FINAL REMEDIAL INVESTIGATION REPORT

VOLUME 5

Appendices

Martin Marietta Reduction Facility
The Dalles, Oregon

GERAGHTY & MILLER, INC.
Ground-Water Consultants

SOILS AND SURFACE-WATER ANALYSIS

JUNE - AUGUST 1987

LABORATORY BLANKS - ORGANICS ANALYSIS

Table B-1. Results of analysis for volatile organic compounds in daily laboratory blanks

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
LAB SAMPLE ID:	BBLK0625	CBLK0626	BBLK0629	BBLK0630
SAMPLE DATE:	06/25/87	06/26/87	06/29/87	06/30/87
ANALYSIS DATE:	06/25/87	06/26/87	06/29/87	06/30/87
FILE NAME:	0625VWB82	0626VWBC1	0629VWB81	0630VWB81
INSTRUMENT ID:	MS-B	MS-C	MS-B	MS-B
MATRIX:	WATER	WATER	WATER	WATER
UNITS:	UG/L	UG/L	UG/L	UG/L
DILUTION FACTOR:	1	1	1	1
COMPOUNDS				
Acrolein	< 10	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10	< 10
Benzene	< 5	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5	< 5
1,3-Dichlorobenzene	< 5	< 5	< 5	< 5
1,2-Dichlorobenzene	< 5	< 5	< 5	< 5
1,4-Dichlorobenzene	< 5	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5	< 5
trans-1,3-Dichloropropene	< 5	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5	< 5

*Any amount detected between the level of detection (LOD = 1 ppb) and the level of quantitation (LOQ = 5 ppb) is marked with an * and should be considered qualitative.

Table B-1. Continued

CLIENT SAMPLE ID:	LAB BLANK
LAB SAMPLE ID:	0805VWBC
SAMPLE DATE:	08/05/87
ANALYSIS DATE:	08/05/87
FILE NAME:	0805VWBC1
INSTRUMENT ID:	MS-C
MATRIX:	WATER
UNITS:	UG/L
DILUTION FACTOR:	1

COMPOUNDS	
Acrolein	< 10
Acrylonitrile	< 10
Benzene	< 5
Bromodichloromethane	< 5
Bromoform	< 5
Bromomethane	< 5
Carbon Tetrachloride	< 5
Chlorobenzene	< 5
Chloroethane	< 5
2-Chloroethylvinylether	< 10
Chloroform	< 5
Chloromethane	< 5
Dibromochloromethane	< 5
1,3-Dichlorobenzene	< 5
1,2-Dichlorobenzene	< 5
1,4-Dichlorobenzene	< 5
1,1-Dichloroethane	< 5
1,2-Dichloroethane	< 5
1,1-Dichloroethene	< 5
1,2-Dichloropropane	< 5
trans-1,3-Dichloropropene	< 5
cis-1,3-Dichloropropene	< 5
Ethylbenzene	< 5
Methylene Chloride	< 5
1,1,2,2-Tetrachloroethane	< 5
Tetrachloroethene	< 5
Toluene	< 5
1,1,1-Trichloroethane	< 5
1,1,2-Trichloroethane	< 5
Trichloroethene	< 5
Trichlorofluoromethane	< 5
Vinyl Chloride *	< 1
cis-1,2-Dichloroethene	< 5
trans-1,2-Dichloroethene	< 5

Table B-2. Results of analysis for base/neutral acid extractable compounds in laboratory extraction blanks

CLIENT SAMPLE ID:	LAB BLANK
LAB SAMPLE ID:	BLK0624S
SAMPLE DATE:	06/24/87
EXTRACTION DATE:	06/24/87
ANALYSIS DATE:	07/09/87
FILE NAME:	0624SSBA1
INSTRUMENT ID:	MS-A
MATRIX:	SOIL
UNITS:	UG/KG

COMPOUNDS	
Acenaphthalene	< 1670
Acenaphthene	< 1670
Anthracene	< 1670
Benzidine	< 3030
Benzo(a)Anthracene	< 1670
Benzo(a)Pyrene	< 1670
Benzo(b+k)fluoranthenes	< 1670
Benzo(g,h,i)Perylene	< 1670
4-Bromophenyl-phenylether	< 1670
Butylbenzylphthalate	< 1670
bis(2-Chloroethoxy)Methane	< 1670
bis(2-Chloroethyl)Ether	< 1670
bis(2-Chloroisopropyl)Ether	< 1670
2-Chloronaphthalene	< 1670
4-Chlorophenyl-phenylether	< 1670
Chrysene	< 1670
Di-n-Butylphthalate	< 1670
Di-n-Octyl Phthalate	< 1670
Dibenz(a,h)Anthracene	< 1670
1,3-Dichlorobenzene	< 1670
1,2-Dichlorobenzene	< 1670
1,4-Dichlorobenzene	< 1670
3,3'-Dichlorobenzidine	< 3330
Diethylphthalate	< 1670
Dimethyl Phthalate	< 1670
2,4-Dinitrotoluene	< 1670
2,6-Dinitrotoluene	< 1670
1,2-Diphenylhydrazine	< 1670
bis(2-Ethylhexyl)Phthalate	< 1670
Fluoranthene	< 1670
Fluorene	< 1670
Hexachlorobenzene	< 1670
Hexachlorobutadiene	< 1670
Hexachlorocyclopentadiene	< 1670
Hexachloroethane	< 1670
Indeno(1,2,3-cd)Pyrene	< 1670

O/L CWF

Table B-2. Continued

CLIENT SAMPLE ID:	LAB BLANK
LAB SAMPLE ID:	BLK0624S
SAMPLE DATE:	06/24/87
EXTRACTION DATE:	06/24/87
ANALYSIS DATE:	07/09/87
FILE NAME:	0624SSBA1
INSTRUMENT ID:	MS-A
MATRIX:	SOIL
UNITS:	UG/KG

COMPOUNDS	
Isophorone	< 1670
N-Nitroso-Di-n-Propylamine	< 1670
N-Nitrosodimethylamine	< 1670
N-Nitrosodiphenylamine	< 1670
Naphthalene	< 1670
Nitrobenzene	< 1670
Phenanthrene	< 1670
Pyrene	< 1670
1,2,4-Trichlorobenzene	< 1670

Table B-2. Continued

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
LAB SAMPLE ID:	BLK0625W	BLK0629W	ABLK0804	ABLK810
SAMPLE DATE:	06/25/87	06/29/87	08/04/87	08/10/87
EXTRACTION DATE:	06/25/87	06/29/87	08/04/87	08/10/87
ANALYSIS DATE:	07/01/87	07/09/87	08/07/87	08/19/87
FILE NAME:	0625SWBA1	0629SWBA1	0804SWBA1	0810SWBA1
INSTRUMENT ID:	MS-A	MS-A	MSA	MS-A
MATRIX:	WATER	WATER	WATER	WATER
UNITS:	UG/L	UG/L	UG/L	UG/L
COMPOUNDS				
Acenaphthalene	< 10	< 10	< 10	< 10
Acenaphthene	< 10	< 10	< 10	< 10
Anthracene	< 10	< 10	< 10	< 10
Benzidine	< 80	< 80	< 80	< 80
Benzo(a)Anthracene	< 10	< 10	< 10	< 10
Benzo(a)Pyrene	< 10	< 10	< 10	< 10
Benzo(b+k)fluoranthenes	< 10	< 10	< 10	< 10
Benzo(g,h,i)Perylene	< 10	< 10	< 10	< 10
4-Bromophenyl-phenylether	< 10	< 10	< 10	< 10
Butylbenzylphthalate	< 10	< 10	< 10	< 10
4-Chloro-3-Methylphenol	< 10	< 10	< 10	< 10
bis(2-Chloroethoxy)Methane	< 10	< 10	< 10	< 10
bis(2-Chloroethyl)Ether	< 10	< 10	< 10	< 10
bis(2-Chloroisopropyl)Ether	< 10	< 10	< 10	< 10
2-Chloronaphthalene	< 10	< 10	< 10	< 10
2-Chlorophenol	< 10	< 10	< 10	< 10
4-Chlorophenyl-phenylether	< 10	< 10	< 10	< 10
Chrysene	< 10	< 10	< 10	< 10
Di-n-Butylphthalate	< 10	< 10	< 10	< 10
Di-n-Octyl Phthalate	< 10	< 10	< 10	< 10
Dibenz(a,h)Anthracene	< 10	< 10	< 10	< 10
1,2-Dichlorobenzene	< 10	< 10	< 10	< 10
1,4-Dichlorobenzene	< 10	< 10	< 10	< 10
1,3-Dichlorobenzene	< 10	< 10	< 10	< 10
3,3'-Dichlorobenzidine	< 20	< 20	< 20	< 20
2,4-Dichlorophenol	< 10	< 10	< 10	< 10
Diethylphthalate	< 10	< 10	< 10	< 10
Dimethyl Phthalate	< 10	< 10	< 10	< 10
2,4-Dimethylphenol	< 10	< 10	< 10	< 10
4,6-Dinitro-2-Methylphenol	< 50	< 50	< 50	< 50
2,4-Dinitrophenol	< 50	< 50	< 50	< 50
2,4-Dinitrotoluene	< 10	< 10	< 10	< 10
2,6-Dinitrotoluene	< 10	< 10	< 10	< 10
1,2-Diphenylhydrazine	< 10	< 10	< 10	< 10
bis(2-Ethylhexyl)Phthalate	43	< 10	< 10	< 10
Fluoranthene	< 10	< 10	< 10	< 10

Table B-2. Continued

CLIENT SAMPLE ID:	LAB BLANK	LAB BLANK	LAB BLANK	LAB BLANK
LAB SAMPLE ID:	BLK0625W	BLK0629W	ABLK0804	ABLK810
SAMPLE DATE:	06/25/87	06/29/87	08/04/87	08/10/87
EXTRACTION DATE:	06/25/87	06/29/87	08/04/87	08/10/87
ANALYSIS DATE:	07/01/87	07/09/87	08/07/87	08/19/87
FILE NAME:	0625SWBA1	0629SWBA1	0804SWBA1	0810SWBA1
INSTRUMENT ID:	MS-A	MS-A	MSA	MS-A
MATRIX:	WATER	WATER	WATER	WATER
UNITS:	UG/L	UG/L	UG/L	UG/L
COMPOUNDS				
Fluorene	< 10	< 10	< 10	< 10
Hexachlorobenzene	< 10	< 10	< 10	< 10
Hexachlorobutadiene	< 10	< 10	< 10	< 10
Hexachlorocyclopentadiene	< 10	< 10	< 10	< 10
Hexachloroethane	< 10	< 10	< 10	< 10
Indeno(1,2,3-cd)Pyrene	< 10	< 10	< 10	< 10
Isophorone	< 10	< 10	< 10	< 10
N-Nitroso-Di-n-Propylamine	< 10	< 10	< 10	< 10
N-Nitrosodimethylamine	< 5	< 5	< 5	< 5
N-Nitrosodiphenylamine	< 10	< 10	< 10	< 10
Napnthalene	< 10	< 10	< 10	< 10
Nitrobenzene	< 10	< 10	< 10	< 10
4-Nitrophenol	< 50	< 50	< 50	< 50
2-Nitrophenol	< 10	< 10	< 10	< 10
Pentachlorophenol	< 50	< 50	< 50	< 50
Phenanthrene	< 10	< 10	< 10	< 10
Phenol	< 10	< 10	< 10	< 10
Pyrene	< 10	< 10	< 10	< 10
1,2,4-Trichlorobenzene	< 10	< 10	< 10	< 10
2,4,6-Trichlorophenol	< 10	< 10	< 10	< 10

