T / F / IHW 31235 CO RP

ASARCO EL PASO COPPE

WWC COMM # 10984235
PROJ. MGR. B.Wilkinson

PHASE IV REMEDIAL INVESTIGATION

EL PASO TEXAS

COPY

Prepared for:

Received
MAY 03 2005
Remediation Division
Corrective Action Section

ASARCO, Incorporated
P.O. BOX 1111
EL PASO, TEXAS 79999

Prepared by:

ASARCO
Consulting, Inc.

El Paso, Texas

SEPTEMBER 2003

VOLUME II of II

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APPENDIX A

EPA METAL SURVEY RESULTS, LA CALAVERA AREA (SAN MARCOS)

EPA Metal Survey, San Marcos Residential Area
Sampling Date - August 3, 2001 Method of Analysis - 6010B

Sample Locations	Sample Number	Lab ID Number	Lead mg/kg	Reporting Limit	Arsenic mg/kg	Reporting Limit
1	SMS01-004-51-01	080301007-57	220	6.0	26	3.0
	SMS01-004-51-02	080301007-58	560	15	59	3.0
2	SMS01-005-51-01	080301007-55	111	3.0	16	3.0
	SMS01-005-51-02	080301007-56	270	12	21	3.0
3	SMS01-006-51-01	080301007-53	200	6.0	22	3.0
	SMS01-006-51-02	080301007-54	480	15	62	3.0
4	SMS01-007-51-01	080301007-51	140	6.0	18	3.0
	SMS01-007-51-02	080301007-52	95	3.0	6.7	3.0
5	SMS01-008-51-01	080301007-50	140	6.0	14	3.0
6	SMS01-009-51-01	080301007-48	190	6.0	24	3.0
	SMS01-009-51-02	080301007-49	150	6.0	13	3.0
	SMS01-009-52-01	080301007-85	240	12	23	3.0
	SMS01-009-52-02	080301007-84	180	6.0	10	3.0
7	SMS01-010-51-01	080301007-46	68	3.0	<5.0	5.0
	SMS01-010-51-02	080301007-47	34	3.0	<3.0	3.0
8	SMS01-011-51-01	080301007-44	100	3.0	12	3.0
	SMS01-011-51-02	080301007-45	120	3.0	16	3.0
9	SMS01-012-51-01	080301007-42	45	3.0	<3.0	3.0
	SMS01-012-51-02	080301007-43	69	3.0	4.4	3.0
10	SMS01-013-51-01	080301007-40	100	3.0	<3.0	3.0
	SMS01-013-51-02	080301007-41	170	6.0	4.9	3.0
11	SMS01-014-51-01	080301007-38	150	6.0	11	3.0
	SMS01-014-51-02	080301007-39	220	6.0	16	3.0
12	SMS01-015-51	080301007-37	70	3.0	8.7	3.0
13	SMS01-016-51	080301007-36	43	3.0	<3.0	3.0
14	SMS01-017-51	080301007-34	32	3.0	<5.0	5.0
	SMS01-017-51	080301007-35	120	3.0	<3.0	3.0
15	SMS01-018-51	080301007-32	19	3.0	<3.0	3.0
	SMS01-018-51	080301007-33	13	3.0	<3.0	3.0
16	SMS01-019-51-01	080301007-30	25	3.0	<3.0	3.0
	SMS01-019-51-02	080301007-31	17	3.0	<3.0	3.0
17	SMS01-025-51-01	080301007-28	260	15	34	3.0
	SMS01-025-51-02	080301007-29	110	3.0	15	3.0
18	SMS01-026-51-01	080301007-26	180	6.0	17	3.0

EPA Metal Survey, San Marcos Residential Area
Sampling Date - August 3, 2001 Method of Analysis - 6010B

Sample Locations	Sample Number	Lab ID Number	Lead mg/kg	Reporting Limit	Arsenic mg/kg	Reporting Limit
	SMS01-026-51-02	080301007-27	850	30	28	3.0
19	SMS01-027-51-01-	080301007-24	180	6.0	23	3.0
	SMS01-027-51-02	080301007-25	57	3.0	14	3.0
20	SMS01-028-51-01	080301007-22	210	6.0	25	3.0
	SMS01-028-51-02	080301007-23	240	12	28	3.0
21	SMS01-029-51-01	080301007-20	210	6.0	22	3.0
	SMS01-029-51-02	080301007-21	88	3.0	11	3.0
		Count	41		41	
		Minimum	13		<3.0	
		Maximum	850		62	

LEGEND

S SAMPLE LOCATIONS

ISO-CONCENTRATIONS (PPM)

INFERRED ISO-CONCENTRATIONS (PPM)

SAMPLING BOUNDARY

0 30 60 Feet

NOTE: THIS IS A DRAFT. DATA HAS NOT BEEN VALIDATED.

EPA United States Environmental Protection Agency

**EL PASO COUNTY METALS INVESTIGATION
ARSENIC ISOPLETH MAP FOR
STATIONS EXCEEDING 20 PPM
SAN MARCOS DR.
EL PASO COUNTY, TEXAS**

AUG 01	20074.515.028.0030	SCALE AS SHOWN

APPENDIX B

PHASE IV LABORATORY ANALYTICAL REPORTS

Phase IV RI

ASARCO

November 26, 2002

Mr. Lairy Johnson
El Paso Plant

Dear Mr. Johnson:

Please find attached the analytical results for your soil samples collected on 10/28/02 through 10/30/02 and received at the lab on 11/05/02. A portion of each sample was digested in accordance with EPA Method 3050 on 11/21/02 through 11/26/02. Results are reported on a dry weight basis. Also attached are the QC results.

T.J. Jacobi

T.J. Jacobi
Sr. Chemist

cc: GRStanga (w/attach.)
Ltangen

RECEIVED
DEC 10 2002
ASARCO INC.
EL PASO PLANT
ENVIRONMENTAL

ASARCO Incorporated 3422 South 700 West, Salt Lake City, Utah 84119-4191 (801) 262-2459 FAX (801) 261-2194

AMERICAN ENVIRONMENTAL CONSULTANTS

ANALYTICAL DATA REPORT

El Paso

(Project RI PHASE IV)

Batch No: L020922

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-001	30-OCT-02	IBWC-1A	AS	59.	ppm	TJJ	22-NOV-02	6010B
			CD	31.	ppm	TJJ	22-NOV-02	6010B
			CR	24.	ppm	TJJ	22-NOV-02	6010B
			CU	771.	ppm	TJJ	22-NOV-02	6010B
			FE	14100.	ppm	TJJ	22-NOV-02	6010B
			PB	543.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	603.	ppm	TJJ	22-NOV-02	6010B
L020922-002	30-OCT-02	IBWC-1B	AS	57.	ppm	TJJ	22-NOV-02	6010B
			CD	10.	ppm	TJJ	22-NOV-02	6010B
			CR	23.	ppm	TJJ	22-NOV-02	6010B
			CU	641.	ppm	TJJ	22-NOV-02	6010B
			FE	16500.	ppm	TJJ	22-NOV-02	6010B
			PB	405.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	304.	ppm	TJJ	22-NOV-02	6010B
L020922-003	30-OCT-02	IBWC-1C	AS	15.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	15.	ppm	TJJ	22-NOV-02	6010B
			CU	81.	ppm	TJJ	22-NOV-02	6010B
			FE	12800.	ppm	TJJ	22-NOV-02	6010B
			PB	62.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	110.	ppm	TJJ	22-NOV-02	6010B
L020922-004	30-OCT-02	IBWC-1D	AS	<10.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	17.	ppm	TJJ	22-NOV-02	6010B
			CU	<10.	ppm	TJJ	22-NOV-02	6010B
			FE	12900.	ppm	TJJ	22-NOV-02	6010B
			PB	<10.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	33.	ppm	TJJ	22-NOV-02	6010B
L020922-005	30-OCT-02	IBWC-1E1	AS	<10.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	14.	ppm	TJJ	22-NOV-02	6010B

AMERICAN ENVIRONMENTAL CONSULTANTS

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El Paso

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LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-005	30-OCT-02	IBWC-1E1	CU	52.	ppm	TJJ	22-NOV-02	6010B
			FE	11900.	ppm	TJJ	22-NOV-02	6010B
			PB	38.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	59.	ppm	TJJ	22-NOV-02	6010B
L020922-006	30-OCT-02	IBWC-1E2 D	AS	<10.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	17.	ppm	TJJ	22-NOV-02	6010B
			CU	30.	ppm	TJJ	22-NOV-02	6010B
			FE	12600.	ppm	TJJ	22-NOV-02	6010B
			PB	23.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	54.	ppm	TJJ	22-NOV-02	6010B
L020922-007	30-OCT-02	IBWC-2A	AS	55.	ppm	TJJ	22-NOV-02	6010B
			CD	21.	ppm	TJJ	22-NOV-02	6010B
			CR	19.	ppm	TJJ	22-NOV-02	6010B
			CU	735.	ppm	TJJ	22-NOV-02	6010B
			FE	13200.	ppm	TJJ	22-NOV-02	6010B
			PB	447.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	473.	ppm	TJJ	22-NOV-02	6010B
L020922-008	30-OCT-02	IBWC-2B	AS	41.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	15.	ppm	TJJ	22-NOV-02	6010B
			CU	447.	ppm	TJJ	22-NOV-02	6010B
			FE	12800.	ppm	TJJ	22-NOV-02	6010B
			PB	333.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	261.	ppm	TJJ	22-NOV-02	6010B
L020922-009	30-OCT-02	IBWC-2C	AS	32.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	20.	ppm	TJJ	22-NOV-02	6010B
			CU	483.	ppm	TJJ	22-NOV-02	6010B
			FE	13300.	ppm	TJJ	22-NOV-02	6010B
			PB	332.	ppm	TJJ	22-NOV-02	6010B

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L020922-009	30-OCT-02	IBWC-2C	SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	216.	ppm	TJJ	22-NOV-02	6010B
L020922-010	30-OCT-02	IBWC-2D	AS	11.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	14.	ppm	TJJ	22-NOV-02	6010B
			CU	101.	ppm	TJJ	22-NOV-02	6010B
			FE	11600.	ppm	TJJ	22-NOV-02	6010B
			PB	69.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	62.	ppm	TJJ	22-NOV-02	6010B
L020922-011	30-OCT-02	IBWC-2E	AS	<10.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	14.	ppm	TJJ	22-NOV-02	6010B
			CU	54.	ppm	TJJ	22-NOV-02	6010B
			FE	10900.	ppm	TJJ	22-NOV-02	6010B
			PB	37.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	49.	ppm	TJJ	22-NOV-02	6010B
L020922-012	30-OCT-02	IBWC-3A	AS	17.	ppm	TJJ	22-NOV-02	6010B
			CD	6.	ppm	TJJ	22-NOV-02	6010B
			CR	13.	ppm	TJJ	22-NOV-02	6010B
			CU	187.	ppm	TJJ	22-NOV-02	6010B
			FE	8590.	ppm	TJJ	22-NOV-02	6010B
			PB	104.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	139.	ppm	TJJ	22-NOV-02	6010B
L020922-013	30-OCT-02	IBMC-3B	AS	47.	ppm	TJJ	22-NOV-02	6010B
			CD	8.	ppm	TJJ	22-NOV-02	6010B
			CR	13.	ppm	TJJ	22-NOV-02	6010B
			CU	460.	ppm	TJJ	22-NOV-02	6010B
			FE	13600.	ppm	TJJ	22-NOV-02	6010B
			PB	302.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	331.	ppm	TJJ	22-NOV-02	6010B

