

**Laboratory Data Consultants, Inc.
Data Validation Report**

Project/Site Name: Aerojet PGOU
Collection Date: June 19, 2006
LDC Report Date: September 22, 2006
Matrix: Soil
Parameters: Selected Metals
Validation Level: EPA Level II & IV equivalent
Laboratory: Test America - Irvine
Sample Delivery Group (SDG): S606389

Sample Identification

C41-SS07-0
C41-SS08-0 **
C41-SS16-0
C41-SS16-0MS
C41-SS16-0MSD

**Indicates sample underwent EPA Level IV review

Introduction

This data review covers five soil samples listed on the cover sheet including QC samples, dilutions, and reanalysis as applicable. The analyses were per EPA SW 846 Methods 6010B, 6020, and 7471A for Metals. The metals analyzed were Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (February 1994), as there are no current guidelines for the methods stated above.

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

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

Samples indicated by a double asterisk on the front cover underwent an EPA Level IV review. An EPA Level II review was performed on all of the other samples. Raw data were not evaluated for the samples reviewed by Level II criteria since this review is based on QC data.

The following are definitions of the data qualifiers:

- U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.
- J Indicates an estimated value.
- R Quality control indicates the data is not usable.
- N Presumptive evidence of presence of the constituent.
- UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.
- A Indicates the finding is based upon technical validation criteria.
- P Indicates the finding is related to a protocol/contractual deviation.
- None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria with the following exceptions:

Sample	Compound	Finding	Criteria	Flag	A or P
All samples in the SDG	All target compounds	Cooler temperature was reported at 10.8°C upon receipt by the laboratory.	Cooler temperature must be 4±2°C	None	A

Although the samples were received outside of the 4 ± 2°C criteria, the bottles were received in good condition the same day of sampling and no qualification of the data is warranted.

II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable.

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. No contaminant concentrations were found above the reporting limit in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration (mg/kg)	Associated Samples
PB (prep blank) (6F22115)	Copper	0.227	C41-SS06-0
	Magnesium	1.04	C41-SS07-0
	Silver	0.684	C41-SS16-0

Sample concentrations were compared to the maximum contaminant concentrations detected in the ICB/CCB/PBs. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks.

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) and matrix spike duplicate (MSD) samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits with the following exceptions:

Spike ID (Associated Samples)	Compound	MS (%R) (Limits)	MSD (%R) (Limits)	RPD (Limits)	Flag	A or P
C41-SS16-0 (all samples in the SDG)	Aluminum	20200 (75-125)	18800 (75-125)	2 (20)	None	A
	Antimony	51 (75-125)	50 (75-125)	0.5 (20)	J/UJ	
	Iron	4600 (75-125)	2000 (75-125)	3 (20)	None	
	Magnesium	152 (75-125)	164 (75-125)	2 (20)	None	
	Manganese	178 (75-125)	144 (75-125)	2 (20)	None	
	Potassium	130 (75-125)	108 (75-125)	6 (20)	None	
	Selenium	71 (75-125)	71 (75-125)	0 (20)	J/UJ	
	Titanium	126 (75-125)	60 (75-125)	5 (20)	None	

Results for Aluminum, Iron, Magnesium, Manganese, Potassium, and Titanium were not qualified as the analyte concentration in the sample were greater than four times the spike concentration.

VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were not performed. Therefore, this parameter was not evaluated.

VII. Laboratory Control Samples (LCS)

The laboratory control samples were reviewed for this SDG. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

VIII. Internal Standards

All internal standard percent recoveries (%R) were within QC limits for samples on which a Level IV review was performed.

Raw data were not evaluated for the samples reviewed by Level III criteria.

IX. Furnace Atomic Absorption QC

Graphite furnace atomic absorption was not utilized in this SDG. Therefore, this parameter was not evaluated.

X. ICP Serial Dilution

ICP serial dilution analysis was not performed by the laboratory. Therefore, this parameter was not evaluated.

XI. Sample Result Verification

All sample result verifications met validation criteria for samples on which an EPA Level IV review was performed. Raw data were not evaluated for the samples reviewed by Level II criteria.

XII. Overall Assessment of Data

Data flags have been summarized at the end of this report.

XIII. Field Duplicates

No samples were identified as field duplicates. Therefore, this parameter was not reviewed.

