratory Control Sample  
 Lab Code : P1003880-LCS  
 Test Notes :

Units : mg/L (ppm)  
 Basis : NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0400	100	90-109	

Approved By

*Karen Rya*

Date :

*10/20/10*



**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

**Client :** Battelle  
**Project Name :** JPL-GW-4Q10  
**Project Number :** G005862 / JPL-GWM  
**Sample Matrix :** WATER

**Service Request :** P1003880  
**Date Collected :** 10/19/10  
**Date Received :** 10/19/10  
**Date Extracted :** NA  
**Date Analyzed :** 10/19/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-7 Units : mg/L (ppm)  
 Lab Code : P1003880-001MS P1003880-001DMS Basis : NA  
 Test Notes :

Analyte	Prep Method	Analysis Method	PQL	Spike Level		Sample Result	Spike Result		Spike Recovery		CAS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0509	0.0499	102	100	78-112	2	

Approved By                     *Karu Rya*                     Date :                     10/20/10

# pH Run Log

Service Request #(s): 3879 3880

Time: 0815

Sample	VWR lot #	Exp.
pH 2 Buffer	59-11200904	5/20/11
pH 4 Buffer	524-03011001	8/31/11
pH 7 Buffer	524-03011002	1/31/12
pH 10 Buffer	524-03021001	9/30/11

Slope	Prep.Run #
} 98.6	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C pH in solid: (3) 9045C, (4) 9045D (Note method number in column labeled # below )

pH adjustment:(5) 7196A,(6) 7199 (Note method # in column labeled # )

Sample	#	pH	Temp. °C
pH 2.000	5	2.000	22.4°
pH 4.000	T	4.003	22.6°
pH 7.000		7.005	22.5°
pH 10.000		9.986	22.9°
Ref#: <sup>TV 26.46 EXP: 10/21/10</sup> 59-11230903C		6.391	23.0°
DI H2O		2.696	20.4°
pH 2.000	↓	1.993	22.4°
TIME: 1610			
pH 2.000	5	2.005	22.8°
3879-1.01	T	1.718	12.2°
-2.01		1.760	12.2°
-3.01		2.135	11.5°
-4.01		1.702	13.1°
-5.01		1.998	14.0°
-6.01		1.932	12.9°
↓ -7.01		2.040	13.8°
3880-1.01	↓	1.832	15.1°

Sample	#	pH	Temp. °C
3880-2.01	5	2.003	14.9°
pH 2.000	5	2.013	22.7°
<p>Space not used</p>			

pH Adjustments:  7196A: Diluted/Conc H<sub>2</sub>SO<sub>4</sub> EMD 49284 EXP: 11/20/14

7199A: Diluted NaOH \_\_\_\_\_ EXP: \_\_\_\_\_

Comments: \_\_\_\_\_

\* Soil or Solid prep: 1:1(wt:vol) with DI water: \*\* Samples received past recommended hold time.

Date buffers and filling solution changed: 10/18/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: JW  
 Reviewer: KR

Date: 10/19/10  
 Date: 10/20/10

Method EPA 7196A

Service Request#(s): 3879 3880  
 Stock#: 524-10191001 T.V.=10PPM EXP: 3/1/11  
 CV/CCV#: 524-10191002 T.V.=0.579PPM EXP: 11/2/10

Run#: 221444  
 Prep Run#: \_\_\_\_\_  
 Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP 11/20/14  
 Coloring Reagent Ref#: 524-10191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999873304
Absorbance @ 540 nm	0.000	0.010	0.049	0.101	

Sample #	Sample Vol.(mL)	Dilution	pH	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
ICB	10ml	—	✓	0.000	0.000	0.000	0.000320	10.00%
ICV 0.0579PPM	—	—	✓	0.000	0.060	0.060	0.0598	103%
MB	—	—	✓	0.000	0.000	0.000	0.000320	10.00%
LCS 0.040PPM	—	—	✓	0.000	0.040	0.040	0.0400	100%
-3879-1.01	—	—	✓	0.000	0.000	0.000	0.000320	10.00%
-1.01 MS 0.05PPM	—	—	✓	0.000	0.053	0.053	0.0529	106% 7.11%
-1.01 MSP ↓	—	—	✓	0.000	0.053	0.053	0.0529	106% 5.8%
-2.01	—	—	✓	0.000	0.000	0.000	0.000320	10.00%
-2.01 VS 0.030PPM	—	—	✓	0.000	0.030	0.030	0.0301	100%
-3.01	—	—	✓	0.000	0.000	0.000	0.000320	10.00%
-4.01	—	—	✓	0.000	0.000	0.000	0.000320	10.00%
↓ -5.01	—	—	✓	0.001	0.003	0.002	0.00230	10.00%
CCV 0.0579PPM	—	—	✓	0.000	0.060	0.060	0.0598	103%
CCB1	—	—	✓	0.000	0.000	0.000	0.000320	10.00%
3879-6.01	—	—	✓	0.000	0.000	0.000	↓	↓
↓ -7.01	—	—	✓	0.000	0.000	0.000	↓	↓
3880-1.01	↓	—	✓	0.000	0.000	0.000	↓	↓