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L020922-014	30-OCT-02	IBMC-3C	AS	20.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	16.	ppm	TJJ	22-NOV-02	6010B
			CU	116.	ppm	TJJ	22-NOV-02	6010B
			FE	13000.	ppm	TJJ	22-NOV-02	6010B
			PB	65.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	335.	ppm	TJJ	22-NOV-02	6010B
L020922-015	30-OCT-02	IBMC-3D	AS	<10.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	18.	ppm	TJJ	22-NOV-02	6010B
			CU	<10.	ppm	TJJ	22-NOV-02	6010B
			FE	11400.	ppm	TJJ	22-NOV-02	6010B
			PB	<10.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	28.	ppm	TJJ	22-NOV-02	6010B
L020922-016	30-OCT-02	IBWC-3E	AS	<10.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	26.	ppm	TJJ	22-NOV-02	6010B
			CU	<10.	ppm	TJJ	22-NOV-02	6010B
			FE	13600.	ppm	TJJ	22-NOV-02	6010B
			PB	<10.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	38.	ppm	TJJ	22-NOV-02	6010B
L020922-017	30-OCT-02	IBWC-5A	AS	144.	ppm	TJJ	22-NOV-02	6010B
			CD	49.	ppm	TJJ	22-NOV-02	6010B
			CR	18.	ppm	TJJ	22-NOV-02	6010B
			CU	2450.	ppm	TJJ	22-NOV-02	6010B
			FE	10900.	ppm	TJJ	22-NOV-02	6010B
			PB	1400.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	1380.	ppm	TJJ	22-NOV-02	6010B
L020922-018	30-CCT-02	IBWC-5B	AS	102.	ppm	TJJ	22-NOV-02	6010B
			CD	69.	ppm	TJJ	22-NOV-02	6010B
			CR	18.	ppm	TJJ	22-NOV-02	6010B

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ANALYTICAL DATA REPORT

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LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-018	30-OCT-02	IBWC-5B	CU	1200.	ppm	TJJ	22-NOV-02	6010B
			FE	15500.	ppm	TJJ	22-NOV-02	6010B
			PB	1100.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	1470.	ppm	TJJ	22-NOV-02	6010B
L020922-019	30-OCT-02	IBWC-5C	AS	24.	ppm	TJJ	22-NOV-02	6010B
			CD	7.	ppm	TJJ	22-NOV-02	6010B
			CR	16.	ppm	TJJ	22-NOV-02	6010B
			CU	241.	ppm	TJJ	22-NOV-02	6010B
			FE	11500.	ppm	TJJ	22-NOV-02	6010B
			PB	137.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	172.	ppm	TJJ	22-NOV-02	6010B
L020922-020	30-OCT-02	IBWC-5D	AS	<10.	ppm	TJJ	22-NOV-02	6010B
			CD	<5.	ppm	TJJ	22-NOV-02	6010B
			CR	16.	ppm	TJJ	22-NOV-02	6010B
			CU	17.	ppm	TJJ	22-NOV-02	6010B
			FE	10300.	ppm	TJJ	22-NOV-02	6010B
			PB	<10.	ppm	TJJ	22-NOV-02	6010B
			SE	<10.	ppm	TJJ	22-NOV-02	6010B
			ZN	29.	ppm	TJJ	22-NOV-02	6010B
L020922-021	30-OCT-02	IBWC-5E1	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	22.	ppm	TJJ	25-NOV-02	6010B
			CU	12.	ppm	TJJ	25-NOV-02	6010B
			FE	11200.	ppm	TJJ	25-NOV-02	6010B
			PB	10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	36.	ppm	TJJ	25-NOV-02	6010B
L020922-022	30-OCT-02	IBWC-5E2	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	20.	ppm	TJJ	25-NOV-02	6010B
			CU	17.	ppm	TJJ	25-NOV-02	6010B
			FE	11500.	ppm	TJJ	25-NOV-02	6010B
			PB	15.	ppm	TJJ	25-NOV-02	6010B

AMERICAN ENVIRONMENTAL CONSULTANTS

ANALYTICAL DATA REPORT

El Paso

(Project RI PHASE IV)

Batch No: L020922

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-022	30-OCT-02	IBWC-5E2	SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	41.	ppm	TJJ	25-NOV-02	6010B
L020922-023	30-OCT-02	IBWC-4A	AS	100.	ppm	TJJ	25-NOV-02	6010B
			CD	46.	ppm	TJJ	25-NOV-02	6010B
			CR	17.	ppm	TJJ	25-NOV-02	6010B
			CU	1230.	ppm	TJJ	25-NOV-02	6010B
			FE	13100.	ppm	TJJ	25-NOV-02	6010B
			PB	881.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	579.	ppm	TJJ	25-NOV-02	6010B
L020922-024	30-OCT-02	IBWC-4B	AS	111.	ppm	TJJ	25-NOV-02	6010B
			CD	57.	ppm	TJJ	25-NOV-02	6010B
			CR	16.	ppm	TJJ	25-NOV-02	6010B
			CU	1110.	ppm	TJJ	25-NOV-02	6010B
			FE	14500.	ppm	TJJ	25-NOV-02	6010B
			PB	1020.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	999.	ppm	TJJ	25-NOV-02	6010B
L020922-025	30-OCT-02	IBWC-4C	AS	37.	ppm	TJJ	25-NOV-02	6010B
			CD	8.	ppm	TJJ	25-NOV-02	6010B
			CR	16.	ppm	TJJ	25-NOV-02	6010B
			CU	382.	ppm	TJJ	25-NOV-02	6010B
			FE	13500.	ppm	TJJ	25-NOV-02	6010B
			PB	352.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	217.	ppm	TJJ	25-NOV-02	6010B
L020922-026	30-OCT-02	IBWC-4D	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	13.	ppm	TJJ	25-NOV-02	6010B
			CU	22.	ppm	TJJ	25-NOV-02	6010B
			FE	10900.	ppm	TJJ	25-NOV-02	6010B
			PB	<10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	34.	ppm	TJJ	25-NOV-02	6010B

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L020922-027	30-OCT-02	IBWC-4E	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	13.	ppm	TJJ	25-NOV-02	6010B
			CU	20.	ppm	TJJ	25-NOV-02	6010B
			FE	12200.	ppm	TJJ	25-NOV-02	6010B
			PB	18.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	46.	ppm	TJJ	25-NOV-02	6010B
L020922-028	30-OCT-02	BH5-11A	AS	144.	ppm	TJJ	25-NOV-02	6010B
			CD	62.	ppm	TJJ	25-NOV-02	6010B
			CR	27.	ppm	TJJ	25-NOV-02	6010B
			CU	1780.	ppm	TJJ	25-NOV-02	6010B
			FE	14900.	ppm	TJJ	25-NOV-02	6010B
			PB	1480.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	908.	ppm	TJJ	25-NOV-02	6010B
L020922-029	30-OCT-02	BH5-11B	AS	115.	ppm	TJJ	25-NOV-02	6010B
			CD	13.	ppm	TJJ	25-NOV-02	6010B
			CR	20.	ppm	TJJ	25-NOV-02	6010B
			CU	604.	ppm	TJJ	25-NOV-02	6010B
			FE	16600.	ppm	TJJ	25-NOV-02	6010B
			PB	646.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	359.	ppm	TJJ	25-NOV-02	6010B
L020922-030	30-OCT-02	BH5-11C	AS	95.	ppm	TJJ	25-NOV-02	6010B
			CD	26.	ppm	TJJ	25-NOV-02	6010B
			CR	18.	ppm	TJJ	25-NOV-02	6010B
			CU	1220.	ppm	TJJ	25-NOV-02	6010B
			FE	14300.	ppm	TJJ	25-NOV-02	6010B
			PB	801.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	490.	ppm	TJJ	25-NOV-02	6010B
L020922-031	30-OCT-02	BH5-11D	AS	36.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	21.	ppm	TJJ	25-NOV-02	6010B

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L020922-031	30-OCT-02	BHS-11D	CU	210.	ppm	TJJ	25-NOV-02	6010B
			FE	15300.	ppm	TJJ	25-NOV-02	6010B
			PB	246.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	174.	ppm	TJJ	25-NOV-02	6010B
L020922-032	30-OCT-02	BHS-11E	AS	23.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	20.	ppm	TJJ	25-NOV-02	6010B
			CU	178.	ppm	TJJ	25-NOV-02	6010B
			FE	18900.	ppm	TJJ	25-NOV-02	6010B
			PB	129.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	120.	ppm	TJJ	25-NOV-02	6010B
L020922-033	30-OCT-02	BHS-11F	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	11.	ppm	TJJ	25-NOV-02	6010B
			CU	<10.	ppm	TJJ	25-NOV-02	6010B
			FE	12300.	ppm	TJJ	25-NOV-02	6010B
			PB	<10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	35.	ppm	TJJ	25-NOV-02	6010B
L020922-034	30-OCT-02	BHS-11G	AS	13.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	15.	ppm	TJJ	25-NOV-02	6010B
			CU	30.	ppm	TJJ	25-NOV-02	6010B
			FE	11700.	ppm	TJJ	25-NOV-02	6010B
			PB	25.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	44.	ppm	TJJ	25-NOV-02	6010B
L020922-035	30-OCT-02	BHS-11G D	AS	17.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	19.	ppm	TJJ	25-NOV-02	6010B
			CU	45.	ppm	TJJ	25-NOV-02	6010B
			FE	14100.	ppm	TJJ	25-NOV-02	6010B
			PB	36.	ppm	TJJ	25-NOV-02	6010B

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L020922-035	30-OCT-02	BH5-11G D	SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	55.	ppm	TJJ	25-NOV-02	6010B
L020922-036	30-OCT-02	BH5-11H	AS	12.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	21.	ppm	TJJ	25-NOV-02	6010B
			CU	12.	ppm	TJJ	25-NOV-02	6010B
			FE	13000.	ppm	TJJ	25-NOV-02	6010B
			PB	12.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	37.	ppm	TJJ	25-NOV-02	6010B
L020922-037	29-OCT-02	EP135-A	AS	13.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	15.	ppm	TJJ	25-NOV-02	6010B
			CU	10.	ppm	TJJ	25-NOV-02	6010B
			FE	13800.	ppm	TJJ	25-NOV-02	6010B
			PB	11.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	43.	ppm	TJJ	25-NOV-02	6010B
L020922-038	29-OCT-02	EP135-B	AS	11.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	20.	ppm	TJJ	25-NOV-02	6010B
			CU	12.	ppm	TJJ	25-NOV-02	6010B
			FE	13100.	ppm	TJJ	25-NOV-02	6010B
			PB	19.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	41.	ppm	TJJ	25-NOV-02	6010B
L020922-039	29-OCT-02	EP135-C	AS	21.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	14.	ppm	TJJ	25-NOV-02	6010B
			CU	<10.	ppm	TJJ	25-NOV-02	6010B
			FE	13400.	ppm	TJJ	25-NOV-02	6010B
			PB	<10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	38.	ppm	TJJ	25-NOV-02	6010B