**Aerojet PGOU
Selected Metals - Data Qualification Summary - SDG S606389**

SDG	Sample	Analyte	Flag	A or P	Reason
S606389	All samples in the SDG	Antimony, Selenium	J detects UJ non-detects	A	Matrix spike % recovery below control limits

**Aerojet PGOU
Selected Metals - Laboratory Blank Data Qualification Summary - SDG S606389**

No Sample Data Qualified in this SDG

ERM-West - Sacramento 2525 Natomas Park Dr., Ste. 350 Sacramento CA, 95833	Project: Aerojet PGOU Project Number: 20648.03 Project Manager: Bruce Lewis	S606389 Reported: 07/13/06 11:50
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METALS
TestAmerica - Irvine, CA

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C41-SS07-0 (S606389-02) Soil Sampled: 06/19/06 10:10 Received: 06/19/06 16:57										
Aluminum	19000	10	20	mg/kg	2	6F22115	06/22/06	06/28/06 21:34	EPA 6010B	
Antimony	ND	1.6	20	"	"	"	"	06/28/06 21:35	"	RL-1 u
Arsenic	6.7	0.50	1.0	"	"	6F22117	06/22/06	06/30/06 10:04	EPA 6020	
Barium	120	1.6	2.0	"	"	6F22115	06/22/06	06/28/06 21:34	EPA 6010B	
Beryllium	0.73	0.40	1.0	"	"	"	"	"	"	RL-1, J
Boron	7.1	2.0	10	"	"	"	"	"	"	RL-1, J
Cadmium	ND	0.040	1.0	"	"	6F22117	06/22/06	06/30/06 10:04	EPA 6020	RL-1
Calcium	1300	10	30	"	"	6F22115	06/22/06	06/28/06 21:34	EPA 6010B	
Chromium	100	0.60	2.0	"	"	"	"	06/28/06 21:35	"	
Cobalt	19	0.60	2.0	"	"	"	"	"	"	
Copper	23	0.40	4.0	"	"	"	"	06/28/06 21:34	"	B-1
Iron	34000	3.0	10	"	"	"	"	"	"	
Lead	11	0.040	1.0	"	"	6F22117	06/22/06	06/30/06 10:04	EPA 6020	
Magnesium	1500	1.8	20	"	"	6F22115	06/22/06	06/28/06 21:34	EPA 6010B	B-1
Manganese	740	1.6	2.0	"	"	"	"	"	"	
Mercury	0.020	0.0030	0.020	"	1	6F27097	06/27/06	06/27/06 14:50	EPA 7471 A	
Molybdenum	0.51	0.40	4.0	"	2	6F22115	06/22/06	06/28/06 21:35	EPA 6010B	RL-1, J
Nickel	23	0.40	4.0	"	"	"	"	06/28/06 21:34	"	
Potassium	970	80	100	"	"	"	"	06/28/06 21:33	"	
Selenium	ND	0.40	2.0	"	"	6F22117	06/22/06	06/30/06 10:04	EPA 6020	RL-1 u
Silver	ND	0.80	2.0	"	"	6F22115	06/22/06	06/28/06 21:34	EPA 6010B	B, RL-1
Sodium	ND	30	100	"	"	"	"	07/01/06 14:12	"	RL-1
Thallium	ND	0.20	1.0	"	"	6F22117	06/22/06	06/30/06 10:04	EPA 6020	RL-1
Titanium	630	0.40	4.0	"	"	6F22115	06/22/06	06/28/06 21:34	EPA 6010B	
Vanadium	110	0.60	2.0	"	"	"	"	"	"	

TestAmerica - Sacramento, CA

The results in this report apply to the samples analyzed in accordance with the chain of custody document. Unless otherwise stated, results are reported on a wet weight basis. This analytical report must be reproduced in its entirety.