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of ↓ ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001 ↑ 10 ml of sample (T.V.= 0.03 ppm)

Comments:

Prepared By: JR  
 Analyzed By: JV  
 Reviewed By: KR

Date/Time: 10/19/10 @ 11:45  
 Date/Time: 10/19/10 @ 1:00  
 Date: 10/20/10

Method EPA 7196A

Service Request#(s): 3879 3880  
 Stock#: 524-10191001 T.V.=10PPM EXP: 3/1/11  
 CV/CCV#: 524-10191002 T.V.=0.579PPM EXP: 11/2/10

Run#: 221444  
 Prep Run#: \_\_\_\_\_  
 Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP: 11/20/11  
 Coloring Reagent Ref#: 52410191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999873304
Absorbance @ 540 nm	0.000	0.010	0.049	0.101	

Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1 3880 - 1.01 MS 0.05ppm	10ml	-	✓	0.000	0.051	0.051	0.0509	102% 2.20%
2 T - 1.01 MSD 0.05ppm	T	-	✓	0.000	0.050	0.050	0.0499	100% 5.4%
3 J - 2.01		-	✓	0.000	0.029	0.029	0.0291	
4 V - 2.01 VS		-	✓	0.000	0.062	0.062	0.0618	109% 8.8%
5 CCV2 0.0579ppm		-	✓	0.000	0.061	0.061	0.0608	105% 5.1%
6 CCV2		-	✓	0.000	0.000	0.000	0.00032	20.004
SPACE NOT USED								

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of J ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001 ↑ 10 ml of sample (T.V.= \_\_\_\_\_ ppm)

Comments: (u) 1/10

Prepared By: JR

Analyzed By: JR

Reviewed By: KR

Date/Time: 10/19/10 @ 1645

Date/Time: 10/19/10 @ 1700

Date: 10/20/10

4/8/09 519-04080901 ICV/COV 1000PPM F FOR IC03  
 SW PURCHASED. INORGANIC VENTURES ICF1-1  
 LOT# B2-F01052  
 EXP: 5/1/2010

4/8/09 519-04080902 ICV/COV (IC03) 1000PPM NO<sub>2</sub>  
 SW PURCHASED INORGANIC VENTURES ICNO21-1  
 LOT# C2-NOX02069  
 EXP: 5/1/10

4/8/09 519-04080903 NH<sub>3</sub> FILLING SW  
 SW PURCHASED. THERMO SCIENTIFIC 951202  
 LOT# MT I P/N 702613-A04  
 EXP 4/8/10

4/9/09 519-04090901 0.1 N H<sub>2</sub>SO<sub>4</sub>  
 SW 5.6 ml Conc H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10) ↑ 2L w/D.  
 EXP: 4/9/10

4/9/09 519-04090902 TSS - LCS T.V = 193<sup>mg/L</sup>  
 SW 0.0193g 518-09160603 (EXP: 2010) ↑ 100ml w/DI H<sub>2</sub>O  
 EXP: 4/10/09

4/9/09 519-04090903 1000PPM F STANDARD  
 SW PURCHASED. ERA CAT# 050 125ml  
 LOT# 200109  
 EXP: 1/2011

4/9/09 519-04090904 ICV/COV Cr<sup>6+</sup> std T.V = 115.8 PPM  
 SW PURCHASED. ERA CAT# 984  
 LOT# P161-984A  
 EXP: 12/2010

- 11/20/09  
SA  
519-11200901 MBTH SOLUTION FOR O<sub>3</sub>-A<sub>1</sub>N  
0.5000g MBTH (ANDRICH LOT 54696EK; EXP: 8/1/14)  
↑ 100 ml W/DI + 0.5 ml H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10)  
EXP: 11/21/09
- 11/20/09  
SA  
519-11200902 2N NaOH  
2.00g NaOH (EMD 47020713; EXP: 10/11/12) ↑ 1L W/DI  
H<sub>2</sub>O  
EXP: 11/20/10
- 11/20/09  
SA  
519-11200903 Ammonia PH ADJUSTING & ISA  
Purchased  
thermo Scientific Orion 951211  
LOT CODE: NW1 P/N: 207475-A01  
EXP: 11/20/10
- 11/20/09  
SA  
519-11200904 PH 2.000 BUFFER  
PURCHASED  
BDH CAT NO 5010-500ML  
LOT 1905343  
EXP: 5/20/11
- 11/20/09  
SA  
519-11200905A→E PH FILLING SOLUTION  
PURCHASED (3M KCl)  
Thermo Scientific 810007  
LOT CODE: NQ1  
EXP: 11/20/10
- 11/23/09  
SA  
519-11230901 1000PPM SO<sub>3</sub> (stock)  
0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627; EXP: 8/31/14) ↑ 100 ml  
W/DI H<sub>2</sub>O  
5/23/10