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L020922-040	29-OCT-02	EP135-D	AS	31.	ppm	TJJ	26-NOV-02	6010B
			CD	<5.	ppm	TJJ	26-NOV-02	6010B
			CR	13.	ppm	TJJ	26-NOV-02	6010B
			CU	<10.	ppm	TJJ	26-NOV-02	6010B
			FE	11650.	ppm	TJJ	26-NOV-02	6010B
			PB	<10.	ppm	TJJ	26-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	35.	ppm	TJJ	26-NOV-02	6010B
L020922-041	28-OCT-02	EP133-A	AS	16.	ppm	TJJ	25-NOV-02	6010B
			CD	6.	ppm	TJJ	25-NOV-02	6010B
			CR	17.	ppm	TJJ	25-NOV-02	6010B
			CU	173.	ppm	TJJ	25-NOV-02	6010B
			FE	9560.	ppm	TJJ	25-NOV-02	6010B
			PB	150.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	110.	ppm	TJJ	25-NOV-02	6010B
L020922-042	28-OCT-02	EP133-B	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	22.	ppm	TJJ	25-NOV-02	6010B
			CU	57.	ppm	TJJ	25-NOV-02	6010B
			FE	6910.	ppm	TJJ	25-NOV-02	6010B
			PB	103.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	69.	ppm	TJJ	25-NOV-02	6010B
L020922-043	28-OCT-02	EP133-C	AS	15.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	15.	ppm	TJJ	25-NOV-02	6010B
			CU	74.	ppm	TJJ	25-NOV-02	6010B
			FE	9630.	ppm	TJJ	25-NOV-02	6010B
			PB	118.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	91.	ppm	TJJ	25-NOV-02	6010B
L020922-044	28-OCT-02	EP133-D1	AS	22.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	24.	ppm	TJJ	25-NOV-02	6010B

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L020922-044	28-OCT-02	EP133-D1	CU	90.	ppm	TJJ	25-NOV-02	6010B
			FE	10900.	ppm	TJJ	25-NOV-02	6010B
			PB	100.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	102.	ppm	TJJ	25-NOV-02	6010B
L020922-045	28-OCT-02	EP133-D2 D	AS	39.	ppm	TJJ	25-NOV-02	6010B
			CD	7.	ppm	TJJ	25-NOV-02	6010B
			CR	22.	ppm	TJJ	25-NOV-02	6010B
			CU	180.	ppm	TJJ	25-NOV-02	6010B
			FE	10000.	ppm	TJJ	25-NOV-02	6010B
			PB	191.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	149.	ppm	TJJ	25-NOV-02	6010B
L020922-046	28-OCT-02	EP133-E	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	30.	ppm	TJJ	25-NOV-02	6010B
			CU	<10.	ppm	TJJ	25-NOV-02	6010B
			FE	4060.	ppm	TJJ	25-NOV-02	6010B
			PB	<10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	18.	ppm	TJJ	25-NOV-02	6010B
L020922-047	28-OCT-02	EP133-F	AS	11.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	24.	ppm	TJJ	25-NOV-02	6010B
			CU	<10.	ppm	TJJ	25-NOV-02	6010B
			FE	4970.	ppm	TJJ	25-NOV-02	6010B
			PB	<10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	17.	ppm	TJJ	25-NOV-02	6010B
L020922-048	30-OCT-02	BH5-12A	AS	210.	ppm	TJJ	25-NOV-02	6010B
			CD	80.	ppm	TJJ	25-NOV-02	6010B
			CR	13.	ppm	TJJ	25-NOV-02	6010B
			CU	1720.	ppm	TJJ	25-NOV-02	6010B
			FE	11600.	ppm	TJJ	25-NOV-02	6010B
			PB	2140.	ppm	TJJ	25-NOV-02	6010B

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L020922-048	30-OCT-02	BH5-12A	SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	1180.	ppm	TJJ	25-NOV-02	6010B
L020922-049	30-OCT-02	BH5-12B	AS	106.	ppm	TJJ	25-NOV-02	6010B
			CD	6.	ppm	TJJ	25-NOV-02	6010B
			CR	17.	ppm	TJJ	25-NOV-02	6010B
			CU	437.	ppm	TJJ	25-NOV-02	6010B
			FE	12700.	ppm	TJJ	25-NOV-02	6010B
			PB	406.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	225.	ppm	TJJ	25-NOV-02	6010B
L020922-050	30-OCT-02	BH5-12C	AS	72.	ppm	TJJ	25-NOV-02	6010B
			CD	15.	ppm	TJJ	25-NOV-02	6010B
			CR	15.	ppm	TJJ	25-NOV-02	6010B
			CU	571.	ppm	TJJ	25-NOV-02	6010B
			FE	10200.	ppm	TJJ	25-NOV-02	6010B
			PB	633.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	348.	ppm	TJJ	25-NOV-02	6010B
L020922-051	30-OCT-02	BH5-12D	AS	22.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	13.	ppm	TJJ	25-NOV-02	6010B
			CU	<10.	ppm	TJJ	25-NOV-02	6010B
			FE	8030.	ppm	TJJ	25-NOV-02	6010B
			PB	13.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	28.	ppm	TJJ	25-NOV-02	6010B
L020922-052	29-OCT-02	EP136-A	AS	61.	ppm	TJJ	25-NOV-02	6010B
			CD	15.	ppm	TJJ	25-NOV-02	6010B
			CR	19.	ppm	TJJ	25-NOV-02	6010B
			CU	598.	ppm	TJJ	25-NOV-02	6010B
			FE	11400.	ppm	TJJ	25-NOV-02	6010B
			PB	759.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	380.	ppm	TJJ	25-NOV-02	6010B

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L020922-053	29-OCT-02	EP136-B	AS	13.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	20.	ppm	TJJ	25-NOV-02	6010B
			CU	87.	ppm	TJJ	25-NOV-02	6010B
			FE	7730.	ppm	TJJ	25-NOV-02	6010B
			PB	131.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	87.	ppm	TJJ	25-NOV-02	6010B
L020922-054	29-OCT-02	EP136-C	AS	27.	ppm	TJJ	25-NOV-02	6010B
			CD	6.	ppm	TJJ	25-NOV-02	6010B
			CR	18.	ppm	TJJ	25-NOV-02	6010B
			CU	240.	ppm	TJJ	25-NOV-02	6010B
			FE	8010.	ppm	TJJ	25-NOV-02	6010B
			PB	195.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	148.	ppm	TJJ	25-NOV-02	6010B
L020922-055	29-OCT-02	EP136-D	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	21.	ppm	TJJ	25-NOV-02	6010B
			CU	90.	ppm	TJJ	25-NOV-02	6010B
			FE	6840.	ppm	TJJ	25-NOV-02	6010B
			PB	114.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	87.	ppm	TJJ	25-NOV-02	6010B
L020922-056	29-OCT-02	EP136-E	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	29.	ppm	TJJ	25-NOV-02	6010B
			CU	44.	ppm	TJJ	25-NOV-02	6010B
			FE	4980.	ppm	TJJ	25-NOV-02	6010B
			PB	38.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	40.	ppm	TJJ	25-NOV-02	6010B
L020922-057	29-OCT-02	EP136-F1	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	29.	ppm	TJJ	25-NOV-02	6010B

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L020922-057	29-OCT-02	EP136-F1	CU	<10.	ppm	TJJ	25-NOV-02	6010B
			FE	3980.	ppm	TJJ	25-NOV-02	6010B
			PB	<10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	13.	ppm	TJJ	25-NOV-02	6010B
L020922-058	29-OCT-02	EP136-F2 D	AS	<10.	ppm	TJJ	25-NOV-02	6010B
			CD	<5.	ppm	TJJ	25-NOV-02	6010B
			CR	26.	ppm	TJJ	25-NOV-02	6010B
			CU	<10.	ppm	TJJ	25-NOV-02	6010B
			FE	4700.	ppm	TJJ	25-NOV-02	6010B
			PB	<10.	ppm	TJJ	25-NOV-02	6010B
			SE	<10.	ppm	TJJ	25-NOV-02	6010B
			ZN	16.	ppm	TJJ	25-NOV-02	6010B
L020922-059	28-OCT-02	MW137-A	AS	30.	ppm	TJJ	25-NOV-02	6010B
			CD	26.	ppm	TJJ	25-NOV-02	6010B
			CR	25.	ppm	TJJ	25-NOV-02	6010B
			CU	199.	ppm	TJJ	25-NOV-02	6010B
			FE	9240.	ppm	TJJ	25-NOV-02	6010B
			PB	227.	ppm	TJJ	25-NOV-02	6010B
			SE	17.	ppm	TJJ	25-NOV-02	6010B
			ZN	157.	ppm	TJJ	25-NOV-02	6010B
L020922-060	28-OCT-02	MW137-B	AS	30.	ppm	TJJ	25-NOV-02	6010B
			CD	40.	ppm	TJJ	25-NOV-02	6010B
			CR	15.	ppm	TJJ	25-NOV-02	6010B
			CU	142.	ppm	TJJ	25-NOV-02	6010B
			FE	8000.	ppm	TJJ	25-NOV-02	6010B
			PB	188.	ppm	TJJ	25-NOV-02	6010B
			SE	57.	ppm	TJJ	25-NOV-02	6010B
			ZN	175.	ppm	TJJ	25-NOV-02	6010B
L020922-061	28-OCT-02	MW137-C	AS	41	ppm	VPK	25-NOV-02	6010B
			CD	45	ppm	VPK	25-NOV-02	6010B
			CR	25	ppm	VPK	25-NOV-02	6010B
			CU	180	ppm	VPK	25-NOV-02	6010B
			FE	8450	ppm	VPK	25-NOV-02	6010B
			PB	226	ppm	VPK	25-NOV-02	6010B

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LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-061	28-OCT-02	MW137-C	SE	120	ppm	VPK	25-NOV-02	6010B
			ZN	251	ppm	VPK	25-NOV-02	6010B
L020922-062	28-OCT-02	MW137-D	AS	<10.	ppm	VPK	25-NOV-02	6010B
			CD	20	ppm	VPK	25-NOV-02	6010B
			CR	55	ppm	VPK	25-NOV-02	6010B
			CU	14	ppm	VPK	25-NOV-02	6010B
			FE	3680	ppm	VPK	25-NOV-02	6010B
			PB	18	ppm	VPK	25-NOV-02	6010B
			SE	14	ppm	VPK	25-NOV-02	6010B
			ZN	137	ppm	VPK	25-NOV-02	6010B
L020922-063	29-OCT-02	EP135-A1	AS	74	ppm	VPK	25-NOV-02	6010B
			CD	12	ppm	VPK	25-NOV-02	6010B
			CR	32	ppm	VPK	25-NOV-02	6010B
			CU	523	ppm	VPK	25-NOV-02	6010B
			FE	14100	ppm	VPK	25-NOV-02	6010B
			PB	704	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	734	ppm	VPK	25-NOV-02	6010B
L020922-064	29-OCT-02	EP135-B11	AS	42	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	22	ppm	VPK	25-NOV-02	6010B
			CU	37	ppm	VPK	25-NOV-02	6010B
			FE	12800	ppm	VPK	25-NOV-02	6010B
			PB	181	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	85	ppm	VPK	25-NOV-02	6010B
L020922-065	29-OCT-02	EP135-B12 D	AS	35	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	20	ppm	VPK	25-NOV-02	6010B
			CU	25	ppm	VPK	25-NOV-02	6010B
			FE	11700	ppm	VPK	25-NOV-02	6010B
			PB	146	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	67	ppm	VPK	25-NOV-02	6010B