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SURROGATE SPIKE RESULTS

Table B-3. Surrogate spike recoveries (%) daily laboratory blanks

Instrument ID		Blank-B	Blank-C	Blank-B	Blank-B	Blank-C		
Date		6/25/87	6/26/87	6/29/87	6/30/87	8/5/87		
VOLATILES	CLP QC Limits							
Toluene-D8	88-110	96	95	97	93	104	✓	
4-Bromofluorobenzene	86-115	100	99	97	100	98	✓	
1,2-Dichloroethane-D4	76-114	87	88	97	90	94	✓	

DK/cwb

Table B-4. Surrogate spike recoveries (%) for laboratory extraction blanks

Lab ID		BLK 06245						
Date		6/24/87						
BASE/NEUTRALS	CLP QC Limit							
Nitrobenzene-D5	23-120	46						
2-Fluorobiphenyl	30-115	48						
P-Terphenyl-D14	18-137	79						
ACIDS/PHENOLS								
Phenol-D5	24-113	33						
2-Fluorophenol	25-121	38						
2,4,6-Tribromophenol	19-122	62						

Table B-4. Continued

		BLK	BLK	ABLK	ABLK			
Lab ID		0625W	0629W	0804	0810			
Date		6/25/87	6/29/87	8/4/87	8/10/87			
BASE/NEUTRALS	CLP QC Limits							
Nitrobenzene-D5	35-114	85	71	75	75			
2-Fluorobiphenyl	43-116	79	54	62	77			
P-Terphenyl-D14	33-141	95	83	100	90			
ACIDS/PHENOLS								
Phenol-D5	10-94	73	61	64	59			
2-Fluorophenol	21-100	78	69	78	70			
2,4,6-Tribromophenol	10-123	74	71	50	73			

Table B-5. Surrogate spike recoveries (%) for aqueous samples collected on 23 and 26 June and 2 August 1987 at Martin Marietta, The Dalles

Lab ID		2918	2925	2926	2927	2928	2929	2930
Client ID		PHFB	DLSW-Rep 1E	Trip Blank 1	LDAWG	Trip Blank 5	LDBWG	LDFB
VOLATILES	CLP QC Limits							
Toluene-D8	88-110		96	99	94	98	97	99
4-Bromofluorobenzene	86-115	2K CWA	100	101	89	106	96	100
1,2-Dichloroethane-D4	76-114		85	102	100	101	101	104
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	40	70		56	83	70	74
2-Fluorobiphenyl	43-116 *	31	65		57	76	50	67
P-Terphenyl-D14	33-141	81	54		37	93	56	84
ACIDS/PHENOLS								
Phenol-D5	10-94	37	75		49	70	47	63
2-Fluorophenol	21-100	35	56		32	74	33	58
2,4,6-Tribromophenol	10-123	63	65		49	58	54	67

*One recovery per fraction may be outside limits if that recovery is >10% (SOW 10/86).

Table B-5. Continued

Lab ID		2931	2988	2989	3338	3339	3340	3341
Client ID		Trip Blank 3	OCWP-Pit B	Scrubber Pipe Effluent	LDBWG	DLSW-Rep 1E	LDAWG	LDFB
VOLATILES	CLP QC Limits							
Toluene-D8	88-110	99	95	95	99	99	101	102
4-Bromofluorobenzene	86-115	103	99	99	86	100	95	102
1,2-Dichloroethane-D4	76-114	104	103	102	102	91	102	96
BASE/NEUTRALS								
Nitrobenzene-D5	35-114		82	67	83	74	80	98
2-Fluorobiphenyl	43-116		70	54	67	65	69	90
P-Terphenyl-D14	33-141		42	58	61	62	61	110
ACIDS/PHENOLS								
Phenol-D5	10-94		48	49	30	21	20	70
2-Fluorophenol	21-100		19*	55	9*	5*	10*	83
2,4,6-Tribromophenol	10-123		47	73	19	28	38	88

Table B-5.. Continued

	Lab ID	3338R	3339R					
	Client ID	LDBWG	DLSW-Rep IE					
BASE/NEUTRALS	CLP QL Limits							
Nitrobenzene-D5	35-114	67	77					
2-Fluorobiphenyl	43-116	93	77					
P-Terphenyl-D14	33-141	44	42					
ACIDS/PHENOLS								
Phenol-D5	10-94	38	45					
2-Fluorophenol	21-100	24	29					
2,4,6-Tribromophenol	10-123	41	37					

Table B-6. Surrogate spike recoveries (%) for soil samples collected on 23 and 24 June 1987 at Martin Marietta, The Dalles

Lab ID		2916	2917	2932				
Client ID		PHASC	Soil Rep 2	ODCSC-1				
BASE/NEUTRALS	CLP QC Limits							
Nitrobenzene-D5	23-120	57	95	61				
2-Fluorobiphenyl	30-115	0*	0*	54				
P-Terphenyl-Dl4	18-137	0*	0*	73				
ACIDS/PHENOLS								
Phenol-D5	24-113	58	74	43				
2-Fluorophenol	25-121	55	0*	51				
2,4,6-Tribromophenol	19-122	0*	0*	65				

*Surrogates diluted out.

Table B-7. Surrogate spike recoveries (%) for matrix spike (MS) and matrix spike duplicate (MSD) analyses of surface water samples collected on 23 June and 2 August 1987 from the Landfill Ditch at Martin Marietta, The Dalles

Lab ID		2927MS	2927MSD	3340MS	3340MSD			
Client ID		LDAWG	LDAWG	LDAWG	LDAWG			
VOLATILES	CLP QC Limits							
Toluene-D8	88-110	98	97	96	98			
4-Bromofluorobenzene	86-115	90	94	96	97			
1,2-Dichloroethane-D4	76-114	104	99	98	104			
BASE/NEUTRALS								
Nitrobenzene-D5	35-114	66	72	90	82			
2-Fluorobiphenyl	43-116	58	62	75	76			
P-Terphenyl-D14	33-141	36	57	66	85			
ACIDS/PHENOLS								
Phenol-D5	10-94	42	56	28	32			
2-Fluorophenol	21-100	28	42	9*	28			
2,4,6-Tribromophenol	10-123	67	53	31	69			

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MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Table B-8. Matrix spike and matrix spike duplicate recoveries: volatiles in surface water matrix

LAB ID: 2927 CLIENT ID: LDAWG UNITS: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	50	48.5	97	52.9	106	9	61-145	14
Trichloroethylene	ND	50	44.8	90	54.6	109	20	71-120	14
Chlorobenzene	ND	50	47.2	94	54.4	109	14	75-130	13
Toluene	ND	50	47.9	96	53.3	107	11	76-125	13
Benzene	ND	50	50.3	101	51.4	103	2	76-127	11

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (10/86) are advisory levels.

Table B-9. Matrix spike and matrix spike duplicate recoveries: volatiles in surface water matrix

LAB ID: 3340 CLIENT ID: LDAWG UNITS: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,1-Dichloroethylene	ND	1000	804	80	806	81	0	61-145	14
Trichloroethylene	ND	1000	824	82	928	93	12	71-120	14
Chlorobenzene	ND	1000	916	92	1020	102	11	75-130	13
Toluene	ND	1000	974	97	1050	105	8	76-125	13
Benzene	ND	1000	886	89	958	96	8	76-127	11

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (10/86) are advisory levels.

Table B-10. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in surface water matrix

LAB ID: 2927 CLIENT ID: LDAWG UNITS: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	200	90.4	45	86.8	43	4	39-98	28
Acenaphthene	ND	200	86.4	43	94.0	47	8	46-118	31
2,4-Dinitrotoluene	ND	200	130	65	152	76	16	24-96	38
Pyrene	20.6	200	80.8	30	113	46	42	26-127	31
N-Nitroso-di-n-Propylamine	ND	200	88.8	44	112	56	23	41-116	38
1,4-Dichlorobenzene	ND	200	75.2	38	82.0	41	9	36-97	28

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (10/86) are advisory levels.

Table B-11. Matrix spike and matrix spike duplicate recoveries: acid extractables in surface water matrix

LAB ID: 2927 CLIENT ID: LDAWG UNITS: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
Pentachlorophenol	ND	400	121	30	219	55	58	9-103	50
Phenol	ND	400	175	44	212	53	19	12-89	42
2-Chlorophenol	ND	400	195	49	260	65	29	27-123	40
4-Chloro-3-Methylphenol	ND	400	210	53	252	63	18	23-97	42
Nitrophenol	ND	400	0	0	0	0	0	10-80	50

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (10/86) are advisory levels.

Table B-12. Matrix spike and matrix spike duplicate recoveries: base/neutral extractables in surface water matrix

LAB ID: 3340 CLIENT ID: LDAWG UNITS: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
1,2,4-Trichlorobenzene	ND	1000	586	59	656	66	11	39-98	28
Acenaphthene	ND	1000	654	65	670	67	2	46-118	31
2,4-Dinitrotoluene	ND	1000	664	66	580	58	14	24-96	38
Pyrene	59.8	1000	516	46	738	68	39	26-127	31
N-Nitrosodi-n-Propylamine	ND	1000	944	94	842	84	11	41-116	38
1,4-Dichlorobenzene	ND	1000	596	60	592	59	1	36-97	28

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (10/86) are advisory levels.

Table B-13. Matrix spike and matrix spike duplicate recoveries: acid extractables in surface water matrix

LAB ID: 3340 CLIENT ID: LDAWG UNITS: µg/L

Spike Compound	Conc. in Sample[a]	Spike Conc. Added	Spike Conc. Measured	% Recovery	Duplicate Spike Conc. Measured	% Recovery	RPD[b]	Acceptable Limits[c]	
								Recovery	RPD
Pentachlorophenol	ND	2000	710	36	2020	101	96	9-103	50
Phenol	ND	2000	508	25	560	28	10	12-89	42
2-Chlorophenol	ND	2000	484	24	992	50	69	27-123	40
4-Chloro-3-Methylphenol	ND	2000	1060	53	812	41	26	23-97	42
4-Nitrophenol	ND	2000	1040	52	1480	74	35	10-80	50

[a] Values reported as not detected (ND) are treated as zero for purposes of calculation.

[b] RPD = relative % difference = $\frac{2(x-x^1)}{x+x^1} \times 100$ where x and x^1 = % spike recovery and duplicate % spike recovery

[c] Limits prescribed by EPA in Contract Lab Program Statement of Work (10/86) are advisory levels.