11/23/09

519-11230902

1000 ppm SO<sub>2</sub> (ICV/CCV)

JW

0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt; H25469; EXP 8/11/14)  
↑ 100ml w/DI  
EXP: 5/23/10

11/23/09

519-11230903 A, B, C, D

PH REFERENCE

JW

PURCHASED  
ERA CAT # 977  
LOT # 129934  
EXP: 1/2012

11/24/09

519-11240901

1000 ppm SO<sub>4</sub> Standard

JW

PURCHASED CAT # ICC-006  
LOT # K60794  
EXP: 9/30/13

11/25/09

519-11250901

0.1N H<sub>2</sub>SO<sub>4</sub>

JW

5.6ml conc H<sub>2</sub>SO<sub>4</sub> (END 47050 EXP: 9/13/10)  
EXP: 4/25 9/13/10  
*See 11/25/09*

11/30/09

519-11300901

Cr<sup>6+</sup> Coloring Reagent

JW

0.2500g diphenylcarbohydrazide (END 4710327; EXP: 1/30/13) ↑ 50ml w/ Acetone (END 47154D; EXP: 9/24/12)  
EXP: 12/30/09

11/30/09

519-11300902

25133 ppb Stock for O<sub>3</sub> in Air

JW

0.05ml Pyridine-4-carboxaldehyde (Alfa Aesar LOT 10140598; EXP 8/11/12)  
↑ 500ml deionized H<sub>2</sub>O  
EXP: 12/14/09

11/30/09

519-11300903

25133 ppb ICV/CCV for O<sub>3</sub> in Air

JW

0.05ml Pyridine-4-carboxaldehyde (TCI LOT # IGIINC; EXP: 8/10/12)  
↑ 500ml w/DI H<sub>2</sub>O  
EXP: 12/14/09

Reviewed And Approved By:

Initial: JW Date: 12/22/09

1/27/10 524-01271001 1000PPM SO<sub>3</sub> (STOCK)  
 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627 EXP: 8/31/14)  
 ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

1/27/10 524-01271002 1000PPM SO<sub>3</sub> (ICV/ICV)  
 0.1607g Na<sub>2</sub>SO<sub>3</sub> (Mallinckrodt H25469; EXP: 8/11/14)  
 ↑ 100ml w/ DI H<sub>2</sub>O  
 EXP: 7/27/10

2/1/10 524-02011001 ICV/ICV Cr<sup>6+</sup> Sol'n T.V = 0.579PPM  
 0.5ml 519-04090904 (115.8PPM; EXP: 12/20/10) ↑ 100ml  
 w/ DI H<sub>2</sub>O  
 EXP: 2/15/10

2/1/10 524-02011002 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g Diphenylcarbohydrazide (EMD ~~47103721~~ 47103721)  
 EXP: 11/30/13 ↑ 50 ml w/ Acetone (EMD 471540; EXP: 9/24/11)  
 EXP: 2/15/10

2/2/10 524-02021001 Cr<sup>6+</sup> 1000PPM STOCK  
 Purchased Inorganic Ventures CGCR(6)I-1  
 LOT # C2-CR03026  
 EXP: 3/1/11



3/1/10 524-03011001 PH 4.000 Buffer  
 Purchased 500ml CAT# 5657-01  
 JT BAKER LOT # H31526  
 EXP 8/31/11

3/1/10 524-03011002 PH 7.000 Buffer  
 Purchased 500ml CAT# 5656-01  
 JT BAKER LOT # H47531  
 EXP: 1/31/12

3/1/10 524-03011003 1000 ppm Cl (US)  
 Purchased 120ml Cat # 1955-4  
 RICA CHEM CO LOT # 1001395  
 EXP: 7/20/11

3/1/10 524-03011004 NH<sub>3</sub> Filling Sol'n  
 Purchased 60ml Oriol 951202  
 Thermo Scientific LOT # MT1  
 P/N: 700613-A04  
 EXP: 3/1/11