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LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-066	29-OCT-02	EP135-C1	AS	64	ppm	VPK	25-NOV-02	6010B
			CD	15	ppm	VPK	25-NOV-02	6010B
			CR	23	ppm	VPK	25-NOV-02	6010B
			CU	402	ppm	VPK	25-NOV-02	6010B
			FE	12700	ppm	VPK	25-NOV-02	6010B
			PB	439	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	285	ppm	VPK	25-NOV-02	6010B
L020922-067	29-OCT-02	MW134-A	AS	19	ppm	VPK	25-NOV-02	6010B
			CD	6	ppm	VPK	25-NOV-02	6010B
			CR	29	ppm	VPK	25-NOV-02	6010B
			CU	259	ppm	VPK	25-NOV-02	6010B
			FE	8830	ppm	VPK	25-NOV-02	6010B
			PB	231	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	152	ppm	VPK	25-NOV-02	6010B
L020922-068	29-OCT-02	MW134-B	AS	30	ppm	VPK	25-NOV-02	6010B
			CD	6	ppm	VPK	25-NOV-02	6010B
			CR	21	ppm	VPK	25-NOV-02	6010B
			CU	241	ppm	VPK	25-NOV-02	6010B
			FE	11300	ppm	VPK	25-NOV-02	6010B
			PB	312	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	177	ppm	VPK	25-NOV-02	6010B
L020922-069	29-OCT-02	MW134-C	AS	55	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	26	ppm	VPK	25-NOV-02	6010B
			CU	238	ppm	VPK	25-NOV-02	6010B
			FE	13700	ppm	VPK	25-NOV-02	6010B
			PB	282	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	143	ppm	VPK	25-NOV-02	6010B
L020922-070	29-OCT-02	MW134-D	AS	69	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	20	ppm	VPK	25-NOV-02	6010B

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LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-070	29-OCT-02	MW134-D	CU	203	ppm	VPK	25-NOV-02	6010B
			FE	13200	ppm	VPK	25-NOV-02	6010B
			PB	440	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	302	ppm	VPK	25-NOV-02	6010B
L020922-071	29-OCT-02	MW134-E	AS	42	ppm	VPK	25-NOV-02	6010B
			CD	6	ppm	VPK	25-NOV-02	6010B
			CR	17	ppm	VPK	25-NOV-02	6010B
			CU	299	ppm	VPK	25-NOV-02	6010B
			FE	12200	ppm	VPK	25-NOV-02	6010B
			PB	334	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	176	ppm	VPK	25-NOV-02	6010B
L020922-072	29-OCT-02	MW134-F	AS	11	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	22	ppm	VPK	25-NOV-02	6010B
			CU	37	ppm	VPK	25-NOV-02	6010B
			FE	8150	ppm	VPK	25-NOV-02	6010B
			PB	40	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	37	ppm	VPK	25-NOV-02	6010B
L020922-073	29-OCT-02	MW128-A	AS	34	ppm	VPK	25-NOV-02	6010B
			CD	43	ppm	VPK	25-NOV-02	6010B
			CR	31	ppm	VPK	25-NOV-02	6010B
			CU	177	ppm	VPK	25-NOV-02	6010B
			FE	8930	ppm	VPK	25-NOV-02	6010B
			PB	230	ppm	VPK	25-NOV-02	6010B
			SE	42	ppm	VPK	25-NOV-02	6010B
			ZN	176	ppm	VPK	25-NOV-02	6010B
L020922-074	29-OCT-02	MW128-B	AS	23	ppm	VPK	25-NOV-02	6010B
			CD	20	ppm	VPK	25-NOV-02	6010B
			CR	28	ppm	VPK	25-NOV-02	6010B
			CU	218	ppm	VPK	25-NOV-02	6010B
			FE	8230	ppm	VPK	25-NOV-02	6010B
			PB	244	ppm	VPK	25-NOV-02	6010B

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LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-074	29-OCT-02	MW128-B	SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	173	ppm	VPK	25-NOV-02	6010B
L020922-075	30-OCT-02	BH5-13A	AS	85	ppm	VPK	25-NOV-02	6010B
			CD	25	ppm	VPK	25-NOV-02	6010B
			CR	27	ppm	VPK	25-NOV-02	6010B
			CU	1100	ppm	VPK	25-NOV-02	6010B
			FE	13200	ppm	VPK	25-NOV-02	6010B
			PB	972	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	511	ppm	VPK	25-NOV-02	6010B
L020922-076	30-OCT-02	BH5-13B	AS	58	ppm	VPK	26-NOV-02	6010B
			CD	14	ppm	VPK	26-NOV-02	6010B
			CR	12	ppm	VPK	26-NOV-02	6010B
			CU	604	ppm	VPK	26-NOV-02	6010B
			FE	8900	ppm	VPK	26-NOV-02	6010B
			PB	555	ppm	VPK	26-NOV-02	6010B
			SE	<10	ppm	VPK	26-NOV-02	6010B
			ZN	322	ppm	VPK	26-NOV-02	6010B
L020922-077	30-OCT-02	BH5-13C1	AS	79	ppm	VPK	25-NOV-02	6010B
			CD	24	ppm	VPK	25-NOV-02	6010B
			CR	19	ppm	VPK	25-NOV-02	6010B
			CU	738	ppm	VPK	25-NOV-02	6010B
			FE	14400	ppm	VPK	25-NOV-02	6010B
			PB	654	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	448	ppm	VPK	25-NOV-02	6010B
L020922-078	30-OCT-02	BH5-13C2 D	AS	55	ppm	VPK	25-NOV-02	6010B
			CD	19	ppm	VPK	25-NOV-02	6010B
			CR	<10.	ppm	VPK	25-NOV-02	6010B
			CU	565	ppm	VPK	25-NOV-02	6010B
			FE	6920	ppm	VPK	25-NOV-02	6010B
			PB	585	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	379	ppm	VPK	25-NOV-02	6010B

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LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
L020922-079	30-OCT-02	BH5-13D	AS	<10.	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	15	ppm	VPK	25-NOV-02	6010B
			CU	15	ppm	VPK	25-NOV-02	6010B
			FE	18500	ppm	VPK	25-NOV-02	6010B
			PB	13	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	55	ppm	VPK	25-NOV-02	6010B
L020922-080	30-OCT-02	BH5-13E	AS	12	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	12	ppm	VPK	25-NOV-02	6010B
			CU	111	ppm	VPK	25-NOV-02	6010B
			FE	14200	ppm	VPK	25-NOV-02	6010B
			PB	76	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	84	ppm	VPK	25-NOV-02	6010B
L020922-081	30-OCT-02	BH5-13F	AS	<10.	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	19	ppm	VPK	25-NOV-02	6010B
			CU	17	ppm	VPK	25-NOV-02	6010B
			FE	21400	ppm	VPK	25-NOV-02	6010B
			PB	13	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	55	ppm	VPK	25-NOV-02	6010B
L020922-082	30-OCT-02	BH5-13G	AS	<10.	ppm	VPK	25-NOV-02	6010B
			CD	<5.	ppm	VPK	25-NOV-02	6010B
			CR	12	ppm	VPK	25-NOV-02	6010B
			CU	<10.	ppm	VPK	25-NOV-02	6010B
			FE	13000	ppm	VPK	25-NOV-02	6010B
			PB	<10.	ppm	VPK	25-NOV-02	6010B
			SE	<10.	ppm	VPK	25-NOV-02	6010B
			ZN	35	ppm	VPK	25-NOV-02	6010B

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Batch No: L020922

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD

Unless otherwise noted results are not blank corrected.

Approved

Reviewer

AMERICAN ENVIRONMENTAL CONSULTANTS

ANALYTICAL DATA REPORT

El Paso

(Project RI PHASE IV)

Batch No: WG020822

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
WG020822-1		Matrix Spike L020922-020 + 2PPM	AS	95	%Recovery	TJJ	22-NOV-02	6010B
			CD	94	%Recovery	TJJ	22-NOV-02	6010B
			CR	98	%Recovery	TJJ	22-NOV-02	6010B
			CU	108	%Recovery	TJJ	22-NOV-02	6010B
			FE	103	%Recovery	TJJ	22-NOV-02	6010B
			PB	98	%Recovery	TJJ	22-NOV-02	6010B
			SE	86	%Recovery	TJJ	22-NOV-02	6010B
			ZN	97	%Recovery	TJJ	22-NOV-02	6010B
WG020822-2		Prep Blank 10% HCL	AS	<10	ppm	TJJ	22-NOV-02	6010B
			CD	<5	ppm	TJJ	22-NOV-02	6010B
			CR	<10	ppm	TJJ	22-NOV-02	6010B
			CU	<10	ppm	TJJ	22-NOV-02	6010B
			FE	<10	ppm	TJJ	22-NOV-02	6010B
			PB	<10	ppm	TJJ	22-NOV-02	6010B
			SE	<10	ppm	TJJ	22-NOV-02	6010B
			ZN	<10	ppm	TJJ	22-NOV-02	6010B
WG020822-3		Lab Control Sample ERA D035-540	AS	93	%Recovery	TJJ	22-NOV-02	6010B
			CD	97	%Recovery	TJJ	22-NOV-02	6010B
			CR	99	%Recovery	TJJ	22-NOV-02	6010B
			CU	102	%Recovery	TJJ	22-NOV-02	6010B
			FE	110	%Recovery	TJJ	22-NOV-02	6010B
			PB	98	%Recovery	TJJ	22-NOV-02	6010B
			SE	80	%Recovery	TJJ	22-NOV-02	6010B
			ZN	98	%Recovery	TJJ	22-NOV-02	6010B
WG020822-4		Matrix Spike Duplicate L020922-020 + 2PPM	AS	3.2	% RPD	TJJ	22-NOV-02	6010B
			CD	2.1	% RPD	TJJ	22-NOV-02	6010B
			CR	2.3	% RPD	TJJ	22-NOV-02	6010B
			CU	0.6	% RPD	TJJ	22-NOV-02	6010B
			FE	1.4	% RPD	TJJ	22-NOV-02	6010B
			PB	2.2	% RPD	TJJ	22-NOV-02	6010B
			SE	6.1	% RPD	TJJ	22-NOV-02	6010B
			ZN	2.7	% RPD	TJJ	22-NOV-02	6010B
WG020822-5		Reporting Limit	AS	10	ppm			6010B
			CD	5	ppm			6010B
			CR	10	ppm			6010B