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METALS
TestAmerica - Irvine, CA

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C41-SS07-0 (S606389-02) Soil Sampled: 06/19/06 10:10 Received: 06/19/06 16:57										
Zinc	22	1.0	20	mg/kg	2	6F22117	06/22/06	06/30/06 10:04	EPA 6020	DU anal
C41-SS08-0 (S606389-03) Soil Sampled: 06/19/06 10:20 Received: 06/19/06 16:57										
Aluminum	18000	5.0	10	mg/kg	1	6F22115	06/22/06	06/27/06 03:25	EPA 6010B	
Antimony	ND	0.80	10	"	"	"	"	06/27/06 03:26	"	uJ
Arsenic	4.3	0.25	0.50	"	"	6F22117	06/22/06	06/29/06 16:27	EPA 6020	
Barium	110	0.80	1.0	"	"	6F22115	06/22/06	06/27/06 03:26	EPA 6010B	
Beryllium	0.58	0.20	0.50	"	"	"	"	"	"	
Boron	2.4	1.0	5.0	"	"	"	"	"	"	J
Cadmium	0.034	0.020	0.50	"	"	6F22117	06/22/06	06/29/06 16:27	EPA 6020	J
Calcium	1200	5.0	15	"	"	6F22115	06/22/06	06/27/06 03:25	EPA 6010B	
Chromium	71	0.30	1.0	"	"	"	"	06/27/06 03:26	"	
Cobalt	17	0.30	1.0	"	"	"	"	"	"	
Copper	21	0.20	2.0	"	"	"	"	"	"	B-I
Iron	27000	1.5	5.0	"	"	"	"	06/27/06 03:25	"	
Lead	9.9	0.020	0.50	"	"	6F22117	06/22/06	06/29/06 16:27	EPA 6020	
Magnesium	1400	0.90	10	"	"	6F22115	06/22/06	06/27/06 03:26	EPA 6010B	B-I
Manganese	690	0.80	1.0	"	"	"	"	06/27/06 03:25	"	
Mercury	0.023	0.0030	0.020	"	"	6F27097	06/27/06	06/27/06 14:52	EPA 7471A	
Molybdenum	0.66	0.20	2.0	"	"	6F22115	06/22/06	06/27/06 03:26	EPA 6010B	J
Nickel	24	0.20	2.0	"	"	"	"	"	"	
Potassium	980	40	50	"	"	"	"	06/27/06 03:24	"	
Selenium	0.22	0.20	1.0	"	"	6F22117	06/22/06	06/29/06 16:27	EPA 6020	J J
Silver	ND	0.40	1.0	"	"	6F22115	06/22/06	06/27/06 03:26	EPA 6010B	B
Sodium	50	15	50	"	"	"	"	06/27/06 03:24	"	

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METALS
TestAmerica - Irvine, CA

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C41-SS08-0 (S606389-03) Soil Sampled: 06/19/06 10:20 Received: 06/19/06 16:57										
Thallium	0.21	0.10	0.50	mg/kg	1	6F22117	06/22/06	06/29/06 16:27	EPA 6020	J
Titanium	580	0.20	2.0	"	"	6F22115	06/22/06	06/27/06 03:25	EPA 6010B	
Vanadium	93	0.30	1.0	"	"	"	"	06/27/06 03:26	"	
Zinc	19	0.50	10	"	"	6F22117	06/22/06	06/29/06 16:27	EPA 6020	
C41-SS16-0 (S606389-04) Soil Sampled: 06/19/06 10:30 Received: 06/19/06 16:57										
Aluminum	23000	10	20	mg/kg	2	6F22115	06/22/06	06/26/06 15:56	EPA 6010B	M-HA
Antimony	12	1.6	20	"	"	"	"	06/26/06 15:57	"	M2, J
Arsenic	3.7	0.25	0.50	"	1	6F22117	06/22/06	06/28/06 20:08	EPA 6020	
Barium	130	1.6	2.0	"	2	6F22115	06/22/06	06/26/06 15:56	EPA 6010B	
Beryllium	ND	0.40	1.0	"	"	"	"	"	"	
Boron	21	2.0	10	"	"	"	"	"	"	
Cadmium	0.032	0.020	0.50	"	1	6F22117	06/22/06	06/28/06 20:08	EPA 6020	J
Calcium	910	10	30	"	2	6F22115	06/22/06	06/26/06 15:56	EPA 6010B	
Chromium	86	0.60	2.0	"	"	"	"	06/26/06 15:57	"	
Cobalt	21	0.60	2.0	"	"	"	"	"	"	
Copper	24	0.40	4.0	"	"	"	"	06/26/06 15:56	"	B-1
Iron	36000	3.0	10	"	"	"	"	"	"	M-HA
Lead	12	0.020	0.50	"	1	6F22117	06/22/06	06/28/06 20:08	EPA 6020	
Magnesium	1400	1.8	20	"	2	6F22115	06/22/06	06/26/06 15:56	EPA 6010B	B-1, M-HA
Manganese	740	1.6	2.0	"	"	"	"	"	"	M-HA
Mercury	0.032	0.0030	0.020	"	1	6F27097	06/27/06	06/27/06 14:55	EPA 7471A	
Molybdenum	0.55	0.40	4.0	"	2	6F22115	06/22/06	06/26/06 15:57	EPA 6010B	J
Nickel	28	0.40	4.0	"	"	"	"	"	"	
Potassium	1100	80	100	"	"	"	"	06/26/06 15:55	"	M-HA
Selenium	0.21	0.20	1.0	"	1	6F22117	06/22/06	06/28/06 20:08	EPA 6020	M2, J