SOILS AND SURFACE-WATER ANALYSIS

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TRIP BLANKS

Table IV-1. Results of analysis for volatile organic compounds in aqueous trip blanks accompanying surface water samples collected on 23 June 1987 from the Landfill Ditch at Martin Marietta, The Dalles

CLIENT SAMPLE ID:	TRIP BLANK-1	TRIP BLANK-3	TRIP BLANK-5
LAB SAMPLE ID:	2926	2931	2928
SAMPLE DATE:	06/16/87	06/16/87	06/16/87
ANALYSIS DATE:	06/29/87	06/29/87	06/29/87
FILE NAME:	V2926B	V2931B	V2928B
INSTRUMENT ID:	MS-8	MS-8	MS-8
MATRIX:	WATER	WATER	WATER
UNITS:	UG/L	UG/L	UG/L
DILUTION FACTOR:	1	1	1
COMPOUNDS			
Acrolein	< 10	< 10	< 10
Acrylonitrile	< 10	< 10	< 10
Benzene	< 5	< 5	< 5
Bromodichloromethane	< 5	< 5	< 5
Bromoform	< 5	< 5	< 5
Bromomethane	< 5	< 5	< 5
Carbon Tetrachloride	< 5	< 5	< 5
Chlorobenzene	< 5	< 5	< 5
Chloroethane	< 5	< 5	< 5
2-Chloroethylvinylether	< 10	< 10	< 10
Chloroform	< 5	< 5	< 5
Chloromethane	< 5	< 5	< 5
Dibromochloromethane	< 5	< 5	< 5
1,3-Dichlorobenzene	< 5	< 5	< 5
1,2-Dichlorobenzene	< 5	< 5	< 5
1,4-Dichlorobenzene	< 5	< 5	< 5
1,1-Dichloroethane	< 5	< 5	< 5
1,2-Dichloroethane	< 5	< 5	< 5
1,1-Dichloroethene	< 5	< 5	< 5
1,2-Dichloropropane	< 5	< 5	< 5
trans-1,3-Dichloropropene	< 5	< 5	< 5
cis-1,3-Dichloropropene	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5
Methylene Chloride	< 5	< 5	< 5
1,1,2,2-Tetrachloroethane	< 5	< 5	< 5
Tetrachloroethene	< 5	< 5	< 5
Toluene	< 5	< 5	< 5
1,1,1-Trichloroethane	< 5	< 5	< 5
1,1,2-Trichloroethane	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5
Trichlorofluoromethane	< 5	< 5	< 5
Vinyl Chloride *	< 1	< 1	< 1
cis-1,2-Dichloroethene	< 5	< 5	< 5
trans-1,2-Dichloroethene	< 5	< 5	< 5

*Any amount detected between the level of detection (LOD = 1 ppb) and the level of quantitation (LOQ = 5 ppb) is marked with an * and should be considered qualitative.

Table IV-2. Results of analysis for base/neutral acid extractable compounds in an aqueous trip blank accompanying surface water samples collected on 23 June 1987 from the Landfill Ditch at Martin Marietta, The Dalles

CLIENT SAMPLE ID:	TRIP BLANK-5
LAB SAMPLE ID:	2928
SAMPLE DATE:	06/16/87
EXTRACTION DATE:	06/25/87
ANALYSIS DATE:	07/01/87
FILE NAME:	BNA2928
INSTRUMENT ID:	MS-A
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS	
Acenaphthalene	< 10
Acenaphthene	< 10
Anthracene	< 10
Benzidine	< 80
Benzo(a)Anthracene	< 10
Benzo(a)Pyrene	< 10
Benzo(b+k)fluoranthenes	< 10
Benzo(g,h,i)Perylene	< 10
4-Bromophenyl-phenylether	< 10
Butylbenzylphthalate	< 10
4-Chloro-3-Methylphenol	< 10
bis(2-Chloroethoxy)Methane	< 10
bis(2-Chloroethyl)Ether	< 10
bis(2-Chloroisopropyl)Ether	< 10
2-Chloronaphthalene	< 10
2-Chlorophenol	< 10
4-Chlorophenyl-phenylether	< 10
Chrysene	< 10
Di-n-Butylphthalate	< 10
Di-n-Octyl Phthalate	< 10
Dibenz(a,h)Anthracene	< 10
1,2-Dichlorobenzene	< 10
1,4-Dichlorobenzene	< 10
1,3-Dichlorobenzene	< 10
3,3'-Dichlorobenzidine	< 20
2,4-Dichlorophenol	< 10
Diethylphthalate	< 10
Dimethyl Phthalate	< 10
2,4-Dimethylphenol	< 10
4,6-Dinitro-2-Methylphenol	< 50
2,4-Dinitrophenol	< 50
2,4-Dinitrotoluene	< 10
2,6-Dinitrotoluene	< 10
1,2-Diphenylhydrazine	< 10
bis(2-Ethylhexyl)Phthalate	< 10
Fluoranthene	< 10

Table IV-2. Continued.

CLIENT SAMPLE ID:	TRIP BLANK-5
LAB SAMPLE ID:	2928
SAMPLE DATE:	06/16/87
EXTRACTION DATE:	06/25/87
ANALYSIS DATE:	07/01/87
FILE NAME:	BNA2928
INSTRUMENT ID:	MS-A
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS	
Fluorene	< 10
Hexachlorobenzene	< 10
Hexachlorobutadiene	< 10
Hexachlorocyclopentadiene	< 10
Hexachloroethane	< 10
Indeno(1,2,3-cd)Pyrene	< 10
Isophorone	< 10
N-Nitroso-Di-n-Propylamine	< 10
N-Nitrosodimethylamine	< 5
N-Nitrosodiphenylamine	< 10
Naphthalene	< 10
Nitrobenzene	< 10
4-Nitrophenol	< 50
2-Nitrophenol	< 10
Pentachlorophenol	< 50
Phenanthrene	< 10
Phenol	< 10
Pyrene	< 10
1,2,4-Trichlorobenzene	< 10
2,4,6-Trichlorophenol	< 10

Table IV-3. Results of chemical analysis of an aqueous trip blank accompanying surface water samples collected on 23 June 1987 from the Landfill Ditch at Martin Marietta, The Dalles

	1	2	3	4	5	6
SAMPLE DATE:	6/16/87					
ESM SAMPLE ID:	2928					
CLIENT SAMPLE ID:	TRP BLNK 5					
NOTE:						
COMPOUNDS						
calcium (ug/L)	730					
magnesium (ug/L)	<500					
potassium (ug/L)	<1000					
sodium (ug/L)	<1000					
chloride (mg/L)	<1.1					
fluoride (mg/L) by IC	<1.6					
fluoride (mg/L) by ISE	<1.0					
sulfate (mg/L) by IC	<2.0					
sulfate (mg/L) turbidimetric	<5.0					
bicarbonate alkalinity (mg/L) (as CaCO3)	<10					
carbonate alkalinity (mg/L) (as CaCO3)	<10					
total cyanide (ug/L)	NT *					
free cyanide (ug/L)	NT					

* Not tested

SOILS AND SURFACE-WATER ANALYSIS

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CONCENTRATIONS OF CALIBRATION CURVE STANDARDS

Table C-25. Concentration of Calibration Curve Standards

Parameter	Method	Standard Concentration	Units
Fluoride	300.0	1.0	mg/L
Fluoride	300.0	5.0	mg/L
Fluoride	300.0	10	mg/L
Fluoride	300.0	20	mg/L
Fluoride	340.2	0.10	mg/L
Fluoride	340.2	1.0	mg/L
Fluoride	340.2	10	mg/L
Fluoride	340.2	50	mg/L
Fluoride	340.2	100	mg/L
Fluoride	340.2	250	mg/L
Fluoride	340.2	500	mg/L
Fluoride	340.2	1000	mg/L
Sulfate	300.0	1.0	mg/L
Sulfate	300.0	5.0	mg/L
Sulfate	300.0	10	mg/L
Sulfate	300.0	20	mg/L

Table C-25. Continued

Parameter	Method	Standard Concentration	Units
Arsenic	206.2	10	ug/L
Arsenic	206.2	30	ug/L
Arsenic	206.2	50	ug/L
Sodium	273.1	5.0	mg/L
Sodium	273.1	10	mg/L
Sodium	273.1	50	mg/L
Sodium	273.1	100	mg/L
EP TOX EXTRACTS			
Arsenic	200.7	3.0	mg/L
Barium	200.7	4.0	mg/L
Cadmium	200.7	3.0	mg/L
Chromium	200.7	3.0	mg/L
Lead	200.7	5.0	mg/L
Mercury	239.1	50,200	ng
Selenium	200.7	2.0	mg/L
Silver	200.7	1.0	mg/L

Table C-25. Continued

Parameter	Method	Standard Concentration	Units
Sulfate	375.4	5.0	mg/L
Sulfate	375.4	10	mg/L
Sulfate	375.4	15	mg/L
Sulfate	375.4	20	mg/L
Sulfate	375.4	25	mg/L
Sulfate	375.4	30	mg/L
Sulfate	375.4	35	mg/L
Sulfate	375.4	40	mg/L
Total Cyanide	335.2	2.5	mg/L
Total Cyanide	335.2	12.5	mg/L
Total Cyanide	335.2	50	mg/L
Total Cyanide	335.2	100	mg/L
Total Cyanide	335.2	200	mg/L
Free Cyanide	412H	2.5	mg/L
Free Cyanide	412H	12.5	mg/L
Free Cyanide	412H	50	mg/L
Free Cyanide	412H	100	mg/L
Free Cyanide	412H	200	mg/L

Table C-25. Continued

Parameter	Method	Standard Concentration	Units
Calcium	200.7	100	mg/L
Magnesium	200.7	100	mg/L
Potassium	200.7	50	mg/L
Sodium *	200.7	250	mg/L
Chloride	325.3	1522	mg/L

* Sodium analyzed by ICP for samples 3338-3341 upon approval of the Project QA Officer at Geraghty & Miller

SOILS AND SURFACE-WATER ANALYSIS

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LABORATORY BLANKS - INORGANICS ANALYSIS

EP Tox - Batch 1

Table C-1. QC Summary -- Laboratory Blanks

Matrix: Extract Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #	
Arsenic	2910-2914	200	<200	200.7	✓
Barium	2910-2914	200	<200	200.7	✓
Cadmium	2910-2914	50	<50	200.7	✓
Chromium	2910-2914	50	<50	200.7	✓
Lead	2910-2914	200	<200	200.7	✓
Mercury	2910-2914	0.30	<0.30	239.2	✓
Selenium	2910-2914	200	<200	200.7	✓
Silver	2910-2914	50	<50	200.7	✓

EP TOX Batch 2

EP TOX Batch 2

Table C-2. QC Summary -- Laboratory Blanks

Matrix: Filtrate Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #	
Arsenic	2915	200	<200	200.7	✓
Barium	2915	200	<200	200.7	✓
Cadmium	2915	50	<50	200.7	✓
Chromium	2915	50	<50	200.7	✓
Lead	2915	200	<200	200.7	✓
Mercury	2915	0.30	<0.30	239.2	✓
Selenium	2915	200	<200	200.7	✓
Silver	2915	50	<50	200.7	✓