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LAB NO	DATE COLLECTED	DESCRIPTION		PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
WG020822-5		Reporting Limit		CU	10	ppm			6010B
				FE	10	ppm			6010B
				PB	10	ppm			6010B
				SE	10	ppm			6010B
				ZN	10	ppm			6010B
WG020822-6		Matrix Spike	L020922-040 + 2PPM	AS	87	%Recovery	TJJ	26-NOV-02	6010B
				CD	92	%Recovery	TJJ	25-NOV-02	6010B
				CR	97	%Recovery	TJJ	25-NOV-02	6010B
				CU	105	%Recovery	TJJ	25-NOV-02	6010B
				FE	108	%Recovery	TJJ	25-NOV-02	6010B
				PB	92	%Recovery	TJJ	26-NOV-02	6010B
				SE	76	%Recovery	TJJ	25-NOV-02	6010B
				ZN	93	%Recovery	TJJ	25-NOV-02	6010B
WG020822-7		Prep Blank	10% HCL	AS	<10	ppm	TJJ	25-NOV-02	6010B
				CD	<5	ppm	TJJ	25-NOV-02	6010B
				CR	<10	ppm	TJJ	25-NOV-02	6010B
				CU	<10	ppm	TJJ	25-NOV-02	6010B
				FE	<10	ppm	TJJ	25-NOV-02	6010B
				PB	<10	ppm	TJJ	25-NOV-02	6010B
				SE	<10	ppm	TJJ	25-NOV-02	6010B
				ZN	<10	ppm	TJJ	25-NOV-02	6010B
WG020822-8		Lab Control Sample	ERA D035-540	AS	87	%Recovery	TJJ	25-NOV-02	6010B
				CD	98	%Recovery	TJJ	25-NOV-02	6010B
				CR	100	%Recovery	TJJ	25-NOV-02	6010B
				CU	105	%Recovery	TJJ	25-NOV-02	6010B
				FE	114	%Recovery	TJJ	25-NOV-02	6010B
				PB	94	%Recovery	TJJ	25-NOV-02	6010B
				SE	73	%Recovery	TJJ	25-NOV-02	6010B
				ZN	99	%Recovery	TJJ	25-NOV-02	6010B
WG020822-9		Matrix Spike Duplicate	L020922-040 + 2PPM	AS	4.3	% RPD	TJJ	26-NOV-02	6010B
				CD	1.0	% RPD	TJJ	25-NOV-02	6010B
				CR	1.4	% RPD	TJJ	25-NOV-02	6010B
				CU	2.2	% RPD	TJJ	25-NOV-02	6010B
				FE	9.6	% RPD	TJJ	25-NOV-02	6010B
				PB	3.0	% RPD	TJJ	26-NOV-02	6010B

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LAB NO	DATE COLLECTED	DESCRIPTION		PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
WG020822-9		Matrix Spike Duplicate	L020922-040 + 2PPM	SE	2.5	% RPD	TJJ	25-NOV-02	6010B
				ZN	0.5	% RPD	TJJ	25-NOV-02	6010B
WG020822-10		Matrix Spike	L020922-060 + 2PPM	AS	90	%Recovery	TJJ	25-NOV-02	6010B
				CD	94	%Recovery	TJJ	25-NOV-02	6010B
				CR	96	%Recovery	TJJ	25-NOV-02	6010B
				CU	102	%Recovery	TJJ	25-NOV-02	6010B
				FE	93	%Recovery	TJJ	25-NOV-02	6010B
				PB	96	%Recovery	TJJ	25-NOV-02	6010B
				SE	81	%Recovery	TJJ	25-NOV-02	6010B
				ZN	94	%Recovery	TJJ	25-NOV-02	6010B
WG020822-11		Prep Blank	10% HCL	AS	<10	ppm	TJJ	25-NOV-02	6010B
				CD	<5	ppm	TJJ	25-NOV-02	6010B
				CR	<10	ppm	TJJ	25-NOV-02	6010B
				CU	<10	ppm	TJJ	25-NOV-02	6010B
				FE	<10	ppm	TJJ	25-NOV-02	6010B
				PB	<10	ppm	TJJ	25-NOV-02	6010B
				SE	<10	ppm	TJJ	25-NOV-02	6010B
				ZN	<10	ppm	TJJ	25-NOV-02	6010B
WG020822-12		Lab Control Sample	ERA D035-540	AS	93	%Recovery	TJJ	25-NOV-02	6010B
				CD	96	%Recovery	TJJ	25-NOV-02	6010B
				CR	98	%Recovery	TJJ	25-NOV-02	6010B
				CU	101	%Recovery	TJJ	25-NOV-02	6010B
				FE	107	%Recovery	TJJ	25-NOV-02	6010B
				PB	95	%Recovery	TJJ	25-NOV-02	6010B
				SE	74	%Recovery	TJJ	25-NOV-02	6010B
				ZN	95	%Recovery	TJJ	25-NOV-02	6010B
WG020822-13		Matrix Spike Duplicate	L020922-060 + 2PPM	AS	3.7	% RPD	TJJ	25-NOV-02	6010B
				CD	1.9	% RPD	TJJ	25-NOV-02	6010B
				CR	2.5	% RPD	TJJ	25-NOV-02	6010B
				CU	6.9	% RPD	TJJ	25-NOV-02	6010B
				FE	20.3	% RPD	TJJ	25-NOV-02	6010B
				PB	8.2	% RPD	TJJ	25-NOV-02	6010B
				SE	3.2	% RPD	TJJ	25-NOV-02	6010B
				ZN	7.7	% RPD	TJJ	25-NOV-02	6010B

AMERICAN ENVIRONMENTAL CONSULTANTS

ANALYTICAL DATA REPORT

El Paso

(Project RI PHASE IV)

Batch No: WG020822

LAB NO	DATE COLLECTED	DESCRIPTION		PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
WG020822-14		Matrix Spike	L020922-061 + 2PPM	AS	89	%Recovery	VPK	25-NOV-02	6010B
				CD	93	%Recovery	VPK	25-NOV-02	6010B
				CR	94	%Recovery	VPK	25-NOV-02	6010B
				CU	101	%Recovery	VPK	25-NOV-02	6010B
				FE	109	%Recovery	VPK	25-NOV-02	6010B
				PB	98	%Recovery	VPK	25-NOV-02	6010B
				SE	89	%Recovery	VPK	25-NOV-02	6010B
				ZN	96	%Recovery	VPK	25-NOV-02	6010B
WG020822-15		Prep Blank	10% HCL	AS	<10	ppm	VPK	25-NOV-02	6010B
				CD	<5	ppm	VPK	25-NOV-02	6010B
				CR	<10	ppm	VPK	25-NOV-02	6010B
				CU	<10	ppm	VPK	25-NOV-02	6010B
				FE	<10	ppm	VPK	25-NOV-02	6010B
				PB	<10	ppm	VPK	25-NOV-02	6010B
				SE	<10	ppm	VPK	25-NOV-02	6010B
				ZN	<10	ppm	VPK	25-NOV-02	6010B
WG020822-16		Lab Control Sample	ERA D035-540	AS	96	%Recovery	VPK	25-NOV-02	6010B
				CD	100	%Recovery	VPK	25-NOV-02	6010B
				CR	102	%Recovery	VPK	25-NOV-02	6010B
				CU	104	%Recovery	VPK	25-NOV-02	6010B
				FE	119	%Recovery	VPK	25-NOV-02	6010B
				PB	99	%Recovery	VPK	25-NOV-02	6010B
				SE	78	%Recovery	VPK	25-NOV-02	6010B
				ZN	98	%Recovery	VPK	25-NOV-02	6010B
WG020822-17		Matrix Spike Duplicate	L020922-061 + 2PPM	AS	6.3	% RPD	VPK	25-NOV-02	6010B
				CD	1.4	% RPD	VPK	25-NOV-02	6010B
				CR	2.9	% RPD	VPK	25-NOV-02	6010B
				CU	1.1	% RPD	VPK	25-NOV-02	6010B
				FE	2.4	% RPD	VPK	25-NOV-02	6010B
				PB	0.8	% RPD	VPK	25-NOV-02	6010B
				SE	3.4	% RPD	VPK	25-NOV-02	6010B
				ZN	0.7	% RPD	VPK	25-NOV-02	6010B
WG020822-18		Matrix Spike	L020922-082 + 2PPM	AS	89	%Recovery	VPK	25-NOV-02	6010B
				CD	88	%Recovery	VPK	25-NOV-02	6010B
				CR	91	%Recovery	VPK	25-NOV-02	6010B

AMERICAN ENVIRONMENTAL CONSULTANTS

ANALYTICAL DATA REPORT

El Paso

(Project RI PHASE IV)

Batch No: WG020822

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD
WG020822-18		Matrix Spike	L020922-082 + 2PPM CU	101	%Recovery	VPK	25-NOV-02	6010B
			FE	89	%Recovery	VPK	25-NOV-02	6010B
			PB	89	%Recovery	VPK	25-NOV-02	6010B
			SE	83	%Recovery	VPK	25-NOV-02	6010B
			ZN	88	%Recovery	VPK	25-NOV-02	6010B
WG020822-19		Prep Blank	10% HCL AS	<10	ppm	VPK	25-NOV-02	6010B
			CD	<5	ppm	VPK	25-NOV-02	6010B
			CR	<10	ppm	VPK	25-NOV-02	6010B
			CU	<10	ppm	VPK	25-NOV-02	6010B
			FE	<10	ppm	VPK	25-NOV-02	6010B
			PB	<10	ppm	VPK	25-NOV-02	6010B
			SE	<10	ppm	VPK	25-NOV-02	6010B
			ZN	<10	ppm	VPK	25-NOV-02	6010B
WG020822-20		Lab Control Sample	ERA D035-540 AS	97	%Recovery	VPK	25-NOV-02	6010B
			CD	101	%Recovery	VPK	25-NOV-02	6010B
			CR	102	%Recovery	VPK	25-NOV-02	6010B
			CU	107	%Recovery	VPK	25-NOV-02	6010B
			FE	121	%Recovery	VPK	25-NOV-02	6010B
			PB	99	%Recovery	VPK	25-NOV-02	6010B
			SE	87	%Recovery	VPK	25-NOV-02	6010B
			ZN	98	%Recovery	VPK	25-NOV-02	6010B
WG020822-21		Matrix Spike Duplicate	L020922-082 + 2PPM AS	7.7	% RPD	VPK	25-NOV-02	6010B
			CD	7.7	% RPD	VPK	25-NOV-02	6010B
			CR	8.4	% RPD	VPK	25-NOV-02	6010B
			CU	9.7	% RPD	VPK	25-NOV-02	6010B
			FE	11.1	% RPD	VPK	25-NOV-02	6010B
			PB	7.4	% RPD	VPK	25-NOV-02	6010B
			SE	8.9	% RPD	VPK	25-NOV-02	6010B
			ZN	8.9	% RPD	VPK	25-NOV-02	6010B

AMERICAN ENVIRONMENTAL CONSULTANTS

ANALYTICAL DATA REPORT

El Paso

(Project RI PHASE IV)

Batch No: WG020822

LAB NO	DATE COLLECTED	DESCRIPTION	PARAMETER	VALUE	UNITS	ANALYST	DATE ANALYZED	METHOD

Unless otherwise noted results are not blank corrected.