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METALS
TestAmerica - Irvine, CA

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C41-SS16-0 (S606389-04) Soil Sampled: 06/19/06 10:30 Received: 06/19/06 16:57										
Silver	ND	0.80	2.0	mg/kg	2	6F22115	06/22/06	06/26/06 15:56	EPA 6010B	B
Sodium	110	30	100	"	"	"	"	06/26/06 15:55	"	
Thallium	0.32	0.10	0.50	"	1	6F22117	06/22/06	06/28/06 20:08	EPA 6020	J
Titanium	640	0.40	4.0	"	2	6F22115	06/22/06	06/26/06 15:56	EPA 6010B	M-HA
Vanadium	110	0.60	2.0	"	"	"	"	"	"	
Zinc	18	0.50	10	"	1	6F22117	06/22/06	06/28/06 20:08	EPA 6020	

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9/13/06

LDC #: 0609-01A4
 SDG #: S606389
 Laboratory: Irvin

VALIDATION COMPLETENESS WORKSHEET

X EPA Level III/IV

Date: 9/12/06
 Page: 1 of 1
 Reviewer: CT
 2nd Reviewer: UE

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

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

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: <u>6/19/06</u>
II.	Calibration	A	
III.	Blanks	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	SW	MS/MSD = 4/5
VI.	Duplicate Sample Analysis	N	
VII.	Laboratory Control Samples (LCS)	A	
VIII.	Internal Standard (ICP-MS)	A	
IX.	Furnace Atomic Absorption QC	N	
X.	ICP Serial Dilution	N	
XI.	Sample Result Verification	A	Not reviewed for Level III validation.
XII.	Overall Assessment of Data	<u>SW Act</u>	
XIII.	Field Duplicates	N	
XIV.	Field Blanks	N	

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

Validated Samples: ** Indicates sample underwent Level IV/D validation

1	C41-SS07-0	11		21		31	
2	C41-SS08-0 **	12		22		32	
3	C41-SS16-0	13		23		33	
4	C41-SS16-0MS	14		24		34	
5	C41-SS16-0MSD	15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes: _____

Method:Metals (EPA SW 826 Method 6010/6020/7000)

Validation Area	Yes	No	NA	Findings/Comments
I. Technical holding times				
All technical holding times were met.	X			
Cooler temperature criteria was met.	X			
II. Calibration				
Were all instruments calibrated daily, each set-up time?	X			
Were the proper number of standards used?	X			
Were all initial and continuing calibration verification %Rs within the 90-110% (80-120% for mercury and 85-115% for cyanide) QC limits?	X			
Were all initial calibration correlation coefficients ≥ 0.995 ? (Level IV only)	X			
Was a midrange cyanide standard distilled? (Level IV only)			X	
III. Blanks				
Was a method blank associated with every sample in this SDG?	X			
Was there contamination in the method blanks? If yes, please see the Blanks validation completeness worksheet.	X			All detects above 5X blank levels
IV. ICP Interference Check Sample				
Were ICP interference check samples performed daily?	X			
Were the AB solution percent recoveries (%R) with the 80-120% QC limits?	X			
IV. Matrix spike/Matrix spike duplicates				
Were a matrix spike (MS) and duplicate (DUP) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD or MS/DUP. Soil / Water.	X			
Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the 75-125 QC limits? If the sample concentration exceeded the spike concentration by a factor of 4 or more, no action was taken.		X		Antimony, Selenium % recovery below MS/MSD control limits
Were the MS/MSD or duplicate relative percent differences (RPD) $\leq 20\%$ for waters and $\leq 35\%$ for soil samples? A control limit of $\pm RL$ ($\pm 2X RL$ for soil) was used for samples that were $\leq 5X$ the RL, including when only one of the duplicate sample values were $< 5X$ the RL.	X			
V. Laboratory control samples				
Was an LCS analyzed for this SDG?	X			
Was an LCS analyzed per extraction batch?	X			
Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the 80-120% QC limits for water samples and laboratory established QC limits for soils?	X			
VI. Furnace Atomic Absorption QC				
If MSA was performed, was the correlation coefficients > 0.995 ?			X	
Do all applicable analyses have duplicate injections? (Level IV only)			X	
For sample concentrations $> RL$, are applicable duplicate injection RSD values $< 20\%$? (Level IV only)			X	

