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MEMORANDUM

TO: Gerard Abrams
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FROM: Fred Seto, Ph.D. FS
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DATE: September 7, 2004

SUBJECT: Review of Data Packages, Boeing Rocketdyne-Santa Susana Field Laboratory RFI
Columbia Analytical Services, Inc.: EPA Method 6010 (Metals), EPA Method 7060 (Arsenic), EPA Method 7471 (Mercury), EPA Method 7740 (Selenium), EPA Method 7841 (Thallium).

As requested, we have reviewed the data packages for metals. The data packages contain 51 samples. They are described below. The analytical results and the associated reporting limits are given in Table 1.

SDG No	Sample No	Date Collected	Matrix (No of Samples)	EPA Method
L9703664	RF697	10/24/97	Soil (18)	6010, 7060
	RF698	10/24/97		7841, 7740
	RF696	10/24/97		7471
	RF700	10/24/97		

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SDG No	Sample No	Date Collected	Matrix (No of Samples)	EPA Method
L9703664	RF701	10/24/97	Soil (18)	6010, 7060
	RF705	10/27/97		7841, 7740
	RF706	10/27/97		7471
	RF707	10/27/97		
	RF708	10/27/97		
	RF710	10/27/97		
	RF711	10/27/97		
	RF112	10/27/97		
	RF113	10/27/97		
	RF114	10/27/97		
	RF115	10/27/97		
	RF116	10/27/97		
	RF117	10/27/97		
	RF118	10/27/97		
L9704114	RF977	12/02/97	Soil (18)	6010, 7060
	RF978	12/02/97		7841, 7740
	RF979	12/02/97		7471
	RF980	12/02/97		
	RF397	12/02/97		
	RF398	12/02/97		
	RF982	12/03/97		
	RF985	12/03/97		
	RF986	12/03/97		
	RF405	12/03/97		
	RF410	12/03/97		
	RF991	12/04/97		
	RF992	12/04/97		
	RF993	12/04/97		
	RF994	12/04/97		
	RF995	12/04/97		
	RF413	12/04/97		
	RF414	12/04/97		
L9800196	RS133	01/23/98	Soil (15)	6010, 7060
	RS134	01/23/98		7841, 7740
	RS135	01/23/98		7471
	RS136	01/23/98		
	RS137	01/23/98		
	RS142	01/23/98		
	RS143	01/23/98		
	RS642	01/23/98		
	RS643	01/23/98		
	RS644	01/23/98		
	ES646	01/23/98		
	RS647	01/23/98		
	RS648	01/23/98		
	RS649	01/23/98		
	RS650	01/23/98		

We have evaluated, where applicable, the holding times, initial calibrations, calibration verifications, method blanks, laboratory control samples (LCS), matrix spike/matrix spike duplicate (MS/MSD), interference check standard (ICS), analyte identification and quantitation. The data review results for metals are summarized in Table 2. We have the following comments:

The initial calibration, calibration verifications, method blanks, LCS, and applicable ICS results were within the control limits for EPA method 6010 (metals), EPA method 7060 (arsenic), EPA method 7471 (mercury), EPA method 7740 (selenium) and EPA method 7841 (thallium). The holding times, anayte identification, and analyte quantitation were acceptable. MS/MSD results were acceptable except the following:

Spiked Compound	MS/MSD Samples	Results	Affected samples
Antimony	L9704114-001	67%, 51%R 27% RPD	SDG L9704114 samples
Mercury	L9800196-019	224%, 167%R 18% RPD	SDG L9800196 samples

However, the LCS results for these compounds were within control limits.

Most of quality assurance/quality control (QA/QC) results were satisfactory. For SDG L9704114 samples, the relative percent difference (RPD) from the MS/MSD results for antimony was not satisfactory (RPD was not within the control limit of 20%). For SDG L9800196 samples, the mercury recoveries from the MS/MSD results were not satisfactory (percent recoveries were not within the control limits of 60% to 130%). Since the LCS results for antimony and mercury were within the control limits, the analytical system would be functioning properly. Since the RPD for the antimony recoveries is outside of the control limit, the reported samples values should be qualified as estimates. However, the reported antimony results for SDG L9704114 samples were not-detected (ND). The antimony ND results may be acceptable since the two individual spiked antimony recoveries were within the control limits. The reported mercury results for SDG L9800196 samples were ND except for samples RS-142 and RS-650 with 1.3 mg/kg and 0.3 mg/kg respectively. Sine the mercury recoveries are higher than the upper control limit, the reported ND values should be acceptable and the reported numerical values should be qualified as estimates.

If you have any questions, please contact me or James Cheng at (510)540-3003.

CC: Cindy Dingman
Lorna Garcia
James Cheng
Thomas Li, Ph.D.