3/2/10 524-03021001 PH 10.000 buffer  
 Purchased 500ml Cat # 5655-01  
 JT Baker LOT H34508  
 EXP: 9/30/11

10/19/10  
 SR  
 524-10191001 10PPM Cr<sup>6+</sup> Sol'n  
 1.0 ml 524-02021001 (1000PPM Cr<sup>6+</sup>; EXP: 3/1/11) ↑ 100ml  
 W/DI H<sub>2</sub>O  
 EXP: 3/1/11

10/19/10  
 SR  
 524-10191002 ION/CCV Cr<sup>6+</sup> T.V = 0.579PPM  
 0.5ml 519-04090904 (T.V = 115.8<sup>mg/l</sup>; EXP 12/2010)  
 ↑ 100ml W/DI  
 EXP: 11/2/10

10/19/10  
 SR  
 524-10191003 Cr<sup>6+</sup> Coloring Reagent  
 0.2500g 1,5-Diphenylcarbohydrazide (END 47103721; EXP:  
 11/30/13) ↑ 50ml Acetone (END 47154; EXP: 9/24/12)  
 EXP: 11/2/10

## LABORATORY REPORT

October 21, 2010

David Conner  
Battelle  
4800 Oak Grove Dr. M/S 180-801  
Pasadena, CA 91109

**RE: JPL GW Mon 4Q10 / G486090**

Dear David:

Enclosed are the results of the samples submitted to our laboratory on October 19, 2010. For your reference, these analyses have been assigned our service request number P1003879.

All analyses were performed according to our laboratory's NELAP-approved quality assurance program. The test results meet requirements of the current NELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA20007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L10-3; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-09-TX; Minnesota Department of Health, Certificate No. 11495AA; Washington State Department of Ecology, ELAP Lab ID: C946. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**Columbia Analytical Services, Inc.**

Sue Anderson  
Project Manager

Client: Battelle  
Project: JPL GW Mon 4Q10 / G486090

CAS Project No: P1003879

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### **CASE NARRATIVE**

The samples were received intact under chain of custody on October 19, 2010 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

#### Hexavalent Chromium by EPA Method 7196A

No anomalies were encountered during this analysis.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for utilization of less than the complete report.*

**DETAIL SUMMARY REPORT**

Client: Battelle  
 Project ID: JPL GW Mon 4Q10 / G486090

Service Request: P1003879

Date Received: 10/19/10  
 Time Received: 15:40

7196A - Cr6

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
MW-21-5	P1003879-001	Water	10/19/10	09:21	X
MW-21-4	P1003879-002	Water	10/19/10	09:45	X
MW-21-3	P1003879-003	Water	10/19/10	10:10	X
MW-21-2	P1003879-004	Water	10/19/10	10:49	X
MW-21-1	P1003879-005	Water	10/19/10	11:20	X
DUPE-01-4Q10	P1003879-006	Water	10/19/10	00:00	X
EB-01-10/19/10	P1003879-007	Water	10/19/10	11:08	X

## Columbia Analytical Services, Inc.

### Acronyms

CA LUFT	California DHS LUFT Method
ASTM	American Society for Testing and Materials
BTEX	Benzene/Toluene/Ethylbenzene/Xylenes
CAS Number	Chemical Abstract Service Registry Number
CFC	Chlorofluorocarbon
CRDL	Contract Required Detection Limit
DLCS	Duplicate Laboratory Control Sample
DMS	Duplicate Matrix Spike
DOH or DHS	Department of Health Services
EPA	U.S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
IC	Ion Chromatography
ICB	Initial Calibration Blank
ICV	Initial Calibration Verification
LCS	Laboratory Control Sample
LUFT	Leaking Underground Fuel Tank
M	Modified Method
MDL	Method Detection Limit
MRL	Method Reporting Limit
MS	Matrix Spike
MTBE	Methyl <i>tert</i> -Butyl Ether
NA	Not Applicable
NC	Not Calculated
ND	None Detected at or above the Method Reporting/Detection Limit (MRL/MDL)
NTU	Nephelometric Turbidity Units
ppb	Parts Per Billion
ppm	Parts Per Million
PQL	Practical Quantitation Limit
QA/QC	Quality Assurance/Quality Control
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
SIM	Selected Ion Monitoring
SM	<i>Standard Methods for the Examination of Water and Wastewater</i> , 19th Ed., 1995.
SW	<i>Test Methods for Evaluating Solid Waste, Physical/Chemical Methods</i> , SW-846, Third Edition, 1986 and as amended by Updates I, II, IIA, and IIB.
TDS	Total Dissolved Solids
TPH	Total Petroleum Hydrocarbons
TSS	Total Suspended Solids
TTLC	Total Threshold Limit Concentration
VOA	Volatile Organic Analyte(s)
VOC	Volatile Organic Compound(s)