VALIDATION FINDINGS CHECKLIST

Validation Area	Yes	No	NA	Findings/Comments
Were analytical spike recoveries within the 85-115% QC limits?			X	
VII. ICP Serial Dilution				
Was an ICP serial dilution analyzed if analyte concentrations were > 50X the IDL?			X	
Were all percent differences (%Ds) < 10%?			X	
Was there evidence of negative interference? If yes, professional judgement will be used to qualify the data.			X	
VIII. Internal Standards (EPA SW 846 Method 6020)				
Were all the percent recoveries (%R) within the 30-120% of the intensity of the internal standard in the associated initial calibration?	X			
If the %Rs were outside the criteria, was a reanalysis performed?			X	
IX. Regional Quality Assurance and Quality Control				
Were performance evaluation (PE) samples performed?			X	
Were the performance evaluation (PE) samples within the acceptance limits?			X	
X. Sample Result Verification				
Were RLs adjusted to reflect all sample dilutions and dry weight factors applicable to level IV validation?	X			Sample C41-SS08-0 only
XI. Overall assessment of data				
Overall assessment of data was found to be acceptable.	X			
XII. Field duplicates				
Field duplicate pairs were identified in this SDG.		X		
Target analytes were detected in the field duplicates.			X	
XIII. Field blanks				
Field blanks were identified in this SDG.		X		
Target analytes were detected in the field blanks.			X	

LDC #: 0609-0114
 SDG #: 3006389

VALIDATION FINDINGS WORKSHEET

Sample Calculation Verification

Page: 1 of 3
 Reviewer: CT
 2nd Reviewer: AE

METHOD: Metals by ICP (EPA SW 846 Method 6010B)

Compound results for all level IV samples reported with a positive detect were recalculated and verified using the following equation:

$$\text{Concentration} = \frac{(Cx)(Vt)(Df)}{(Vo)(\%M)}$$

Where:

- Cx = Raw data concentration
- Vt = Final Extract Volume
- DF = Dilution factor
- Vo = Volume or weight of sample extracted
- %M = Percent moisture, applicable to soils and solids matrices only. (For water, %S = 1)

#	Sample I.D.	Compound	Raw Data Conc. (A/H)	Final Volume (mL)	Dilution Factor	Sample wt/vol (g)	% moi	Reported Concentration (mg/Kg)	Calculated Concentration (mg/Kg)	% Diff	Acc (Y/N)
1	C41-SS08-0	Al	709.7	50	1	2	1	18,000	17,922	-0.4	Y
		Ba	4.216	50	1	2	1	110	106	-3.2	Y
		Be	0.0231	50	1	2	1	0.58	0.58	0.6	Y
		B	0.0975	50	1	2	1	2.4	2.5	2.6	Y
		Ca	46.64	50	1	2	1	1,200	1,178	-1.9	Y
		Cr	2.858	50	1	2	1	71	72	1.7	Y
		Co	0.6916	50	1	2	1	17	17	2.7	Y
		Cu	0.8404	50	1	2	1	21	21	1.1	Y
		Fe	1065	50	1	2	1	27,000	26,894	-0.4	Y
		Mg	57.76	50	1	2	1	1,400	1,459	4.2	Y
		Mn	27.77	50	1	2	1	690	701	1.6	Y
		Mo	0.0262	50	1	2	1	0.66	0.66	0.2	Y
		Ni	0.9412	50	1	2	1	24	24	-1.0	Y
		K	39.12	50	1	2	1	980	988	0.8	Y
		Na	2.001	50	1	2	1	50	51	1.1	Y
		Ti	23.02	50	1	2	1	580	581	0.2	Y
		V	3.738	50	1	2	1	93	94	1.5	Y