INORGANIC PARAMETERS BATCH 1

Table C-5. QC Summary -- Laboratory Blanks

Matrix: Soil Units: mg/kg

Blank No. 1

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Arsenic	2910-2914	2.0	<2.0	206.2
Sodium	2910-2914;2916-2917	200	<200	273.1
Fluoride	2910-2914;2916-2917	1.0	<1.0	340.2
Sulfate	2910-2914	2.0	<2.0	300.0
Sulfate	2910-2914	5.0	<5.0	375.4
TotCyanide	2910-2914;2916-2917	0.50	<0.50	335.2
Free Cyanide	2910-2914;2916-2917	0.50	<0.50	412H

INORGANIC PARAMETERS

Table C-8. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Arsenic	2915	0.010	<0.010	206.2
Sodium	2915	1.0	<1.0	273.1
Fluoride	2915	1.6	<1.6	300.0
Fluoride	2915	1.0	<1.0	340.2
Sulfate	2915	2.0	<2.0	300.0
Sulfate	2915	5.0	<5.0	375.4
TotCyanide	2915	0.010	<0.010	335.2
Free Cyanide	2915	0.010	<0.010	412H

Table C-9. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Calcium	2925-2930	5.0	<5.0	200.7
Magnesium	2925-2930	5.0	<5.0	200.7
Potassium	2925-2930	10	<10	200.7
Sodium	2925-2930	1.0	<1.0	273.1
Chloride	2925-2930	52	<52	325.2
Fluoride	2925-2930	1.6	<1.6	300.0
Fluoride	2925-2930	1.0	<1.0	340.2
Sulfate	2925-2930	2.0	<2.0	300.0
Sulfate	2925-2930	5.0	<5.0	375.4
Alkalinity	2925-2930	10	<10	403

For Landfill Ditch Water Samples

INORGANIC PARAMETERS
Batch 3

Table C-12. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #	
Sodium	2933	1.0	<1.0	273.1	✓
Fluoride	2933	1.6	<1.6	300.0	✓
Fluoride	2933	1.0	<1.0	340.2	✓
TotCyanide	2933	0.010	<0.010	335.2	✓
FreeCyanide	2933	0.010	<0.010	412H	✓

INORGANIC Parameters
Batch 4

Table C-13. QC Summary -- Laboratory Blanks

Matrix: Soil Units: mg/kg

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #	
Sodium	2934-2942	200	<200	273.1	✓
Fluoride	2934-2942	1.0	<1.0	340.2	✓
TotCyanide	2934-2942	0.50	<0.50	335.2	✓
FreeCyanide	2934-2942	0.50	<0.50	412H	✓

INORGANIC PARAMETERS
BATCH 5

Table C-16. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Sodium	2988,2989,2992	1.0	<1.0	273.1
Fluoride	2988-2989	1.6	<1.6	300.0
Fluoride	2988-2989	1.0	<1.0	340.2
TotCyanide	2988,2989,2992	0.010	<0.010	335.2
FreeCyanide	2988,2989,2992	0.010	<0.010	412H

2988 - P.W. water
2989 -
2992 - SAFB -

Inorganic Parameters - Batch 6

Table C-19. QC Summary -- Laboratory Blanks

Matrix: Soil Units: mg/kg

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #	
Sodium	2990-2991;2993-2995	200	<200	273.1	✓
TotCyanide	2990-2991;2993-2995	0.50	<0.50	335.2	✓
FreeCyanide	2990-2991;2993-2995	0.50	<0.50	412H	✓

Table C-22. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Calcium	3338-3341	0.50	<0.50	200.7
Magnesium	3338-3341	0.50	<0.50	200.7
Potassium	3338-3341	1.00	<1.00	200.7
Sodium	3338-3341	1.00	<1.00	200.7
Chloride	3338-3341	1.1	<1.1	325.2
Fluoride	3338-3341	1.6	<1.6	300.0
Fluoride	3338-3341	1.0	<1.0	340.2
Sulfate	3338-3341	2.0	<2.0	300.0
Sulfate	3338-3341	5.0	<5.0	375.4
Alkalinity	3338-3341	5.0	<5.0	403
TotCyanide	3338-3341	0.010	<0.010	335.2
FreeCyanide	3338-3341	0.010	<0.010	412H

SOILS AND SURFACE-WATER ANALYSIS

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INITIAL AND CONTINUING CALIBRATION VERIFICATION

INORGANICS

Table C-26. Initial and Continuing Calibration Verification

Associated Samples (ESM ID RANGE): 2910-2914; 2916-2917 Units: mg/L Matrix: Soil

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Arsenic (b)	25	25.4	101	25	26.4	106
Arsenic (c)	25	25.4	101	25	24.1	97
Sodium	40	39.0	98	40	38.7	97
Fluoride(d)	1.0	1.05	105	100	99	99
Sulfate(e)	5.0	4.6	92	5.0	4.6	92
Sulfate(f)	5.0	4.5	90	5.0	5.0	100
Sulfate(g)	20	18	90	20	21	105
Sulfate(h)	20	20	100	20	19	95
Sulfate(i)	20	18	90	20	19	95

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 2910-2911
(c) Samples 2912-2914
(d) Method 340.2
(e) Method 300.0; samples 2910, 2914
(f) Method 300.0; samples 2911-2913
(g) Method 375.4; sample 2910
(h) Method 375.4; samples 2911-2913
(i) Method 375.4; sample 2914

Table C-27. Initial and Continuing Calibration Verification

Associated Samples (ESM ID RANGE): 2934-2942; 2990-2991; 2993-2994 Units: mg/L Matrix: Soil

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R		Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R	
Sodium (b)	40	39.7	99	✓	40	39.9	100	✓
Sodium (c)	40	39.0	98	✓	40	38.7	97	✓
Sodium (d)	40	39.7	99	✓	40	39.7	99	✓
Sodium (e)	40	39.0	98	✓	40	38.5	96	✓
Fluoride(f)	100	102	102	✓	100	98	98	✓
Fluoride(g)	50	50	100	✓	50	50	100	✓
Fluoride(h)	50	50	100	✓	50	50	100	✓

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 2934-2937
(c) Samples 2938-2939
(d) Samples 2940-2942; 2990
(e) Samples 2991; 2993-2995
(f) Samples 2934, 2939
(g) Samples 2935-2938
(h) Samples 2940-2942

Table C-28. Initial and Continuing Calibration Verification

Associated Samples (ESM ID RANGE): 2910-2915 Units: mg/L Matrix: Water

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration * %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration * %R	
Arsenic	2.0	2.0	100	2.0	1.95	98	✓
Barium	1.6	1.5	94	1.6	1.48	93	✓
Cadmium	0.70	0.66	94	0.70	0.68	97	✓
Chromium	1.25	1.22	97	1.25	1.25	100	✓
Lead	1.0	0.99	99	1.0	1.01	101	✓
Mercury	100	103	103	100	108	108	✓
Selenium	1.0	1.0	100	1.0	0.94	94	✓
Silver	1.0	0.91	91	1.0	0.92	92	✓

* %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%

Table C-29. Initial and Continuing Calibration Verification

Associated Samples (ESM ID RANGE): See below Units: mg/L Matrix: Water

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R	
Arsenic(b)	25	25.4	101	25	26.4	106	✓
Calcium(c)	50	51	102	50	51.6	103	
Calcium(d)	50	51	102	50	49.6	99	✓
Calcium(e)	10	9.97	100	10	9.97	100	✓
Calcium(f)	10	9.97	100	10	9.9	99	✓
Calcium(g)	10	9.97	100	10	10.1	101	✓
Magnesium(c)	50	51	102	50	51.7	103	
Magnesium(d)	50	51	102	50	49.8	100	✓
Magnesium(e)	10	10.5	105	10	10.3	103	✓
Magnesium(f)	10	10.5	105	10	10.1	101	✓
Magnesium(g)	10	10.5	105	10	10.5	105	✓
Potassium(h)	10	10.1	101	10	10.1	101	✓
Potassium(i)	10	9.8	98	10	10	100	✓
Potassium(g)	10	9.8	98	10	9.5	95	✓
Sodium(j)	40	39.7	99	40	39.9	100	✓
Sodium(k)	40	39.0	98	40	38.4	96	✓
Sodium(l)	40	39.4	98	40	39.1	98	✓
Sodium(m)	50	52.3	105	50	52.6	105	✓

Table C-29. Continued

Associated Samples See below (ESM ID RANGE): _____ Units: mg/L Matrix: Water

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R	
Fluoride (IC,b)	5.0	4.9	98	5.0	5.3	106	✓
Fluoride(n)	5.0	5.3	106	5.0	5.3	106	✓
Fluoride(o)	5.0	5.2	104	5.0	5.2	104	✓
Fluoride(p)	5.0	5.2	104	5.0	4.7	94	✓
Fluoride(q)	5.0	5.2	104	5.0	5.4	108	✓
Fluoride(r)	5.0	4.9	98	5.0	4.8	96	✓
Fluoride(m)	5.0	4.6	92	5.0	5.0	100	✓
Fluoride(f)	5.0	5.1	102	5.0	5.0	100	✓
Fluoride(ISE,s)	1.0	1.04	104	1.0	1.02	102	✓
Fluoride(k)	50	55	110	50	54	108	✓
Fluoride(t)	250	240	96	250	250	100	
Fluoride(m)	1.0	1.05	105	1.0	1.0	100	✓
Sulfate(IC,u)	5.0	5.0	100	5.0	5.5	110	✓
Sulfate(v)	5.0	5.0	100	5.0	5.5	110	✓
Sulfate(p)	5.0	5.3	106	5.0	5.3	106	✓
Sulfate(q)	5.0	4.8	96	5.0	5.1	102	✓
Sulfate(w)	5.0	5.1	102	5.0	5.1	102	✓
Sulfate(x)	5.0	5.1	102	5.0	5.0	100	✓
Sulfate(f)	5.0	4.9	98	5.0	4.7	94	✓

Table C-29. Continued

Associated Samples (ESM ID RANGE): See below Units: mg/L Matrix: Water

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Sulfate(y)	20	18	90 ✓	20	21	105 ✓
Sulfate(z)	20	18	90 ✓	20	21	105 ✓
Sulfate(f,x)	5.0	4.6	92 ✓	5.0	4.6	92 ✓
Sulfate(w)	5.0	4.6	92 ✓	5.0	4.7	94 ✓

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Sample 2915
(c) Samples 2925, 2929
(d) Samples 2927-2928
(e) Samples 3338-3339
(f) Sample 3340
(g) Sample 3341
(h) Samples 2925, 2927-2929
(i) Samples 3338-3340
(j) Samples 2915, 2933
(k) Samples 2925, 2927, 2929
(l) Samples 2988-2989, 2992
(m) Samples 3338-3341
(n) Samples 2925, 2988
(o) Sample 2927
(p) Sample 2929
(q) Samples 2928, 2930, 2933
(r) Sample 2989
(s) Samples 2915, 2928, 2930, 2933
(t) Samples 2988-2989
(u) Samples 2915, 2927
(v) Sample 2925
(w) Samples 3338, 3341
(x) Sample 3339
(y) Samples 2915, 2925, 2928, 2930
(z) Samples 2927, 2929

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ICP SERIAL DILUTIONS

INORGANICS

Table C-33. ICP Serial Dilutions

Matrix: Water Units: mg/L

Parameter	Control Limits	ESM Sample ID	Sample Result	Dilution Result	* %R
Potassium	90-110	2927	146	154	106
Magnesium	90-110	3338	<0.50	NA	NA
Calcium	90-110	3338	7.1	7.1	100
Potassium	90-110	3338(dup)	538	501	93
Sodium	90-110	3340	69,700	65,600	94

* %R = [(true value - amount found)/true value] x 100
No serial dilutions were performed for calcium and magnesium on the 2925-2929 batch due to low sample results.