### Qualifiers

U	The compound was analyzed for, but was not detected ("Non-detect") at or above the MRL/MDL.
J	The result is an estimated concentration that is less than the MRL (PQL), but greater than or equal to the MDL.
B	Analyte detected in the method blank above MRL (PQL).
E	Estimated; result based on response which exceeded the instrument calibration range.
N	The result is presumptive. The analyte was tentatively identified, but a confirmation analysis was not performed.
D	The reported result is from a dilution.
X	See case narrative.



**Columbia Analytical Services**  
 2655 Park Center Drive, Suite A  
 Simi Valley, California 93065  
 Phone (805) 526-7161  
 Fax (805) 526-7270

# Water & Soil - Chain of Custody Record & Analytical Service Request

**Requested Turnaround Time in Business Days (Surcharges) please circle**  
 1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day - Standard

CAS Project No. 91003879  
 CAS Contact:

Company Name & Address (Reporting Information) BATELLER 5980 OLD TOWN AVE., C-205 SAN DIEGO, CA 92110

Project Name PL 611 MON 4010  
 Project Number 5488690  
 P.O. # / Billing Information 21439 / BATELLER  
ATTN: GERALD THOMPkins  
505 KINL AVE  
CUMBUS, TX 73201

Project Manager DAVID CONNER  
 Phone (619) 726-7311 Fax \_\_\_\_\_  
 Email Address for Result Reporting \_\_\_\_\_  
 Sampler (Print & Sign) DAVID CONNER

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Matrix	Number of Containers	Analysis Method and/or Analytes	Preservative Code	Remarks
MW-21-5	(1)	10/19/10	0921	W	1	Cr III (7198)		
MW-21-4	(2)	10/19/10	0945	W	1			
MW-21-3	(3)	10/19/10	1010	W	1			
MW-21-2	(4)	10/19/10	1049	W	1			
MW-21-1	(5)	10/19/10	1120	W	1			
DPE-01-4010	(6)	10/19/10	1108	W	1			
DPE-01-10/19/10	(7)	10/19/10	1108	W	1			Duplicate

**Report Tier Levels - please select:**  
 Tier I - (Results/Default if not specified) \_\_\_\_\_  
 Tier II - (Results + QC) \_\_\_\_\_  
 Tier III - (Data Validation Package) 10% Surcharge \_\_\_\_\_  
 Tier V - (client specified) \_\_\_\_\_

MRL required Yes / No \_\_\_\_\_  
 MDL / POL / J required Yes / No \_\_\_\_\_  
 EDD required Yes / No \_\_\_\_\_

Relinquished by: (Signature) \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_  
 Relinquished by: (Signature) \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Received by: (Signature) WTamar Date: 10/19/10 Time: 5:40  
 Received by: (Signature) \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Project Requirements (MRLs, QAPP) \_\_\_\_\_  
 Cooler / Blank / Ice / No Ice \_\_\_\_\_  
 Temperature 20C °C

Client: Battelle Work order: P1003879  
 Project: JPL GW Mon 4Q10 / G486090  
 Sample(s) received on: 10/19/10 Date opened: 10/19/10 by: MZAMORA

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

- |  | Yes                                 | No                                  | N/A                                 |
|--|-------------------------------------|-------------------------------------|-------------------------------------|
| 1 Were <b>sample containers</b> properly marked with client sample ID?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 2 Container(s) <b>supplied by CAS</b> ?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 3 Did <b>sample containers</b> arrive in good condition?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 4 Was a <b>chain-of-custody</b> provided?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 5 Was the <b>chain-of-custody</b> properly completed?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 6 Did <b>sample container labels</b> and/or tags agree with custody papers?                                      | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 7 Was <b>sample volume</b> received adequate for analysis?   | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 8 Are samples within specified holding times?  | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| 9 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?                          | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Cooler Temperature _____ °C Blank Temperature <u>2</u> °C  |                                     |                                     |                                     |
| 10 Was a <b>trip blank</b> received?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Trip blank supplied by CAS: _____  |                                     |                                     |                                     |
| 11 Were <b>custody seals</b> on outside of cooler/Box?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were custody seals on outside of sample container?   | <input type="checkbox"/>            | <input checked="" type="checkbox"/> | <input type="checkbox"/>            |
| Location of seal(s)? _____ Sealing Lid?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were signature and date included?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were seals intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 12 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information? | <input checked="" type="checkbox"/> | <input type="checkbox"/>            | <input type="checkbox"/>            |
| Is there a client indication that the submitted samples are <b>pH</b> preserved?                                 | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Were <b>VOA vials</b> checked for presence/absence of air bubbles?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?        | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 13 <b>Tubes:</b> Are the tubes capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Do they contain moisture?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| 14 <b>Badges:</b> Are the badges properly capped and intact?   | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |
| Are dual bed badges separated and individually capped and intact?  | <input type="checkbox"/>            | <input type="checkbox"/>            | <input checked="" type="checkbox"/> |