Approved

Reviewer

CHAIN OF CUSTODY RECORD

Hydrometrics Inc.

3275 W. Ina Rd., Ste. 205 • Tucson, AZ 85741 • (520) 544-3150 • FAX (520) 544-3190
P.O. Box 220182, El Paso, TX 79913 • (915) 532-3489 • FAX (915) 532-4897

PROJ. NO.:

PROJECT NAME: Phase IV RI

SAMPLERS: (Signature) Alfonso Martinez

DATE	TIME	COMP.	GRAB	SAMPLE NUMBER	NO. OF CONTAINERS	Commons UF/RAW	Nutrients UF/H_2SO_4	Diss. Metal F/HNO_3	CN UF/NaOH	Total Metals UF/HNO_3	Total Recoverable Metals UF/HNO_3	BTEX	TPH	XRF (Total Metals)							REMARKS
10/28				MW 137C	1 bag									+							4-5 ft
10/28				MW 137D																	7-8 ft
10/29				EP 135 A1																	0-1 ft
				EP 135 B11																	1-2 ft
				EP 135 B12 (Dup)																	1-2 ft
				EP 135 C1																	2-3 ft
				MW 134A																	0-1 ft
				MW 134B																	1-2 ft
				MW 134C																	2-3 ft
				MW 134D																	3-4 ft
				MW 134E																	7-5 ft
				MW 134F																	6-7 ft
				MW 128A																	2-3 ft
				MW 128B																	3-4 ft

Relinquished (Signature)	Date/Time	Received by: (Signature)	Lab	P.O. #	Shipped via: Bus, Fed Ex, UPS
D. Johnson	4/4/02 1000		TSC Salt Lake City UT		Other ____ Air Bill # ____

Relinquished (Signature)	Date/Time	Received by: (Signature)	Remarks

Relinquished (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Enclosed:
		[illegible signature]	11-5-02 11:00	☐ Parameter sheet w/detection limits ☐ QA/QC standard mixing instructions ☐ Cover letter ☐ Other ____

Split Samples: [] Accepted [] Declined ____ Signature

HFORM-1-4/95

Return results & electronic copy to:

CHAIN OF CUSTODY RECORD

Hydrometrics Inc.

3275 W. Ina Rd., Ste. 205 • Tucson, AZ 85741 • (520) 544-3150 • FAX (520) 544-3190
P.O. Box 220182, El Paso, TX 79913 • (915) 532-3489 • FAX (915) 532-4897

PROJ. NO.:

PROJECT NAME: Phase IV RI

SAMPLERS: (Signature) [signature]

DATE	TIME	COMP.	GRAB	SAMPLE NUMBER	NO. OF CONTAINERS	Commons UF/RAW	Nutrients UF/H_2SO_4	Diss. Metal F/HNO_3	CN UF/NaOH	Total Metals UF/HNO_3	Total Recoverable Metals UF/HNO_3	BTEX	TPH	XRF (Total Metals)							REMARKS
10/30/02				BHS-11D	1 bag									+							3-4 ft
				BHS-11E																	4-5 ft
				BHS-11F																	7-9 ft
				BHS-11G																	10-12 ft
				BHS-11G (Duplicate)																	10-12 ft
10/30/02				BHS-11H																	15-17 ft
10/29/02				EP135A	1 bag																3-4 ft
				EP135B																	4-5 ft
				EP135C																	7-9 ft
				EP135D																	13-15 ft
10/28				EP133A																	0-1 ft
				EP133B																	1-2 ft
				EP133C																	2-3 ft
				EP134D1																	3-4 ft
				EP134 D2 (Duplicate)										X							3-4 ft

Relinquished (Signature)	Date/Time	Received by: (Signature)	Lab	P.O. #	
[signature]	11/4/02 1400		TSC Salt Lake City, UT		Shipped via: Bus, Fed Ex, UPS Other___ Air Bill #___

Relinquished (Signature)	Date/Time	Received by: (Signature)	Remarks

Relinquished (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	
		[signature]	11.5.02 11:10	Enclosed: ☐ Parameter sheet w/detection limits ☐ QA/QC standard mixing instructions ☐ Cover letter ☐ Other___

HFORM-1-4/95

Return results & electronic copy to:

Split Samples:
☐ Accepted ☐ Declined

CHAIN OF CUSTODY RECORD

Hydrometrics, Inc.

3275 W. Ina Rd., Ste. 205 • Tucson, AZ 85741 • (520) 544-3150 • FAX (520) 544-3190
P.O. Box 220182, El Paso, TX 79913 • (915) 532-3489 • FAX (915) 532-4897

PROJ. NO.:

PROJECT NAME: RI Phase IV

SAMPLERS: (Signature) Alfonso [signature]

DATE	TIME	COMP.	GRAB	SAMPLE NUMBER	NO. OF CON-TAINERS	Commons UF/RAW	Nutrients UF/H_2SO_4	Diss. Metal F/HNO_3	CN UF/NaOH	Total Metals UF/HNO_3	Total Recoverable Metals UF/HNO_3	BTEX	TPH	XRF (Total Metals) standard 8							REMARKS
10/30/02	1420			IBWC 3E	1 bag									+							4-5 ft
	1430			IBWC 5-A																	0-1 ft
	1435			IBWC 5-B																	1-2 ft
	1440			IBWC 5-C																	2-3 ft
	1445			IBWC 5-D																	3-4 ft
	1450			IBWC 5-E1																	4-5 ft
	1450			IBWC 5-E2 Duplicate																	4-5 ft
	1500			IBWC 4A																	0-1 ft
	1505			IBWC 4B																	1-2 ft
	1510			IBWC 4C																	2-3 ft
	1515			IBWC 4D																	3-4 ft
	1520			IBWC 4E																	4-5 ft
				BHS-11A																	0-1 ft
				BHS-11B																	1-2 ft
				BHS-11C										+							2-3 ft

Relinquished (Signature)	Date/Time		Received by: (Signature)	Lab	P.O. #	Shipped via: Bus, Fed Ex, UPS
[signature]	11/4/02	1600		TSC Salt Lake City UT		Other ___ Air Bill # ___

Relinquished (Signature)	Date/Time		Received by: (Signature)	Remarks

Relinquished (Signature)	Date/Time		Received for Laboratory by: (Signature)	Date/Time		Enclosed: ☐ Parameter sheet w/detection limits ☐ QA/QC standard mixing instructions ☐ Cover letter ☐ Other ___
			[signature]	11-5-02	11:20	

Return results & electronic copy to:

Split Samples: ☐ Accepted ☐ Declined

Hydrometrics, Inc.

CHAIN OF CUSTODY RECORD

3275 W. Ina Rd., Ste. 205 • Tucson, AZ 85741 • (520) 544-3150 • FAX (520) 544-3190
P.O. Box 220182, El Paso, TX 79913 • (915) 532-3489 • FAX (915) 532-4897

PROJ. NO.:

PROJECT NAME: Phase IV RI

SAMPLERS: (Signature) Alfonso [signature]

DATE	TIME	COMP.	GRAB	SAMPLE NUMBER	NO. OF CONTAINERS	Commons UF/RAW	Nutrients UF/H_2SO_4	Diss. Metal F/HNO_3	CN UF/NaOH	Total Metals UF/HNO_3	Total Recoverable Metals UF/HNO_3	BTEX	TPH	XRF (Strontium EDX) (Total Metals)	REMARKS
10/30/02	1300			IBWC 1A	1 bag									X	0-1 ft
	1305			IBWC 1B										X	1-2 ft
	1310			IBWC 1C										X	2-3 ft
	1315			IBWC 1D										X	3-4 ft
	1320			IBWC 1E1										X	4-5 ft
	1320			IBWC 1E2 (Duplic)										X	4-5 ft
	1330			IBWC 2A										X	0-1 ft
	1335			IBWC 2B										X	1-2 ft
	1340			IBWC 2C										X	2-3 ft
	1345			IBWC 2D										X	3-4 ft
	1350			IBWC 2E										X	4-5 ft
	1406			IBWC 3A										X	0-1 ft
	1405			IBWC 3B										X	1-2 ft
	1410			IBWC 3C										X	2-3 ft
10/30/02	1415			IBWC 3D										X	3-4 ft

Relinquished (Signature): [signature] Date/Time: 11/4/02 1600

Received by: (Signature)

Lab: TSC, Salt Lake

P.O. #

Shipped via: Bus, Fed Ex, UPS
Other
Air Bill #

Relinquished (Signature) Date/Time

Received by: (Signature)

Remarks

Relinquished (Signature) Date/Time

Received for Laboratory by: (Signature) [signature]

Date/Time: 11.6.02 11:00

Enclosed: ☐ Parameter sheet w/detection limits
☐ QA/QC standard mixing instructions ☐ Cover letter
☐ Other

Split Samples: [] Accepted [] Declined

HFORM-1-4/95

Return results & electronic copy to:

CHAIN OF CUSTODY RECORD

Hydrometrics Inc.

3275 W. Ina Rd., Ste. 205 • Tucson, AZ 85741 • (520) 544-3150 • FAX (520) 544-3190
P.O. Box 220182, El Paso, TX 79913 • (915) 532-3489 • FAX (915) 532-4897

PROJ. NO.

PROJECT NAME: Phase IV RI

SAMPLERS: (Signature)

DATE	TIME	COMP.	GRAB	SAMPLE NUMBER	NO. OF CON-TAINERS	Commons UF/RAW	Nutrients UF/H_2SO_4	Diss. Metal F/HNO_3	CN UF/NaOH	Total Metals UF/HNO_3	Total Recoverable Metals UF/HNO_3	BTEX	TPH	XRF (Total Metals)	REMARKS
10/30				BHS-13A	1 bag										0-1
				BHS-13B											1-2
				BHS-13C1											4-5
				BHS-13C2 (Dup)											4-5
				BHS-13D											7-9
				BHS-13E											12-14 ft
				BHS-13F											15-17 ft
10/30				BHS-13G											20-22 ft

Relinquished (Signature)	Date/Time	Received by: (Signature)	Lab	P.O. #	Shipped via: Bus, FedEx, UPS
	11/04/02 1400		TSC Salt Lake City UT		Other ____ Air Bill # ____

Relinquished (Signature)	Date/Time	Received by: (Signature)	Remarks

Relinquished (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Enclosed: ☐ Parameter sheet w/detection limits ☐ QA/QC standard mixing instructions ☐ Cover letter ☐ Other ____
			11.5.02 11:00	

Split Samples: [] Accepted [] Declined ____ Signature

HFORM-1-4/95

Return results & electronic copy to:

Hydrometrics, Inc.