SOILS AND SURFACE-WATER ANALYSIS

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LABORATORY DUPLICATES

INORGANICS/ORGANICS

EP TOX Both

Table C-3. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 2910-2915 (ESM ID RANGE) Matrix: Extract Units: ug/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
Arsenic	2914	200	<200	<200	NC(b) ✓
Barium	2914	200	<200	<200	NC ✓
Cadmium	2914	50	<50	<50	NC ✓
Chromium	2914	50	<50	<50	NC ✓
Lead	2914	200	<200	<200	NC ✓
Mercury	2914	0.30	<0.30	<0.30	NC ✓
Selenium	2914	200	<200	<200	NC ✓
Silver	2914	50	<50	<50	NC ✓

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL

Table C-6. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 2910-2914; 2916-2917 (ESM ID RANGE) Matrix: Soil Units: mg/kg

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
Arsenic	2913	2.0	<11	<11	NC(b)
Sodium	2916	200	29,600	30,700	4%
Fluoride	2916	1.0	673	673	0%
Fluoride (c)	2916	1.0	673	980	37%(d)
Sulfate	2913	500	3330	3660	9%
TotCyanide	2916	0.50	13.7	13.0	5%
FreeCyanide	2916	0.50	3.98	3.94	1%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL
(c) Leaching duplicate
(d) High RPD due to sample inhomogeneity

Table C-10. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 2925-2930 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
Calcium	2929	5.0	<5.0	<5.0	NC(b)
Magnesium	2929	5.0	<5.0	<5.0	NC
Potassium	2929	10	104	105	<1%
Sodium	2929	1.0	37,300	37,200	<1%
Chloride	2929	52	645	645	0%
Fluoride	2929	1.6	4650	4590	1%
Fluoride	2929	1.0	5750	5620	2%
Sulfate	2929	2.0	11,800	11,800	0%
Sulfate	2929	5.0	12,000	11,500	4%
Bicarbonate alkalinity	2929	10	16,000	15,500	3%
Carbonate alkalinity	2929	10	46,500	46,000	<1%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL

For Landfill Ditch Water Samples

Inorg. Batch 2

Table C-14. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 2934-2942 (ESM ID RANGE) Matrix: Soil Units: mg/kg

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
Sodium	2939	200	6690	6310	6%
Fluoride	2939	1.0	1330	1300	2%
Fluoride(b)	2939	1.0	1330	816	48%(c)
Tot Cyanide	2939	0.50	16.7	17.6	5%
FreeCyanide	2939	0.50	4.76	4.41	8%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) Leaching duplicate
(c) High RPD due to inhomogeneity of sample

PA H2O Batch

Table C-17. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 2988-2989 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	* Calc RPD
Sodium	2989	1.0	2550	2270	12%
Fluoride	2989	1.0	120	121	<1%

* RPD = (SR-DR)/[(SR+DR)/2] X 100

Table C-20. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 2990-2991; 2993-2995 (ESM ID RANGE) Matrix: Soil Units: mg/kg

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	Calc RPD *
Sodium	2995	200	10,900	11,900	9% ✓
TotCyanide	2995	0.50	19.2	18.9	2% ✓
FreeCyanide	2995	0.50	5.2	4.9	6% ✓

* RPD = (SR-DR)/[(SR+DR)/2] X 100

Table C-23. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3338-3341 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
Calcium	3338	5.00	7.10	6.74	5%
Magnesium	3338	5.00	<5.00	<5.00	NC(b)
Potassium	3338	10.0	606	538	12%
Sodium	3338	10.0	79,200	68,100	15%
Chloride	3338	1.0	3140	3237	3%
Fluoride	3338	1.6	8440	8420	<1%
Fluoride	3338	1.0	8000	7500	6%
Sulfate	3338	2.0	40,900	40,800	<1%
Sulfate	3338	5.0	30,800	32,000	4%
Bicarbonate alkalinity	3338	5.0	63,500	55,800	13%
Carbonate alkalinity	3338	5.0	76,500	75,000	2%
TotCyanide	3338	0.010	1090	989	9%
FreeCyanide	3338	0.010	77.2	74.5	4%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL

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MATRIX SPIKES - INORGANICS

Table C-4. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Extract Associated Samples (ESM ID RANGE): 2910-2915 Units: ug/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Arsenic	2914	75-125	481	0	500	96 ✓
Barium	2914	75-125	498	40	500	90 ✓
Cadmium	2914	75-125	453	0	500	91 ✓
Chromium	2914	75-125	467	0	500	93 ✓
Lead	2914	75-125	479	0	500	96 ✓
Mercury	2914	75-125	2.97	0	2.86	104 ✓
Selenium	2914	75-125	506	0	500	101 ✓
Silver	2914	75-125	428	0	500	86 ✓

* %R = [(SSR-SR)/SA] x

Table C-7. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Soil Associated Samples (ESM ID RANGE): 2910-2914; 2916-2917 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Arsenic	2910	75-125	0.060	0.025	0.040	87
Sodium	2910	75-125	47	5.2	40	105
Fluoride	2910	85-115	12.5	8.6	4.0	98
Sulfate(IC)	2910	85-115	19	9.9	10	91
Sulfate	2910	85-115	30	0.98	20	145(b)
TotCyanide	2910	75-125	0.868	0.399	0.400	117
FreeCyanide	2910	75-125	0.318	0.026	0.400	73(c)

(a) %R = [(SSR-SR)/SA] x 100
(b) High spike recovery due to matrix interferences
(c) Low spike recovery due to matrix interferences

Table C-11. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 2925-2930 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Chloride	2927	85-115	91.4	18.1	72.5	104
Fluoride(IC)	2927	85-115	13	3.2	10	98
Fluoride	2927	85-115	324	293	5.0	(b)
Sulfate(IC)	2927	85-115	12	2.4	10	96
Sulfate	2927	85-115	32	21	10	110

(a) %R = [(SSR-SR)/SA] x 100
(b) Sample concentration >4x SA, %R not calculated

For landfill ditch water samples

Table C-15. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Soil Associated Samples (ESM ID RANGE): 2935-2942 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Sodium	2934	75-125	64	26	40	96
Fluoride	2935	85-115	81	77	4.0	(b)
TotCyanide	2935	75-125	0.403	0.054	0.400	87
FreeCyanide	2935	75-125	0.418	0.011	0.400	102

(a) %R = [(SSR-SR)/SA] x 100
(b) Sample concentration >4x SA, %R not calculated

Table C-18. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 2988-2989 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Sodium	2989	75-125	43	26	20	88
Fluoride	2988	85-115	12	1.7	10	103
Fluoride	2988	85-115	118	108	10	(b)

(a) %R = [(SSR-SR)/SA] x 100
(b) Sample concentration >4x SA, %R not calculated

Table C-21. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Soil Associated Samples (ESM ID RANGE): 2990-2991; 2993-2995 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Sodium	2990	75-125	65	26	40	96
TotCyanide	2990	75-125	0.509	0.299	0.016	(b)
FreeCyanide	2990	75-125	0.521	0.326	0.400	49(c)

(a) %R = [(SSR-SR)/SA] x 100
(b) Sample concentration >4x SA, %R not calculated
(c) Low spike recovery due to matrix interferences

Table C-24. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3338-3341 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Calcium	3340	75-125	18.0	0.25	20	89
Magnesium	3340	75-125	17.2	0.16	20	85
Potassium	3340	75-125	33.1	13.5	20	98
Sodium	3340	75-125	206	109	100	97
Chloride	3340	75-125	72.5	6.0	71.5	92
Fluoride	3340	85-115	12.7	1.7	10	110
Fluoride	3340	75-125	320	270	50	(b)
Sulfate	3340	85-115	14.3	4.8	10	95
Sulfate	3340	75-125	33.2	16.0	20	86
TotCyanide	3340	75-125	0.293	0.299	0.080	0(c)
FreeCyanide	3340	75-125	0.176	0.0547	0.160	76

(a) %R = [(SSR-SR)/SA] x 100
(b) Sample concentration >4x SA, %R not calculated
(c) Low spike recovery due to matrix interferences

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LABORATORY CONTROL SAMPLE (LCS)

INORGANICS

Table C-31. QC Summary -- Laboratory Control Sample -

Matrix: ~~Soil~~ Water Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	True Value	Amount Found	* %R	
TotCyanide	2910-2914, 2916	10	400	426	106	✓
TotCyanide	2917	10	100	89	89	✓
TotCyanide	2934-2938, 2940	10	400	372	93	✓
TotCyanide	2939, 2941-2942	10	400	345	86	✓
TotCyanide	2990-2991,2994-2995	10	400	369	92	✓
TotCyanide	2993	10	400	353	88	✓
FreeCyanide	2910-2914,2916-2917	10	100	87	87	✓
FreeCyanide	2934-2935,2939-2940	10	400	404	101	✓
FreeCyanide	2936	10	400	378	94	✓
FreeCyanide	2937-2938,2941-2942	10	400	364	91	✓
FreeCyanide	2990	10	400	327	82	✓
FreeCyanide	2991, 2993-2995	10	400	350	88	✓

* %R = [(true value - amount found)/true value] x 100
Control limits = 80-120%

Table C-32. QC Summary -- Laboratory Control Sample

Matrix: Water Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	True Value	Amount Found	* %R	
TotCyanide	2915	10	100	89	89	✓
TotCyanide	2933	10	400	372	93	✓
TotCyanide	2988-2989, 2992	10	400	352	88	✓
TotCyanide	3338-3341	10	400	376	94	✓
FreeCyanide	2915	10	100	89	89	✓
FreeCyanide	2933	10	400	378	94	
FreeCyanide	2988-2989, 2992	10	400	368	92	✓
FreeCyanide	3338-3341	10	400	374	94	✓
Sodium	2925-2930,2988-2989	1000	50,000	48,700	97	✓
Sodium	3338-3341	1000	50,000	53,800	108	✓

* %R = [(true value - amount found)/true value] x 100
Control limits = 80-120%

Table C-30. Laboratory Control Samples.