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1003879-001.01	125mL Plastic NP					
P1003879-002.01	125mL Plastic NP					
P1003879-003.01	125mL Plastic NP					
P1003879-004.01	125mL Plastic NP					
P1003879-005.01	125mL Plastic NP					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

\*Required pH: Phenols/COD/NH3/TOC/TOX/NO3+NO2/TKN/T.PHOS, H2SO4 (pH<2); Metals, HNO3 (pH<2); CN (NaOH or NaOH/Asc Acid) (pH>12);  
 Diss. Sulfide, NaOH (pH>12); T. Sulfide, NaOH/ZnAc (pH>12) RSK - MEEPP, HCL (pH<2); RSK - CO2, (pH 5-8); Sulfur (pH>4)





**COLUMBIA ANALYTICAL SERVICES, INC.**

Analytical Report

Client : Battelle  
 Project Name : JPL GW Mon 4Q10  
 Project Number : G486090  
 Sample Matrix : WATER

Service Request : P1003879  
 Date Collected : 10/19/10  
 Date Received : 10/19/10

Chromium, Hexavalent

Prep Method : None  
 Analysis Method : 7196A  
 Test Notes :

Units : mg/L (ppm)  
 Basis : NA

Sample Name	Lab Code	PQL	MDL	Dilution Factor	Date Extracted	Date/Time Analyzed	Result	Result Notes
MW-21-5	P1003879-001	0.010	0.004	1	NA	10/19/10 17:00	ND	
MW-21-4	P1003879-002	0.010	0.004	1	NA	10/19/10 17:00	ND	
MW-21-3	P1003879-003	0.010	0.004	1	NA	10/19/10 17:00	ND	
MW-21-2	P1003879-004	0.010	0.004	1	NA	10/19/10 17:00	ND	
MW-21-1	P1003879-005	0.010	0.004	1	NA	10/19/10 17:00	ND	
DUPE-01-4Q10	P1003879-006	0.010	0.004	1	NA	10/19/10 17:00	ND	
EB-01-10/19/10	P1003879-007	0.010	0.004	1	NA	10/19/10 17:00	ND	
Method Blank	P1003879-MB	0.010	0.004	1	NA	10/19/10 17:00	ND	

Approved By           *Karen Rya*           Date :           10/20/10

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL GW Mon 4Q10 / G486090

**Service Request:** P1003879  
**Date Analyzed:** 10/19/10

**Title:** Initial and Continuing Calibration Blank (ICB and CCB) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	PQL	MDL	Result
ICB	0.010	0.004	ND
CCB1	0.010	0.004	ND
CCB2	0.010	0.004	ND

Approved By: \_\_\_\_\_  
ICCBMDL/120594

*Karen Rya*

Date: \_\_\_\_\_

*10/20/10*

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

**Client:** Battelle  
**Project:** JPL GW Mon 4Q10 / G486090

**Service Request:** P1003879  
**Date Analyzed:** 10/19/10

**Title:** Initial and Continuing Calibration Verification (ICV and CCV) Summary  
**Analyte:** Chromium, Hexavalent  
**Method:** 7196A  
**Units:** mg/L (ppm)

Sample Name	True Value	Result	Percent Recovery	Acceptance Criteria
ICV	0.0579	0.0598	103	90-110
CCV1	0.0579	0.0598	103	90-110
CCV2	0.0579	0.0608	105	90-110

Approved By: \_\_\_\_\_  
CCV1A/120594

*Karee Rya*

Date: \_\_\_\_\_

*10/26/10*

QA/QC Report

Client : Battelle  
 Project Name : JPL GW Mon 4Q10  
 Project Number : G486090  
 Sample Matrix : WATER

Service Request : P1003879  
 Date Collected : NA  
 Date Received : NA  
 Date Extracted : NA  
 Date Analyzed : 10/19/10

Laboratory Control Sample Summary  
 Inorganic Parameters

Sample Name : Laboratory Control Sample  
 Lab Code : P1003879-LCS  
 Test Notes :