Table 1: Analytical Results and Reporting Limits for Metals in Soil Samples

Analyte	Sample No RF-697 (mg/Kg)	RF-698 (mg/Kg)	RF-696 (mg/kg)	RF-700 (mg/kg)	RF-701 (mg/kg)	RF-705 (mg/kg)	RF-706 (mg/kg)	RF-707 (mg/kg)	RF-708 (mg/kg)	Reporting Limit (mg/kg)
Aluminum (Al)	NA	NA	NA	NA	NA	NA	NA	NA	NA	11
Antimony (Sb)	NA	NA	NA	NA	NA	ND	ND	ND	ND	23
Arsenic (As)	NA	NA	NA	NA	NA	ND	ND	ND	ND	12
Barium (Ba)	NA	NA	NA	NA	NA	120	33	47	75	2
Beryllium (Be)	NA	NA	NA	NA	NA	ND	ND	ND	ND	1.2
Boron (B)	NA	NA	NA	NA	NA	NA	NA	NA	NA	11
Cadmium (Cd)	NA	NA	NA	NA	NA	3	ND	ND	3	1
Chromium (Cr)	NA	NA	NA	NA	NA	31	8	11	22	2
Cobalt (Co)	NA	NA	NA	NA	NA	10	ND	4	7	2
Copper (Cu)	NA	NA	NA	NA	NA	300	14	9	220	2
Lead (Pb)	41	11	48	33	42	45	14	18	39	6
Mercury (Hg)	NA	NA	NA	NA	NA	ND	ND	ND	ND	0.2
Molybdenum (Mo)	NA	NA	NA	NA	NA	ND	ND	ND	ND	10
Nickel (Ni)	NA	NA	NA	NA	NA	22	ND	8	17	6
Selenium (Se)	NA	NA	NA	NA	NA	ND	ND	ND	ND	5
Silver (Ag)	NA	NA	NA	NA	NA	10	ND	ND	14	1
Thallium (Tl)	NA	NA	NA	NA	NA	ND	ND	ND	ND	5
Vanadium (V)	NA	NA	NA	NA	NA	46	14	20	29	2
Zinc (Zn)	NA	NA	NA	NA	NA	260	150	98	210	1

ND = Not Detected
NA = Not Applicable (no reported data)

Table 1: Analytical Results and Reporting Limits for Metals in Soil Samples (Continued)

Analyte	Sample No RF-710 (mg/Kg)	RF-111 (mg/Kg)	RF-112 (mg/Kg)	RF-113 (mg/Kg)	RF-114 (mg/Kg)	RF-115 (mg/Kg)	RF-116 (mg/Kg)	RF-117 (mg/Kg)	RF-118 (mg/Kg)	RF-977 (mg/Kg)	RF-978 (mg/Kg)	RF-979 (mg/Kg)	RF-980 (mg/Kg)	RF-397 (mg/Kg)	Reporting Limit (mg/Kg)
Al	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14
Sb	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	23
As	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12
Ba	28	89	90	76	63	110	59	93	60	62	76	67	60	89	2
Be	3.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.2
B	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14
Cd	6	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	1
Cr	12	21	23	24	18	23	18	27	27	11	21	15	22	25	2
Co	4	10	7	4	6	7	7	8	4	6	10	6	5	8	2
Cu	15	40	400	8	37	3500	10	40	7	5	20	19	21	12	2
Pb	77	13	14	ND	13	15	8	14	9	ND	56	19	10	13	6
Hg	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.6	0.3	0.4	0.2
Mo	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10
Ni	10	17	17	13	13	18	16	25	15	ND	11	9	7	16	6
Se	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
Ag	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND	1
Tl	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5
V	11	38	ND	29	28	41	37	38	33	28	25	30	27	41	2
Zn	1300	56	38	49	47	110	45	62	42	41	840	210	99	84	1

ND = Not Detected
NA = Not Applicable (no reported data)

Table 1: Analytical Results and Reporting Limits for Metals in Soil Samples (Continued)