Matrix: Soil and Water Units: ug/L

Parameter	Control Limits	Associated Samples (ESM ID RANGE)	True Value	Amount Found	* %R	
TotCyanide	80-120	2910-2914; 2916	400	409	102	✓
TotCyanide	80-120	2917	50	50	100	✓
TotCyanide	80-120	2933-2938	50	45	90	✓
TotCyanide	80-120	2939-2942	400	412	103	✓
TotCyanide	80-120	2988-2993	400	398	99	✓
TotCyanide	80-120	2994-2995	400	398	99	✓
TotCyanide	80-120	3338-3341	200	212	106	✓
FreeCyanide	80-120	2910-2917	50	50	100	✓
FreeCyanide	80-120	2933, 2936	50	45	90	✓
FreeCyanide	80-120	2934-2935	200	203	102	✓
FreeCyanide	80-120	2937-2938,2940-2942	400	361	90	✓
FreeCyanide	80-120	2939	200	203	102	✓
FreeCyanide	80-120	2988-2993	400	406	102	✓
FreeCyanide	80-120	2994-2995	400	391	98	✓
FreeCyanide	80-120	3338-3339, 3341	200	212	106	✓
FreeCyanide	80-120	3340	200	190	95	✓
Chloride	80-120	2925-2930	886	903	102	✓
Chloride	80-120	3338-3341	886	813	92	✓
Alkalinity	80-120	2925-2930	2500	2350	94	✓
Alkalinity	80-120	3338-3341	2500	2400	96	✓

* %R = [(true value - amount found)/true value] x 100
Control limits = 80-120%

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POST DIGESTION SPIKE RECOVERIES

Table C-34. QC Summary--Spike Recoveries (Post Digestion)

Matrix: Soil Associated Samples (ESM ID RANGE): 2910-2914 Units: ug/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Arsenic	2910	85-115	26.9	5.1	20	109
Arsenic	2911	85-115	26.5	5.5	20	105
Arsenic	2912	85-115	39.9	18.6	20	106
Arsenic	2913	85-115	25.2	4.3	20	104
Arsenic	2914	85-115	23.1	3.4	20	98

* %R = [(SSR-SR)/SA] x 100

Table C-35. QC Summary--Spike Recoveries (Post Digestion)

Matrix: Water Associated Samples (ESM ID RANGE): 2915 Units: ug/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Arsenic	2915	85-115	22.0	0	20	110

* %R = [(SSR-SR)/SA] x 100

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FIELD REPLICATE DATA COMPARISON

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FIELD REPLICATE DATA COMPARISON
MARTIN MARIETTA - THE DALLES
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	Parameter	Sample	Replicate	RPD %	Sample	Replicate	RPD %
Sample ID:		LRBSC	Soil Rep1E		PHASC	Soil Rep2	
Lab ID:		2911	2913		2916	2917	
Matrix:		Soil	Soil		Soil	Soil	
	Total Cyanide	7.4	3.8	64.2	14	16	13.3
	Free Cyanide	0.80	0.68	16.2	4.0	4.8	18.2
	Fluoride	1830	1510	19.2	673	898	28.6
	*Sulfate	3440	3330	3.2			
	Sodium	12400	11600	6.7	29,600	28,600	3.4
	Arsenic	<11	<11	NC			
	EP Tox Metals	BDL	BDL	NC			
	% Solids	93	93	0			
	B/N				see attached		
Sample ID:		MDASG	Soil Rep3R		BRASC	Soil Rep4R	
Lab ID:		2935	2947		2934	2942	
Matrix:		Soil	Soil		Soil	Soil	
	Total Cyanide	1.5	2.3	42.1	17	26	41.2
	Free Cyanide	<0.52	<0.52	NC	17	12	34.4
	Fluoride	856	7.4	18.1	808	869	7.3
	Sulfate						
	Sodium	49,800	50,000	0.4	51,800	36,4000	34.9
	Arsenic						
	EP Tox Metals						
	% Solids						
	B/N						

Observations and Conclusions:

High relative percent differences (RPD) are common in soil sample replicates because of sample differences. Generally all samples show good agreement and do not invalidate data.

Field Replicate Data Comparison (continued)

Parameter	Sample	Replicate	RPD %
Sample ID:	PHASCS	Soil Rep2	
Lab ID:	2916	2917	
Base/Neutral Extractables:			
Acenaphthene	114,000	91,300	22.1
Benzo(a)Anthracene	989,000	820,000	18.7
Benzo(a)Tyrene	778,000	585,000	28.3
Benzo(b&k)Fluoranthenes	1.8×10^6	1.5×10^6	18.2
Benzo(g,h,i)Perylene	466,000	700,000	40.1
Chrysene	872,000	815,000	6.6
Dibenz(a,h)anthracene	274,000	451,000	48.8
Fluoranthene	1.6×10^6	1.2×10^6	28.6
Indeno(1,2,3-ch)Pyrene	559,000	444,000	22.9
Phenanthrene	696,000	553,000	22.9
Pyrene	893,000	783,000	13.1
			270.3
			Average RPD=24.6%

Observations and Conclusions:

High relative percent differences (RPD) are common in soil sample replicates because of intrinsic sample differences. However, both samples above show good agreement and the average RPD is acceptable.

Field Replicate Data Comparison (continued)

Parameter	Sample	Replicate	RPD %
Sample ID:	LDGWG	DLSW Rep1E	
Lab ID:	2929	2925	
Matrix:	Surface Water	Surface Water	
Sodium	37.3×10^6	37.6×10^6	0.8%
Fluoride (ISE)	5,750	5,400	6.2
Sulfate (Turb)	12,000	11,000	8.7
Total Cyanide	NT[1/]	NT	---
Free Cyanide	NT	NT	---[2/]
Calcium	<5,000	<5,000	NC
Magnesium	<5,000	<5,000	NC
Potassium	104,000	98,200	5.7
Chloride	645	748	14.8
Bicarbonate	16,000	15,000	6.5
Carbonate	46,500	47,500	2.1
Volatile Organics	BDL	BDL[3/]	NC
B/N/A	see attached		
Sample ID:	<DBWG Repeat	DLSW-Rep1E	Repeat
Lab ID:	3338	3339	
Matrix:	Surface Water	Surface Water	
Sodium	79.2×10^6	99.8×10^6	23.0
Fluoride (ISE)	8,000	7,750	3.2
Sulfate (Turb)	39,900	42,300	5.8
Total Cyanide	1.09×10^6	1.28×10^6	16.0
Free Cyanide	77,200	59,700	25.6
Calcium	7,100	16,400	79.1
Magnesium	<5,000	<5,000	NC
Potassium	606,000	798,000	27.3
Chloride	3,140	3,430	8.8
Bicarbonate	63,500	36,000	55.2
Carbonate	76,500	73,000	4.7
Volatile Organics	BDL	BDL	NC
B/N/A	BDL	BDL	NC

[1/] NT = Not tested because holding times were exceeded
[2/] BDL = Below detection limit
[3/] NC = RPD not calculated

Observations and Conclusions:

High RPD are common in soil sample replicates because of intrinsic sample differences.

Field Replicate Data Comparison (continued)

Parameter	Sample	Sample	Replicate	RPD %
Sample ID:	LDAWG	LDBWG	DLSW-Rep1E	
Lab ID:	2927	2929	2925	
Matrix:	Surface Water	Surface Water	Surface Water	
Base/Neutral Extractables				
Units	ug/L	ug/L	ug/L	
Benzo(b&k) Fluoranthenes	23	<20	41	56.2
Chrysene	24	<2025	4.0	
Bis (2 ethylhexyl) phthalate	77	<20	64	18.4
Fluoranthene	<20	28	<20	---
Pyrene	21	<20	32	41.5
Benzo(a)anthracene	<20	<20	25	---

Obervations and Conclusions:

(1) Replicate sample DLSW-Rep1E is supposed to be a replicate of LDGWG. However, the data comparison is more favorable for LDAWG. This suggests a misidentification occurred. Review of other parameters suggests this error only occurred in the extraction laboratory. (See Laboratory Data Validation)

(2) The daily lab extraction blank (BLK0625W) showed 43ppb of Bis (2 ethylhexyl) phthalate suggesting LDAWG and DLSW Rep1E may have also been contaminated with this compound during extraction. (See Laboratory Data Validation)

(3) RPD is between LDAWG and DLSW - Rep1E.

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LABORATORY DATA VALIDATION OF ANAYTICAL DATA FOR GROUND-WATER SAMPLES COLLECTED BETWEEN 27 JULY AND 1 SEPTEMBER 1987 AT MARTIN MARIETTA ALUMINUM REDUCTION PLANT THE DALLES, OREGON

REPORT SUMMARY

This report presents analytical data for groundwater and surface water samples collected at the Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon as part of the remedial investigation/feasibility study work plan being conducted by Geraghty & Miller, Inc., July through September 1987. Versar, Inc., ESM Operations Environmental Chemistry Laboratory performed the work presented in this report according to the "Task Order for Laboratory Services No. 901-999-701" (Contract No. 87-ETMF-002 with Martin Marietta Corporation).

Quality control protocols specified in Task Order 901-999-701 were adhered to and results are presented in the following tables. EPA-CLP quality control limits were employed for the respective methods. Laboratory levels of quantitation are also listed. All sample holding times were met.

QUALITY ASSURANCE SUMMARY

1. Due to difficulties during analysis of samples 3458-3465 for chloride using EPA Method 325.3 (titrimetric), the results reported in the data and QC tables are those collected using EPA Method 300.0 (Ion chromatograph).

2. Quality control outliers (i.e., percent recoveries for spikes and relative percent difference (RPD) for duplicates) due to matrix interferences were found for the samples listed below. Most QC outliers have been verified by reanalysis; the persistent QC outlier indicates matrix interferences.

Parameter	Associated Samples	QC Outlier
Free cyanide	3311-3314	Low spike recovery
Total cyanide	3315-3320	High RPD
Total cyanide	3334-3337	Low spike recovery
Fluoride (IC)	3458-3465	High spike recovery
Sulfate (IC)	3458-3465	Low spike recovery
Total cyanide	3567-3577	Low spike recovery

3. The Level of Quantitation (LOQ) for chloride (using EPA Method 325.3) varies with the normality of the titrant. A new LOQ is established when a new titrant is prepared and standardized.