Units : mg/L (ppm)  
 Basis : NA

Analyte	Prep Method	Analysis Method	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Limits	Result Notes
Chromium, Hexavalent	None	7196A	0.0400	0.0400	100	90-109	

Approved By Karen Ryan Date : 10/20/10

**COLUMBIA ANALYTICAL SERVICES, INC.**

QA/QC Report

Client : Battelle  
 Project Name : JPL GW Mon 4Q10  
 Project Number : G486090  
 Sample Matrix : WATER

Service Request : P1003879  
 Date Collected : 10/19/10  
 Date Received : 10/19/10  
 Date Extracted : NA  
 Date Analyzed : 10/19/10

Matrix Spike/Duplicate Matrix Spike Summary

Sample Name : MW-21-5 Units : mg/L (ppm)  
 Lab Code : P1003879-001MS P1003879-001DMS Basis : NA  
 Test Notes :

Analyte	Prep Method	Analysis Method	PQL	Spike Level		Sample Result	Spike Result		Spike Recovery		CAS Acceptance Limits	Relative Percent Difference	Result Notes
				MS	DMS		MS	DMS	MS	DMS			
Chromium, Hexavalent	None	7196A	0.010	0.0500	0.0500	ND	0.0529	0.0529	106	106	78-112	<1	

Approved By           *Karu Rya*           Date :           *10/20/10*

### pH Run Log

Service Request #(s): 3879 3880

Time: 0815

Sample	VWR lot #	Exp.
pH 2 Buffer	99-11200904	5/20/11
pH 4 Buffer	624-03011001	8/31/11
pH 7 Buffer	624-03011002	1/31/12
pH 10 Buffer	521-03021001	9/30/11

Slope	Prep.Run #
} 98.6	—
	Run#
	—

pH in liquid: (1) 9040B, (2) 9040C pH in solid: (3) 9045C, (4) 9045D (Note method number in column labeled # below )

pH adjustment:(5) 7196A,(6) 7199 (Note method # In column labeled # )

Sample	#	pH	Temp. °C
pH 2.000	5	2.000	22.4°
pH 4.000	T	4.003	22.6°
pH 7.000	J	7.005	22.5°
pH 10.000	J	9.986	22.9°
Ref#: <sup>TV=6.46 EXP=1/2/12</sup> 519-11230903C	J	6.391	23.0°
DI H2O	J	2.696	20.4°
pH 2.000	J	1.993	22.4°
TIME: 1610			
pH 2.000	5	2.005	22.8°
3879-1.01	T	1.718	12.2°
-2.01	J	1.760	12.2°
-3.01	J	2.135	11.5°
-4.01	J	1.702	13.1°
-5.01	J	1.998	14.0°
-6.01	J	1.932	12.9°
-7.01	J	2.040	13.8°
3880-1.01	J	1.832	15.1°

Sample	#	pH	Temp. °C
3880-1.01	5	2.002	14.9°
pH 2.000	5	2.013	22.7°
<p>Spaced not used</p>			

pH Adjustments:  **7196A:** Diluted/Conc H<sub>2</sub>SO<sub>4</sub> (EMD 41284) EXP: 11/20/14

**7199A:** Diluted NaOH \_\_\_\_\_ EXP: \_\_\_\_\_

Comments: \_\_\_\_\_

\* Soil or Solid prep: 1:1(wt:vol) with DI water: \*\* Samples received past recommended hold time.

Date buffers and filling solution changed: 10/18/10

Note: ATC probe used; therefore, temperature correction calculation is not necessary.

Analyst: SW

Date: 10/19/10

Reviewer: KR

Date: 10/20/10





Service Request#(s): 3879 3880  
 Stock#: 524-10191001 T.V.=10PPM EXP: 3/1/11  
 CV/CCV#: 524-10191002 T.V.=0.579PPM EXP: 11/2/10

Run#: 221444  
 Prep Run#: \_\_\_\_\_  
 Conc. H<sub>2</sub>SO<sub>4</sub> Lot#: EMD 49284 EXP: 11/20/11 *page 2 of 2*  
 Coloring Reagent Ref#: 52410191003 EXP: 11/2/10

Working Curve:

Prep Dilution	NA	0.05/50	0.25/50	0.5/50	Corr. Coeff.
Concentration mg/L	0.00	0.01	0.05	0.1	0.999873304
Absorbance @ 540 nm	0.070	0.010	0.0219	0.101	