3275 W. Ina Rd., Ste. 205 • Tucson, AZ 85741 • (520) 544-3150 • FAX (520) 544-3190
P.O. Box 220182, El Paso, TX 79913 • (915) 532-3489 • FAX (915) 532-4897

CHAIN OF CUSTODY RECORD

PROJ. NO.:

PROJECT NAME: Phase IV RI

SAMPLERS: (Signature) Alfonso Muñoz

DATE	TIME	COMP.	GRAB	SAMPLE NUMBER	NO. OF CONTAINERS	Commons UF/RAW	Nutrients UF/H_2SO_4	Diss. Metal F/HNO_3	CN UF/NaOH	Total Metals UF/HNO_3	Total Recoverable Metals UF/HNO_3	BTEX	TPH	XRF (Total Metals) 57 ancl and 8							REMARKS
10/25/02				EP133E	1 bag																4-5ft
|				EP133F	|									|						7-8ft
10/31/02				BHS-12A	|									|						0-1ft
|				BHS-12B	|									|						1-2ft
|				BHS-12C	|									|						2-3ft
				BHS-12D	|									|						3-4ft
10/29				EP136A	|									|						0-1ft
|				EP136B	|									|						1-2ft
|				EP136C	|									|						2-3ft
|				EP136D	|									|						3-4ft
|				EP136E	|									|						4-5ft
|				EP136F1	|									|						7-8ft
				EP136F2 (Duplicate)	|									|						7-8ft
10/28				MW137A	|									|						0-1ft
|				MW137B	|									|						1-2ft

Relinquished (Signature)	Date/Time	Received by: (Signature)	Lab	P.O. #	Shipped via: Bus, Fed Ex, UPS
[signature]	11/4/02 1400		TSC Salt Lake City UT		Other___ Air Bill #

Relinquished (Signature)	Date/Time	Received by: (Signature)	Remarks

Relinquished (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Enclosed: ☐ Parameter sheet w/detection limits ☐ QA/QC standard mixing instructions ☐ Cover letter ☐ Other___
		[signature]	11-5-02 11:10	

Return results & electronic copy to:

Split Samples: ☐ Accepted ☐ Declined

HFORM-1-4/95

APPENDIX C

LEAD AND ARSENIC IN EL PASO RESIDENTIAL SOILS (LA CALAVERA): SOURCE, SPECIES DISTRIBUTION AND BIOACCESSABILITY

Walker & Associates, Inc.
Geochemistry, Engineering, and Occupational Health

DRAFT REPORT

LEAD AND ARSENIC IN EL PASO RESIDENTIAL SOILS: SOURCES, SPECIES DISTRIBUTION AND BIOACCESSABILITY

EL PASO, TX

Submitted to:

Mr. Duane Yantorno
ASARCO, Inc.
Copper Operations
1150 N. 7th Avenue
Tucson, AZ 85703-0747

January 10, 2002

2618 J Street, Suite 1
Sacramento, CA 95816
Phone (916) 442-5304
Fax (916) 442-5313

TABLE OF CONTENTS

1 INTRODUCTION

This expedited study was undertaken to examine the sources, speciation and potential bioaccessability of lead (PB) and arsenic (As) in residential surface soils in the vicinity of ASARCO's copper smelter in El Paso Texas. In particular, the study focused on the occurrence and distribution of metals, especially lead (Pb) and arsenic (As) in the soils and whether windblown slag or other smelter derived materials could account for the observed metal contents in the soil. The occurrence of all Pb and As species was undertaken to ensure that the major sources impacting the residential soils could be determined.

The specific objectives of the study were to:

- Examine the chemical data for 35 off-site residential soils to determine if any specific patterns of metal distribution occur.
- Examine the possible impact that slag may have had on metal contents in the soil. ASARCO slag was known to have been used by other companies, in a crushed form, also in the vicinity of the same residences. Therefore, the potential for the slag to be a source of Pb and As was investigated.
- Examine the soil samples with low magnification microscopy and X-ray diffraction to determine the major soil particle composition patterns. This analysis could help identify suspect metal bearing particles.
- Examine the samples using scanning electron microscopy. This technique would allow identification of Pb and As bearing particles and yield positive information concerning their origin.
- Examine the bioaccessability of the samples for use in human health risk assessment.

2 TECHNICAL APPROACH

2.1 Sampling and sample selection

Residential soils samples were collected by Hydrometrics in 2001 from approximately 35 locations east of the ASARCO smelter along and south of Executive Center Drive in El Paso, Texas. For this expedited study, the 0-1" sample increment was examined from each location since this is the sample depth typically used for human health risk assessment and exposure. Sampling protocols and sampling handling procedures can be found in the appropriate Hydrometrics Workplan.

The sample locations are denoted in Hydrometrics Figure 1, attached.

A crushed slag sample was also sent for microscopic examination. Other possible source materials are not currently available.

2.2 Total metal content

The total metal content of the soils samples was determined by the ASARCO Technical Service Center Laboratory in Salt Lake City, Utah. The samples were analyzed for total metals by Energy Dispersive X-Ray Fluorescence (EDXRF) for arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), iron (Fe), lead (Pb), selenium (Se), and zinc (Zn). The results of the analysis are presented in Table 1 for specific metals of concern. The entire data package and attendant QA/QC results will be submitted under separate cover at a later date.

2.3 Low magnification microscopy

Low magnification microscopy was conducted by Walker & Associates, Inc utilizing a National Stereomicroscope at 15X with a zoom lens expanding the field of vision to 30x. The microscope contains a digital camera that was used to capture still frame images under magnification using Motic software.

Specimens were prepared by:

1. Removing a large subsample (100g) from the samples provided. The subsample was run through a riffle splitter to obtain homogeneity.

2. From one of the size splits obtained from the riffle splitter, a smaller subsample (1g) was spread across a glass microscope slide. Double sided sticky tape was placed over the slide and then lifted, essentially capturing a monolayer of soil particles.

3. Next a magnet (ordinary household strength) was run over the 1g subsample to separate magnetic particles from the rest of the sample. The flat magnet surface containing the magnetic fraction was inverted and the particles transferred to another piece of sticky tape that was the applied to a second microscope slide.

4. Representative images were then taken of the bulk soil sample and the magnetic fraction removed from the same sample.

Results of the low magnification micrscopy study for selected samples are shown in Plates 1-12.

2.4 X-Ray diffraction

Bulk mineralogy of selected samples was determined by X-ray diffraction (XRD) by DCM Science Laboratory in Wheat Ridge, CO. The samples were prepared for XRD by random powder mount techniques and scanned over a range of 3o to 45o 2 theta. Mineral phases were identified with the aid of computer assisted programs accessing a cd-rom powder diffraction database. Estimates of mineral concentrations were based on relative peak heights and reference intensity rations (RIR) measured in-house. Results of the XRD study are presented in Table 2.

2.5 Scanning Electron Microscopy

Select samples were examined by computer controlled scanning electron microscopy by the RJLee Group in Munroeville, PA. The method of sample preparation was to produce an epoxy impregnated polished mount. Soil commonly displays a great range in particle size and therefore was sieved to less tha 250 microns, the size fraction commonly used for human health risk assessment.

A representative split of approximately one gram of the sieved dry sample was vacuum impregnated with epoxy in a 1 inch outside diameter ring and allowed to cure. A sample label was placed in the epoxy for permanent identification. The "puck" was polished to remove at the minimum a thickness of material equal to the radius of the largest particle. Polishing occurs using kerosene as a lubricant to avoid chemical reactions that might occur with water. Finally, the sample was given a thin coating of carbon to prevent charging while under the electron beam in a vacuum.

2.5.1 SEM Analysis set-up

The sample ring was scratched with two registration marks and small strips of carbon and copper tape were fixed to the upper surface before placing up to four samples into the SEM. The electron beam was saturated using an accelerating voltage of 20 KeV and imaging set to the backscattered electron mode where the brightness of a phase is proportional to it's average atomic number (z). The image brightness and contrast controls are adjusted such that the intensity of the carbon and copper tape are at previously established values thus assuring consistency in the analysis of all samples. In addition, a brighmess threshold value was selected to separate phases of interest from the background.

The epoxy and low atomic number phases such as coal appear as a dark background. The most common soil-forming phases (e.g., quartz, feldspars, calcite, dolomite, clay) are intermediate in average atomic number and appear as a medium gray. Iron-bearing occurrences, not uncommon in soils, appear as a lighter gray, and heavy metal phases are bright. In complete characterization of all particles, the threshold value is chosen as just brighter than the background. This is referred to as an "all particle" run. A particle of potential interest in the context of heavy metal characterization is defined as one that is brighter than an appropriate intensity level chosen by the analyst. These particles are candidates for a heavy metal occurrence. This is referred to as a "high-z" analysis. If heavy metals occur concentrated in the phases (e.g., $PbSO_4$ is 68% lead), the threshold level can be set quite high eliminating from consideration a large percentage of the particles. If heavy metals occur at low levels in a phase (e.g., leaded iron phase may have lead levels at a few percent), the threshold level must be set at a lower value resulting in more heavy metal-free occurrences being evaluated by EDS.

The area for analysis was defined by driving the stage to four edges of the circular puck and setting their X, and Y coordinates and the focus. The focus at these known locations allows the focus to be calculated for any position on the sample in the event that the sample surface is not exactly horizontal. The stage is also driven to the two registration marks whose locations are also saved. The registration marks define a new (local or sample) coordinate system. The first mark defines the origin and is assigned the X,Y coordinates as 0,0. The second mark defines the alignment or orientation of the X axis. Setting the origin and alignment to define a local coordinate system allows particles to be relocated even after the sample has been removed and replaced into the SEM days or years later.

2.5.2 Data Acquisition

After the initial set-up, the SEM analysis began under the control of the computer. The stage is driven to the first field. The fields are selected either randomly if the whole surface is not to be analyzed (high magnification) or selected to analyze all fields in order if the whole surface is to be analyzed (low magnification). The field is inspected for pixels above the threshold brightness level to identify particles. Each particle of interest is sized and the electron beam is placed within that particle. The liberated x-rays are collected and parsed into 2048 energy channels, each 10 electron volts (ev) wide. As the spectrum is being acquired, it is evaluated for elemental composition as determined by peaks in the EDS spectrum. The evaluation is only for elements selected by the analyst. Due to the potential for overlapping peaks from different elements, the position and shape of the peaks are compared to spectra acquired on elemental standards to identify the elements and determine the number of x-ray counts attributed to each element. The EDS peak area for each element is expressed as a percent of the total area of all elements analyzed. In general, the EDS area percent increases and decreases as the element concentration increases or decreases, but it should not be considered as a weight percent.

As the spectrum is being collected and the EDS area percents calculated for the potential particles of interest, the particles are assigned to classes previously defined by the analyst. At the minimum, this classification is used to separate particles of interest from particles that are not of interest. If the particle is of interest, the analyst can specify that the x-ray acquisition be extended (generally from 2 seconds to 5-7 seconds), and that a tagged information file format (TIFF) data object be saved. This data object contains the image, the 2048 channel EDS spectrum, and additional information related to instrument working conditions as well as particle physical measures and elemental composition. In addition to the data stored in tags, data consisting of the physical measures and the elemental composition and particle location are saved for all particles in table form for later review and summary.

The classification rules can be simple such as "heavy metal-bearing" and "other", or can be more complex to give a running total of the different phases observed in the analysis. It should be noted that there is the opportunity to classify (and re-classify) particles after the analysis is complete so that the on-line classification is not critical.