Ground Water Analysis
July - September 1987

Sample Master List

Table 1. List of samples received between 29 July and 2 September 1987 and corresponding laboratory tracking numbers

Martin Marietta The Dalles Sample ID		Versar, Inc. ESM Operations	
		Lab ID(a)	Lab ID(b)
MWR-8B	7/27/87	870729-008	3311
MWR-8A	7/28/87	870729-009	3312
MWR-8A-FB	7/28/87	870729-010	3313
MWRep-4	7/28/87	870729-011	3314
MWR-6B	7/28/87	870730-001	3315
MW-12A	7/28/87	870730-002	3316
MWRep-3	7/28/87	870730-003	3317
MW-18A	7/29/87	870730-004	3318
MW-12B	7/29/87	870730-005	3319
MW-12B-FB	7/29/87	870730-006	3320
MW-13A	7/29/87	870731-001	3327
MW-13B	7/30/87	870731-002	3328
MW-14A	7/29/87	870731-003	3329
MW-14B	7/29/87	870731-004	3330
MW-17S	7/30/87	870731-005	3331
MW-19S	7/30/87	870731-006	3332
MWRep-7	7/30/87	870731-007	3333
MW-20S	7/30/87	870803-001	3334
MW-23S	7/31/87	870803-002	3335
MW-26S	7/31/87	870803-003	3336
MWRep 8	7/30/87	870803-004	3337
CCSWG-1	8/2/87	870804-012	3342
MW-4S	8/2/87	870804-013	3343
MW-22S	8/2/87	870804-014	3344
MWRep-9	8/2/87	870804-015	3345
MW-8S	8/3/87	870805-001	3458
MW-24S	8/3/87	870805-002	3459
MW-24S-FB	8/3/87	870805-003	3460
MWRep-5	8/4/87	870805-004	3461
MW-9S	8/4/87	870805-005	3462
MWR-9A	8/4/87	870805-006	3463
MW-15S	8/3/87	870805-007	3464
MW-27S	8/3/87	870805-008	3465

(a)Used for inorganics data tables.
(b)Used for organic data tables and all QC tables.

able 1. Continued

Martin Marietta The Dalles Sample ID		Versar, Inc. ESM Operations Lab ID(a)	Lab ID(b)
MW-24A	8/12/87	870817-001	3617
MW-6AA	8/12/87	870817-002	3618
MW-6AA-FB	8/12/87	870817-003	3619
Chenowith #1	8/13/87	870817-004	3620
Chenowith #3	8/13/87	870817-005	3621
MWR-3B	8/13/87	870817-006	3622
MW-4B	8/13/87	870817-007	3623
MWRep-1	8/16/87	870818-003	3626
MWR-7B	8/16/87	870818-004	3627
MW-18B	8/17/87	870818-005	3628
MW-18B-FB	8/17/87	870818-006	3629
MWR-1A	8/16/87	870818-007	3630
MWR-2B	8/16/87	870818-008	3631
MWR-2A	8/15/87	870818-009	3632
MWR-9B	8/15/87	870818-010	3633
MWR-1B	8/17/87	870820-001	3648
MW-26B	8/20/87	870825-001	3666
Trip Blank #1	6/12/87	870825-002	3661
Residence	8/19/87	870825-003	3668
MWRep-15	8/19/87	870825-004	3669
MW-16B	8/23/87	870825-008	3673
MW-32S	8/24/87	870825-009	3674
MWRep-16	8/24/87	870825-010	3675
MW-15S	8/20/87	870825-011	3676
MW-30S	8/24/87	870827-001	3684
CCSWG-2	8/24/87	870827-002	3685
MW-33A	8/24/87	870827-003	3686
MW-33B	8/24/87	870827-004	3687
MW-34B	8/25/87	870827-005	3688
CRSWG-1	8/25/87	870827-006	3689
MW-27B	8/26/87	870831-001	3690
MW-27B-FB	8/26/87	870831-002	3691
MW-34A	8/27/87	870831-003	3692
MW-8B Pump Test	8/27/87	870831-004	3693
MW-31S	8/27/87	870831-026	3715
Replicate	8/27/87	870831-027	3716
Leachate	8/27/87	870831-028	3717
MWR-8B Pump Test	8/29/87	870901-025	3742
MWR-8B Pump Test	8/30/87	870901-026	3743
Hold Tank	9/1/87	870902-001	3744

Table 1. Continued

Martin Marietta The Dalles Sample ID		Versar, Inc. ESM Operations Lab ID(a)	Lab ID(b)
MW-2S	8/4/87	870806-019	3482
MW-2S-FB	8/4/87	870806-020	3483
MWR-7A	8/5/87	870806-021	3484
MW-21S	8/5/87	870807-001	3485
MW-20A	8/5/87	870807-002	3486
MW-20A-FB	8/5/87	870807-003	3487
Trip Blank #3	6/12/87	870807-004	3488
MW-21S-FB	8/5/87	870810-018	3527
MW-10A	8/6/87	870810-019	3528
Rec Well	8/6/87	870810-020	3529
MW-5A	8/7/87	870810-021	3530
MW-28S	8/7/87	870810-022	3531
MWRep-10	8/8/87	870811-001	3532
MW-3S-FB	8/9/87	870811-002	3533
MWRep-2	8/9/87	870811-003	3534
MW-3S	8/9/87	870811-004	3535
MW-5S	8/9/87	870811-005	3536
MWR-4A	8/9/87	870811-006	3537
MW-4A-FB	8/9/87	870811-007	3538
MW-11D	8/8/87	870811-008	3539
MW-18S	8/8/87	870811-009	3540
MWR-3A	8/9/87	870811-010	3541
MW-25S	8/8/87	870811-011	3542
MW-29S	8/8/87	870811-012	3543
MWRep-6	8/8/87	870811-013	3544
PW-3	8/11/87	870812-023	3567
PW-4	8/11/87	870812-024	3568
MWRep-11	8/11/87	870812-025	3569
PW-4-FB	8/11/87	870812-026	3570
MW-26A	8/10/87	870812-027	3571
MW-27A	8/10/87	870812-028	3572
MW-16A-FB	8/11/87	870812-029	3573
MWRep-14	8/11/87	870812-030	3574
PW-1	8/11/87	870812-031	3575
MW-16A	8/11/87	870812-032	3576
MW-16D	8/11/87	870812-033	3577
AS-FB	8/11/87	870813-007	3584
MWRep-12	8/11/87	870813-008	3585
MW-15A	8/11/87	870813-009	3586
MW-15B	8/11/87	870813-010	3587
Animal Shelter	8/11/87	870813-011	3588
Rockline	8/11/87	870813-012	3589
Mt. Fir Lumber	8/11/87	870813-013	3590
Klindt	8/11/87	870813-014	3591

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LABORATORY DATA VALIDATION SUMMARY
MARTIN MARIETTA - THE DALLES
QUALITY ASSURANCE REVIEW
GROUND WATER
SAMPLES COLLECTED
JULY-SEPTEMBER 1987

DATA QUALIFIERS

Qualifier	Batch	Sample	Lab ID	Parameter	Explanation
J	A	MWR-8B	3311	Free Cyanide	Matrix Spike recovery too
J		MWR-8A	3312		low but >30%. Data biased
UJ		MWR-8A-FB	3313		low
J		MW REP4	3314		
J	B	MWR-6B	3315	Total Cyanide	Lab Duplicate - high RPD but
J		MW-12A	3316		<35%
J		MW-Rep3	3317		
J		MW-18A	3318		
J		MW-12B	3319		
J		MW-12B-FB	3320		
J	C	MW-13A	3327	Sulfate	ICVS/CCVS - too low but
J		MW-13B	3328	(Turbidimetric)	>50% - Data biased low
J		MW-14A	3329		
J		MW-14B	3330		
J		MW-17S	3331		
J		MW-19S	3332		
J		MW-Rep7	3333		
UJ	D	MW-20S	3334	Total Cyanide	Matrix Spike - % R too low
J		MW-23S	3335		but >30%. Data biased low
UJ		MW-26S	3336		
J		MW-Rep8	3337		
J	D	MW-20S	3334	Sulfate	ICVS/CCVS - too low but
J		MW-23S	3335		>50%. Data biased low
J		MW-26S	3336		
J		MW-Rep8	3337		
J	E	CCSWG-1	3342	Sulfate	ICVS/CCVS - too low but >50%.
J		MW-45	3343		Data biased low
J		MW-22S	3344		
J		MW-Rep9	3345		

Data Qualifiers (continued)

Qualifier	Batch	Sample	Lab ID	Parameter	Explanation
UJ	J	PW-3	3567	Total Cyanide	Matrix Spike % R too low but
UJ		PW-4	3568		>30%. Data biased low
UJ		MW-Rep11	3569		
UJ		PW4-FB	3570		
J		MW-26A	3571		
J		MW-27A	3572		
UJ		MW-16AFB	3573		
J		MW-Rep14	3574		
UJ		PW-1	3575		
J		MW-16A	3576		
UJ		MW-16D	3577		
J	M	MWR-3B	3622	Total Cyanide	Lab Duplicate - high RPD but
J		MW-4B	3623		<35%
J		MW-Rep1	3626		
J		MWR-7B	3627		
J		MW-18B	3628		
J		MW-18B-FB	3629		
J		MWR-1A	3630		
J		MWR-2B	3631		
J		MWR-2A	3632		
J		MWR-9B	3633		

Ground Water Analysis
July - September 1987

Methods of Analysis

and

Levels of Quantitation

LEVELS OF QUANTITATION
FOR
INORGANIC ANALYSIS

The Levels of Quantitation (LOQ) for inorganic analyses were determined using the procedure specified in "Principles of Environmental Analysis" Analytical Chemistry, Volume 55, Pages 2210-2218, December 1983. The actual LOQs for each sample will vary depending on sample size, required dilutions, sample matrix, etc.

VERSAR INC., ESM OPERATIONS
LEVELS OF QUANTITATION

Parameter	Method	LEVEL OF QUANTITATION WATER (mg/L)
Total Cyanide	335.2	0.010
Free Cyanide	412H(1)	0.010
Fluoride	300.0	1.6
Fluoride	340.2	1.0
Sulfate	375.4	5.0
Sulfate	300.0	2.0
Chloride	325.3	0.29(1)
Carbonate	403(2)	1.0
Bicarbonate	403	1.0
Sodium(tot)	200.7	1.0
Sodium(diss)	200.7	1.0
Calcium(diss)	200.7	0.50
Magnesium(diss)	200.7	0.50
Potassium(diss)	200.7	1.0

(1) LOQ for chloride varies with the normality of the titrant.
(2) Standard Methods

LEVELS OF QUANTITATION
FOR
ORGANIC ANALYSIS

The Levels of Quantitation (LOQ) for the organic analyses were determined using the procedure specified in the USEPA Contract Laboratory Program Statement of Work, 7/85 Revision Page A-4, paragraph c.

This method requires the analysis of each compound in triplicate at a level equivalent to 3 to 5 times the Contract Required Detection Limit (now called the Contract Required Quantitation Level). The actual LOQs for each sample may vary, however, dependent on how much sample was extracted or analyzed, required dilutions, sample matrix, etc.