Sample #	Sample Vol.(mL)	Dilution	pH ✓	Bkg.	Absorbance @ 540nm	Corrected Abs. (minus bkg.)	Results - mg/L	QA/QC - %R / RPD
1 3880-1.01 US 0.05PPM	10ml	-	✓	0.000	0.051	0.051	0.0509	102% 2%
2 T-1.01 MSD 0.05PPM	T	-	✓	0.000	0.050	0.050	0.0499	100% 5%
3 J-2.01	J	-	✓	0.000	0.029	0.029	0.0291	
4 ✓ -2.01 VS		-	✓	0.000	0.062	0.062	0.0618	109% 18%
5 CCV2 0.0579PPM		-	✓	0.000	0.061	0.061	0.0608	105% 5%
6 CCB2		-	✓	0.000	0.000	0.000	0.00032	10.004
SPACE NOT USED								

pH Requirement: Method 7196A (2 ± 0.5) \* Samples filtered prior to pH adjustment

ICV/CCV spiked with 5.0 ml of 524-10191002 ↑ 50 ml of pH adjusted DI WATER (T.V.=0.0579 ppm)

MS/MSD spiked with 0.05 ml of 524-10191001 ↑ 10 ml of pH adjusted sample (T.V.= 0.05 ppm)

LCS spiked with 0.2 ml of J ↑ 50 ml of pH adjusted DI Water (T.V.= 0.04 ppm)

Verification Standard Spiked 0.3 ml of 524-10191001 ↑ 10 ml of sample (T.V.= \_\_\_\_\_ ppm)

Comments: \_\_\_\_\_

Prepared By: [Signature]  
 Analyzed By: [Signature]  
 Reviewed By: [Signature]

Date/Time: 10/19/10 @ 645  
 Date/Time: 10/19/10 @ 1700  
 Date: 10/20/10

4/8/09 519-04080901 ION/CON 1000PPM F FOR ION3  
 PURCHASED. INORGANIC VENTURES ICF1-1  
 LOT# B2-F01052  
 EXP: 5/1/2010

4/8/09 519-04080902 ION/CON (ION3) 1000PPM NO<sub>2</sub>  
 PURCHASED INORGANIC VENTURES ICNO21-1  
 LOT# C2-NOX02069  
 EXP: 5/1/10

4/8/09 519-04080903 NH<sub>3</sub> FIXING SOLN  
 PURCHASED. THERMO SCIENTIFIC 951202  
 LOT# MT I P/N 702613-A04  
 EXP 4/8/10

4/9/09 519-04090901 0.1 N H<sub>2</sub>SO<sub>4</sub>  
 5.8 ml Conc H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10) ↑ 2L W/D  
 EXP: 4/9/10

4/9/09 519-04090902 TSS - LCS T.V = 193 mg/L  
 0.0193g 518-09160603 (EXP: 2010) ↑ 100 ml W/DI H<sub>2</sub>  
 EXP: 4/10/09

4/9/09 519-04090903 1000PPM F STANDARD  
 PURCHASED. ERA CAT# 050 125ML  
 LOT# 200109  
 EXP: 1/2011

4/9/09 519-04090904 ION/CON Cr<sup>6+</sup> STD T.V = 115.8 PPM  
 PURCHASED. ERA CAT# 984  
 LOT# P161-984A  
 EXP: 12/2010

11/20/09  
 SA 519-11200901 MBTH SOLUTION FOR O<sub>3</sub>-AIR  
 0.5000g MBTH (ANDRICH LOT 54696EK; EXP: 8/1/14)  
 ↑ 100 ml W/DI + 0.5 ml H<sub>2</sub>SO<sub>4</sub> (EMD 47050; EXP: 9/13/10)  
 EXP: 11/21/09

11/20/09  
 SA 519-11200902 2N NaOH  
 2.00g NaOH (EMD 47022713; EXP: 10/11/12) ↑ 1L W/DI  
 H<sub>2</sub>O  
 EXP: 11/20/10

11/20/09  
 SA 519-11200903 Ammonia PH ADJUSTIN G ISA  
 Purchased  
 Thermo Scientific Orion 951211  
 LOT CODE: NW1 P/N: 207475-A01  
 EXP: 11/20/10

11/20/09  
 SA 519-11200904 PH 2.000 BUFFER  
 PURCHASED  
 BDH CAT NO 5010-500ML  
 LOT 1905343  
 EXP: 5/2011

11/20/09  
 SA 519-11200905A-E PH FILLING SOLUTION  
 PURCHASED (3M KCl)  
 Thermo Scientific 810007  
 LOT CODE: NQ1  
 EXP: 11/20/10

11/23/09  
 SA 519-11230901 1000PPM SO<sub>3</sub> (stock)  
 0.1591g Na<sub>2</sub>SO<sub>3</sub> (JT Baker H10627; EXP: 8/31/14) ↑ 100 ml  
 W/DI H<sub>2</sub>O  
 5/23/10