Analyte	Sample No RF-398 (mg/Kg)	RF-982 (mg/Kg)	RF-985 (mg/Kg)	RF-986 (mg/Kg)	RF-405 (mg/Kg)	RF-410 (mg/Kg)	RF-991 (mg/Kg)	RF-992 (mg/Kg)	RF-993 (mg/Kg)	RF-994 (mg/Kg)	RF-995 (mg/Kg)	RF-413 (mg/Kg)	RF-414 (mg/Kg)	RS-133 (mg/Kg)	Reporting Limit (mg/Kg)
Al	NA	NA	NA	9600	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	14
Sb	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	23
As	94	16	ND	NA	13	ND	NA	ND	ND	ND	ND	ND	ND	ND	12
Ba	77	83	73	NA	81	78	NA	78	50	89	65	69	72	NA	2
Be	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	1.2
B	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	14
Cd	ND	ND	17	NA	ND	ND	NA	ND	ND	6	2	ND	ND	NA	1
Cr	12	22	65	NA	30	16	NA	24	18	691	22	16	13	NA	2
Co	5	7	7	NA	12	7	NA	7	5	7	6	6	5	NA	2
Cu	7	10	35	NA	26	6	NA	15	13	64	16	6	8	NA	2
Pb	7	8	91	NA	27	8	NA	12	25	120	32	8	7	NA	6
Hg	ND	ND	20	NA	ND	ND	10	ND	ND	ND	ND	9	ND	NA	0.2
Mo	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	10
Ni	9	15	8	NA	30	9	NA	16	12	22	14	10	9	NA	6
Se	ND	ND	28	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	5
Ag	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	1
Tl	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	ND	ND	ND	NA	5
V	21	34	24	NA	52	29	NA	34	26	40	32	26	23	NA	2
Zn	45	50	770	NA	110	43	NA	160	160	510	600	47	60	NA	1

ND = Not Detected
NA = Not Applicable (no reported data)

Table 1: Analytical Results and Reporting Limits for Metals in Soil Samples (Continued)

Analyte	Sample No RS-134 (mg/Kg)	RS-135 (mg/Kg)	RS-136 (mg/Kg)	RS-137 (mg/Kg)	RS-142 (mg/Kg)	RS-143 (mg/Kg)	RS-642 (mg/Kg)	RS-643 (mg/Kg)	RS-644 (mg/Kg)	RS-646 (mg/Kg)	RS-647 (mg/Kg)	RS-648 (mg/Kg)	RS-649 (mg/Kg)	RS-650 (mg/Kg)	Reporting Limit (mg/Kg)
Al	NA	NA	NA	NA	NA	NA	16000	NA	11000	NA	NA	4400	NA	10000	14
Sb	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA	NA	ND	NA	ND	23
As	ND	18	ND	ND	ND	ND	ND	NA	ND	ND	ND	ND	NA	ND	12
Ba	NA	NA	NA	NA	NA	NA	110	230	120	NA	NA	34	NA	78	2
Be	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA	NA	ND	NA	82	1.2
B	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA	NA	ND	NA	15	14
Cd	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA	NA	ND	NA	4	1
Cr	NA	NA	NA	NA	NA	NA	27	NA	43	NA	NA	9	NA	20	2
Co	NA	NA	NA	NA	4	5	9	NA	4	NA	NA	4	NA	6	2
Cu	NA	NA	NA	NA	NA	NA	15	NA	11	NA	NA	9	NA	26	2
Pb	NA	NA	NA	NA	NA	NA	12	NA	9	NA	NA	22	ND	60	6
Hg	NA	NA	NA	NA	1.3	ND	ND	NA	ND	NA	NA	ND	NA	0.3	0.2
Mo	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA	NA	ND	NA	ND	10
Ni	NA	NA	NA	NA	NA	NA	23	NA	10	NA	NA	7	NA	16	6
Se	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA	NA	ND	NA	ND	5
Ag	NA	NA	NA	NA	NA	NA	ND	17	73	NA	NA	ND	NA	ND	1
Tl	NA	NA	NA	NA	NA	NA	ND	NA	ND	NA	NA	ND	NA	ND	5
V	NA	NA	NA	NA	NA	NA	43	NA	34	NA	NA	15	NA	30	2
Zn	NA	NA	2NA	NA	NA	NA	66	NA	57	NA	NA	52	NA	180	1

ND = Not Detected
NA = Not Applicable (no reported data)

Table 2. Metals Data Review Summary

QA/QC Criteria	EPA Method 6010 (Metals)	EPA Method 7060 (Arsenic)	EPA Method 7471 (Mercury)	EPA Method 7740 (Selenium)	EPA Method 7841 (Thallium)
Holding Times 6 months (metals except mercury) 28 days (mercury)	Yes	Yes	Yes	Yes	Yes
Initial Calibration	Yes	Yes	Yes	Yes	Yes
Calibration Verification R=90%-110%(except Hg) R=80%-120% (Hg)	Yes	Yes	Yes	Yes	Yes
Method Blanks	Yes	Yes	Yes	Yes	Yes
Laboratory Control Samples R=75%-125%	Yes	Yes	Yes	Yes	Yes
Matrix Spike/Matrix Spike Duplicate R=60%-130% (metals except Sb,Se) R=30%-120(Sb) R=50%-130(Se) RPD=<20%	Yes	Yes	Yes	Yes	Yes
Interference Check Standard R=80%-120%	Yes	NA	NA	NA	NA
Identification	Yes	Yes	Yes	Yes	Yes
Quantitation	Yes	Yes	Yes	Yes	Yes

R = Recovery RPD = Relative Percent Difference NA = Not Applicable