The analysis continues with the next particle in the field and additional fields are analyzed until a stopping criterion is met. The stopping criteria include completing the defined area or reaching a predetermined number of fields, number of particles, or amount of time. The analysis proceeds on the next sample until all samples have been analyzed. Four one-inch diameter samples can be placed in the standard sample chamber, but larger chambers are available.

2.6 Bioaccessability

The results of the bioaccessability testing have been submitted under separate cover. *In Vitro* bioaccessability testing was performed on 18 surface soil samples collected from residential properties in the vicinity of the ASARCO smelter in El Paso, Texas. The *In Vitro* testing was done in accordance with the method of Ruby et al., 1996 and as modified by Ruby et al., in 1999. Details of the methodology have been previously submitted.

For lead (Pb), *In Vitro* testing is typically accomplished by examining the mass of Pb dissolved in synthetic stomach fluid at pH 1.5 after a 1 hr contact time. Intestinal absorption of Pb is not considered significant, mainly due to the low solubility of Pb at the higher pH observed in the upper intestine (pH 5.5 to 7). Therefore, Pb bioaccessability was only measured in the stomach phase of the investigation as recommended by Ruby et al., 1999.

For arsenic (As), both the stomach phase and intestinal phase dissolution concentrations are considered significant in the *In Vitro* test. Therefore, As was determined in both phases and presented as such in the data summary spreadsheet. In the actual test, the stomach fluid (pH 1.5) samples were collected after 1 hr at 37 °C and then buffered to pH 7. Bile salts were added in accordance with Ruby et al., 1996. Arsenic was determined in the pH 7 (intestinal phase) after 3 hrs of equilibration. Bioaccessability is calculated as a fraction or percentage of the total sample As or Pb (e.g. mass dissolved in stomach or intestine/total mass x 100).

3 SOURCES OF LEAD AND ARSENIC

3.1 Site background: suspected sources of metals

This expedited study was undertaken to examine the sources, speciation and potential bioaccessability of lead (PB) and arsenic (As) in residential surface soils in the vicinity of ASARCO's copper smelter in El Paso Texas. The study focused on the occurrence and distribution of metals in the soils and whether smelter derived materials such as windblown slag, concentrate, stack emissions could account for the observed metal contents in the soil. Other potential sources were also sought such as paint, homecare products and naturally occurring metals in order to determine which source or sources were responsible for the observed metal loading in the soils.

3.2 Chemical data analysis: XY scatter plots

The chemical data for some of the elements of interest are summarized in Table 1. As noted there is data for 35 soil samples at 3 depths for each location. In addition a surface slag and two other ASARCO slag samples were analyzed for comparing trace metal distribution in the soils to that in the slag. Since slag samples were readily available, they were used initially in the study for comparative purposes. By comparing the chemistry and mineralogy of the slag to that in the soils, the slag could be identified as a source or be eliminated from consideration if the chemical and mineralogical fingerprints did not explain the observed metal distributions in the soils.

Summary statistics are listed at the bottom of Table 1. The mean As content was 65 mg/kg with a minimum of 13 mg/kg and a maximum of 230 mg/kg. For iron, the average content was 1.98% with a minimum content of 0.88% and a maximum of 5.3 %. For Pb, the mean content was 310 mg/kg with a minimum of 54 mg/kg and a maximum of 760 mg/kg.

The slag samples have much higher As, Pb and Fe concentrations. Arsenic ranges from 325 mg/k to 23000 mg/kg, Fe from 21 to 46% and Pb from 1928 to 7800 mg/kg. Due to the high iron content and lower Pb and As in the slag samples, it should be fairly simple to determine if soils are impacted by slag since significant impact should significantly raise the Fe content (and hence Pb and As) in the soils.

To discern the source of Pb in these samples, scatter plots were created to determine the degree to which different metals in different sample classes associate with each other. In many instances, samples from different locations or geologic formations or ores will have distinct metal associations and when plotted in an X-Y scatter plot will show a distinct trend. Each type of sample will have a slightly different trend. If two sets of samples (e.g. slag and soils) have a similar trend in metal associations it could mean that one set has mixed with the other or it could be simply coincidental. To determine if samples trend similarly (i.e. are mixed), more than one metal association is examined. If all the metal trends are similar, then the chances of the association being coincidental are decreased.

Another factor to consider when using scatter plots for exploring data association is that the interpretation must be made in light of the manner in which one set of samples impacts or mixes with another set. For instance, slag particles can impact the soils of the area in the following way. This involves whole slag particles that mix with or enter soil by wind transport, sediment transport in runoff or vertical particle migration into underlying soil. In these cases, the resulting chemistry (metal concentrations) of the slag and soil mixtures are simply determined by the proportion of slag added since the slag particles retains all its metals in the mixing process. Therefore, if the soils have low metal contents, and the slag has high metal content, then mixtures of soil and slag will show increasing levels of all metals as the proportion of slag increases. In this case, the scatter plots will be very useful.

The occurrence of slag material in residential soil samples was determined by comparing the elemental chemistry in the slag to the occurrence of the same elements in the soils. Since windblown slag particles would result in transport of the entire particle, soils impacted by windblown material would begin to take on the same chemical characteristics as pure slag once sufficient impact occurred. As a result, determining whether impact has occurred is quite simple. For example, if a soil contains low levels of Pb and other metals initially and then is slowly enriched in slag, the soils will increase in metal concentrations in the same proportions they exist in the slag

Mixing lines comparing the effect of slag on the residential soil samples were constructed to see if the samples followed such mixing trends. To construct this model, identification of end-members representing potential source and receptor areas was required. For one-end member, two of the slag samples concentrations of Pb, Fe and As were used. For the other end-member, the three samples with the lowest Pb content (about 100 mg/kg) were used to represent a background sample.

Using these two end members, the background samples were enriched in Pb via mixing with slag. As Pb increases, the contents of the other metals, especially Fe, also should increase. The general equation describing the mixing of slag with background soils is:

Metal content after mixing [mg/kg] = ((fraction of slag in sample) * (metal content of slag in mg/kg)) + ((fraction of background soil in sample mixture) * (metal content of background soil))

or, for Pb:

$$\text{Pb [mg/kg] in mixture} = (a * 1928) + (b * 100)$$

where

a = fraction of tailings in sample
b = fraction of soil in sample

The results of the mixing model for Fe and Pb in slag are shown in Figure 2. For Pb and Fe it is clear that increasing Fe in the samples frequently results in an increase in Pb. Since slag is composed of almost 50 % iron, it seems logical that slag particles are enriching many of the soils in Pb. The plot also shows that many of the samples fall along the slag mixing line indicating that they may only be impacted by this source. In some other cases, there is more Pb in the sample than that predicted by the Fe content (or slag alone) suggesting another Pb rich source.

Similar plots were constructed for Pb vs Zn and Pb vs As. In both cases (Figures 3 and 4), Zn and As increase with Pb and in the same manner that Pb increases with Fe. This, plus the chemical data, suggests that slag is a significant source of Pb, Zn, and As in many of the residential soils. However, there is also a set of samples in each plot that have more Zn or As than would be predicted by slag alone. This other phase is under investigation.

The most important result of this analysis is that in most cases, Pb and As are found to be the highest in soils with high Fe contents. Since slag is composed of very high Fe (nearly 21 to 45%), slag is likely a significant source of Pb and As in many of the samples.

3.3 X-ray Diffraction

XRD was used to determine the main mineral phases in several select soil and slag samples from the site. The results are summarized in Table 2.

As noted the soil samples are rich in quartz, plagioclase, feldspar and calcite with minor amounts of clays and magnetite. The samples also contain significant amounts of igneous volcanic minerals such as as fayalite and augite formed under rapid cooling conditions in low Si magmas. The Table also shows that the slag contains fayalite and augite and magnetite, all Fe rich minerals. Since slag is iron rich, and forms from melts under air cooled conditions, the existence of the phases is not unexpected. The Table also shows the observed ratio of Pb to Fe (as magnetite) observed in the samples. Again the ratios are very similar suggesting that that the Pb rich magnetite particles in the slag are the same as those found in the soils.

3.4 Microscopy

To confirm the occurrence of slag/magnetite and other iron rich minerals in the samples, the specimens were viewed under low magnification and photos taken of the bulk samples and the magnetic fraction removed from the bulk samples. These are presented in a series of plates for the same soils noted in Table 2. Several observations were made:

- The bulk samples contained abundant quartz, calcite and feldspars with dark, sharply fractured shards of magnetite or other Fe rich minerals.
- Passing a magnet over the sample removed these magnetite particles easily suggesting that these were derived from slag.
- The morphology of the slag/magnetite particles observed was similar in all samples and with the sample of slag examined in the same way.
- The samples with the highest Pb also appeared to qualitatively contain the most slag or magnetite particles. For example, sample 6c, which had less than 75 mg/kg Pb, had only one magnetite particle observable under low magnification. Sample 25A, with nearly 800 mg/kg Pb had abundant magnetite/slag particles observable under low magnification.

3.5 Scanning Electron Microscopy

The RJLee Group provided speciation data on several of the samples from the site; Samples 2A, 16A, 25A, 32A and a crushed slag sample. The results of their initial observations are described in Tables 3 through 8. For each sample, the total Pb content is noted and then a brief description of the overall Pb and As occurrence within the sample. Next a table is provided that shows the composition of the metal bearing particles found by CCSEM. The particle number examined is given in the far-left column. Next to the particle number is the image number, many of which are attached in Plates 13 to 39 as identified in the far right column. The third column describes the phase or association of Pb or As in the particle of interest.

Because much Pb appears to be associated with slag, the operator adjusted the contrast and brightness on one slag particle in Sample 2A to see if the lead-bearing occurrences could be enhanced. This series, shown in Table 4, illustrates that Pb can be "brought out".

4 BIOACCESSABILITY

The previously submitted document shows the sample IDs, total sample Pb and As and the results of the *In Vitro* testing. For Pb, the absolute bioaccessability ranged from 8.5% to 22%, considerably less than the EPA default values for Pb bioavailiability of 35%. This is not unexpected since the samples appear to contain slag like particles composed of a dense Fe rich matrix which is likely resistant to attach by acids (speciation of samples is still in progress). Hence, Pb associated with slag would have a fairly low solubility even at very low pH.

Arsenic absolute bioaccessability in the stomach (low pH) phase was only 2.5 to 15% of the total sample arsenic. At high pH (intestinal phase), the bioaccessability ranged only from 2 to 8%. As before, arsenic associated with or bound within the dense iron matrix of the slag particles would not be expected to dissolve significantly under most conditions.

5 PRELIMINARY CONCLUSIONS

Based on the samples examined to date, the following preliminary conclusions can be drawn:

- Simple examination of the chemical data set shows that samples containing high Pb or As also show high Fe contents. The correlation appears to be quite good for many samples.
- In other cases, Pb and As are enriched in the soils without having significant enrichment in Fe. These samples may be impacted by a different source than those noted in the first conclusion above.
- Comparison of slag chemistry and mineralogy to the residential soils shows that many of the soils' Pb and As contents fall along slag mixing lines. Again, a portion of the samples do not follow this trend, suggesting a different source or variance in the slag composition that may be impacting the soils.
- Low magnification microscopy and magnetic separation appear to confirm the presence of slag in the subset of samples examined.