Table D-2. Levels of quantitation for base/neutral acid extractables in an aqueous matrix

	MATRIX:	WATER
	UNITS:	UG/L
COMPOUNDS		
Acenaphthalene		10
Acenaphthene		10
Anthracene		10
Benzidine		80
Benzo(a)Anthracene		10
Benzo(a)Pyrene		10
Benzo(b+k)fluoranthenes		10
Benzo(g,h,i)Perylene		10
4-Bromophenyl-phenylether		10
Butylbenzylphthalate		10
4-Chloro-3-Methylphenol		10
bis(2-Chloroethoxy)Methane		10
bis(2-Chloroethyl)Ether		10
bis(2-Chloroisopropyl)Ether		10
2-Chloronaphthalene		10
2-Chlorophenol		10
4-Chlorophenyl-phenylether		10
Chrysene		10
Di-n-Butylphthalate		10
Di-n-Octyl Phthalate		10
Dibenz(a,h)Anthracene		10
1,2-Dichlorobenzene		10
1,4-Dichlorobenzene		10
1,3-Dichlorobenzene		10
3,3'-Dichlorobenzidine		20
2,4-Dichlorophenol		10
Diethylphthalate		10
Dimethyl Phthalate		10
2,4-Dimethylphenol		10
4,6-Dinitro-2-Methylphenol		50
2,4-Dinitrophenol		50
2,4-Dinitrotoluene		10
2,6-Dinitrotoluene		10
1,2-Diphenylhydrazine		10
bis(2-Ethylhexyl)Phthalate		10
Fluoranthene		10

Table D-2. Continued

COMPOUNDS	MATRIX: WATER UNITS: UG/L
Fluorene	10
Hexachlorobenzene	10
Hexachlorobutadiene	10
Hexachlorocyclopentadiene	10
Hexachloroethane	10
Indeno(1,2,3-cd)Pyrene	10
Isophorone	10
N-Nitroso-Di-n-Propylamine	10
N-Nitrosodimethylamine	5
N-Nitrosodiphenylamine	10
Naphthalene	10
Nitrobenzene	10
4-Nitrophenol	50
2-Nitrophenol	10
Pentachlorophenol	50
Phenanthrene	10
Phenol	10
Pyrene	10
1,2,4-Trichlorobenzene	10
2,4,6-Trichlorophenol	10

LABORATORY DATA VALIDATION

Note: Any data qualifier codes determined from this validation are listed in the Data Qualifier Table for this section.

Laboratory Data Validation
Martin Marietta - The Dalles
Quality Assurance Review
Ground Water Samples Collected
July - September 1987

Holding Times

Parameters:

VOCs	N	B/N	A	Acids	A	PCBs	N
Chloride	A	T. Cyanide	A	F. Cyanide	A		
Fluoride	A	Sulfate	A	Sodium	A		
Arsenic	A	Calcium	A	Magnesium	A		
Potassium	A	Carbonate	A	Bicarbonate	A		

Criteria:

A - Acceptable: All QAPP and 40 CFR 136 specified holding times met;

P - Provisional: Some QAPP and 40 CFR 136 specified holding times met;

U - Unacceptable: All holding times exceeded;

N - Not applicable.

Remarks:

All samples prepared/extracted and analyzed within required holding times.

Table B-64.

VERSAR INC., ESM OPERATIONS
SAMPLE HOLDING TIME SUMMARY

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES: COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	HOLDING TIME REQUIREMENT
Chloride	3311-3314	water	7/27-28/87	7-29-87	NA	8-12-87	28 days
Chloride	3315-3320	water	7/28-29/87	7-30-87	NA	8-12-87	28 days
Chloride	3327-3333	water	7/29-30/87	8-3-87	NA	8-25-87	28 days
Chloride	3334-3337	water	7-30-87	8-3-87	NA	8-25-87	28 days
Chloride	3342-3345	water	8-2-87	8-4-87	NA	8-25-87	28 days
Chloride	3458-3465	water	8/3-4/87	8-5-87	NA	8/19-20/87	28 days
Chloride	3482-3488	water	8/4-5/87	8/6-7/87	NA	9-1-87	28 days
Chloride	3527-3531	water	8/5-7/87	8-10-87	NA	9-1-87	28 days
Chloride	3532-3544	water	8/8-9/87	8-11-87	NA	9-1-87	28 days
Chloride	3567-3577	water	8/10-11/87	8-12-87	NA	9-1-87	28 days
Chloride	3584-3591	water	8-11-87	8-13-87	NA	9-8-87	28 days
Chloride	3617-3621	water	8/12-13/87	8-14-87	NA	9-8-87	28 days
Chloride	3622-3623	water	8-13-87	8-17-87	NA	9-8-87	28 days
Chloride	3626-3633	water	8/15-17/87	8-18-87	NA	9-8-87	28 days
Chloride	3648,3666-3668	water	8/17-20/87	8/20,24/87	NA	9-8-87	28 days
Chloride	3673-3675	water	8/23-24/87	8-25-87	NA	9-8-87	28 days
Chloride	3684-3689	water	8/24-25/87	8-27-87	NA	9-8-87	28 days
Chloride	3690-3693,3715	water	8/26-27/87	8-31-87	NA	9-8-87	28 days
Chloride	3742-3743	water	8/29-30/87	9-1-87	NA	9-8-87	28 days

NA= Not applicable

Table B-65.

VERSAR INC., ESM OPERATIONS
SAMPLE HOLDING TIME SUMMARY

PARAMETER	SAMPLE ESH ID	SAMPLE MATRIX	SAMPLE DATES: COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	HOLDING TIME REQUIREMENT
Total Cyanide	3311-3314	water	7/27-28/87	7-29-87	7-31-87	8/5,8/87	14 days
Total Cyanide	3315-3320	water	7/28-29/87	7-30-87	7/31;8-4-87	8/5,8/87	14 days
Total Cyanide	3327-3333	water	7/29-30/87	8-3-87	8/8,12/87	8/12-13/87	14 days
Total Cyanide	3334-3337	water	7-30-87	8-3-87	8-12-87	8-13-87	14 days
Total Cyanide	3342-3345	water	8-2-87	8-4-87	8-13-87	8-14-87	14 days
Total Cyanide	3458-3465	water	8/3-4/87	8-5-87	8-15-87	8-17-87	14 days
Total Cyanide	3482-3488	water	8/4-5/87	8/6-7/87	8/16-17/87	8/17,19/87	14 days
Total Cyanide	3527-3531	water	8/5-7/87	8-10-87	8/17-18/87	8/19-20/87	14 days
Total Cyanide	3532-3544	water	8/8-9/87	8-11-87	8/18-20/87	8/20,22/87	14 days
Total Cyanide	3567-3577	water	8/10-11/87	8-12-87	8/20-22/87	8/22-25/87	14 days
Total Cyanide	3584-3591	water	8-11-87	8-13-87	8/22,25/87	8-25-87	14 days
Total Cyanide	3617-3621	water	8/12-13/87	8-14-87	8-26-87	8-26-87	14 days
Total Cyanide	3622-3623	water	8-13-87	8-17-87	8/26-27/87	8/26-27/87	14 days
Total Cyanide	3626-3633	water	8/15-17/87	8-18-87	8/26-27/87	8/26-28/87	14 days
Total Cyanide	3648,3666-3668	water	8/17-20/87	8/20,24/87	8/28,31/87	8-28;9-1-87	14 days
Total Cyanide	3673-3675	water	8/23-24/87	8-25-87	8-31-87	9-1-87	14 days
Total Cyanide	3684-3689	water	8/24-25/87	8-27-87	9-1-87	9-4-87	14 days
Total Cyanide	3690-3693,3715	water	8/26-27/87	8-31-87	9-8-87	9-9-87	14 days
Total Cyanide	3742-3743	water	8/29-30/87	9-1-87	9-11-87	9-11-87	14 days

NA= Not applicable

Table B-66.

VERSAR INC., ESM OPERATIONS
SAMPLE HOLDING TIME SUMMARY

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES: COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	HOLDING TIME REQUIREMENT
Free Cyanide	3311-3314	water	7/27-28/87	7-29-87	8-4-87	8-11-87	14 days
Free Cyanide	3315-3320	water	7/28-29/87	7-30-87	8/4-5/87	8-5-87	14 days
Free Cyanide	3327-3333	water	7/29-30/87	8-3-87	8-11-87	8-12-87	14 days
Free Cyanide	3334-3337	water	7-30-87	8-3-87	8-12-87	8-13-87	14 days
Free Cyanide	3342-3345	water	8-2-87	8-4-87	8-14-87	8-16-87	14 days
Free Cyanide	3458-3465	water	8/3-4/87	8-5-87	8/15-16/87	8-17-87	14 days
Free Cyanide	3482-3488	water	8/4-5/87	8/6-7/87	8/16-17/87	8/17,19/87	14 days
Free Cyanide	3527-3531	water	8/5-7/87	8-10-87	8/18-18/87	8/19-20/87	14 days
Free Cyanide	3532-3544	water	8/8-9/87	8-11-87	8/18-20/87	8/20,22/87	14 days
Free Cyanide	3567-3577	water	8/10-11/87	8-12-87	8/20-22/87	8/22-25/87	14 days
Free Cyanide	3584-3591	water	8-11-87	8-13-87	8/22-25/87	8-25-87	14 days
Free Cyanide	3617-3621	water	8/12-13/87	8-14-87	8-26-87	8-26-87	14 days
Free Cyanide	3622-3623	water	8-13-87	8-17-87	8/26-27/87	8/26-27/87	14 days
Free Cyanide	3626-3633	water	8/15-17/87	8-18-87	8/26-27/87	8/26-28/87	14 days
Free Cyanide	3648,3666-3668	water	8/17-20/87	8/20,24/87	8/28,31/87	8-28;9-1-87	14 days
Free Cyanide	3673-3675	water	8/23-24/87	8-25-87	8-31-87	9-1-87	14 days
Free Cyanide	3684-3689	water	8/24-25/87	8-27-87	9-4-87	9-4-87	14 days
Free Cyanide	3690-3693,3715	water	8/26-27/87	8-31-87	9-9-87	9-9-87	14 days
Free Cyanide	3742-3743	water	8/29-30/87	9-1-87	9-11-87	9-11-87	14 days

NA= Not applicable

Table B-67.

VERSAR INC., ESM OPERATIONS
SAMPLE HOLDING TIME SUMMARY

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES: COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	HOLDING TIME REQUIREMENT
Fluoride (IC)	3311-3314	water	7/27-28/87	7-29-87	NA	8-10-87	28 days
Fluoride (IC)	3315-3320	water	7/28-29/87	7-30-87	NA	8-11-87	28 days
Fluoride (IC)	3327-3333	water	7/29-30/87	8-3-87	NA	8-12-87	28 days
Fluoride (IC)	3334-3337	water	7-30-87	8-3-87	NA	8-12-87	28 days
Fluoride (IC)	3342-3345	water	8-2-87	8-4-87	NA	8-13-87	28 days
Fluoride (IC)	3458-3465	water	8/3-4/87	8-5-87	NA	8/19-21/87	28 days
Fluoride (IC)	3482-3488	water	8/4-5/87	8/6-7/87	NA	8/19-20/87	28 days
Fluoride (IC)	3527-3531	water	8/5-7/87	8-10-87	NA	8/21,24/87	28 days
Fluoride (IC)	3532-3544	water	8/8-9/87	8-11-87	NA	8/31; 9-1-87	28 days
Fluoride (IC)	3567-3577	water	8/10-11/87	8-12-87	NA	9/1-4/87	28 days
Fluoride (IC)	3584-3591	water	8-11-87	8-13-87	NA	9/3-4/87	28 days
Fluoride (IC)	3617-3621	water	8/12-13/87	8-14-87	NA	9-8-87	28 days
Fluoride (IC)	3622-3623	water	8-13-87	8-17-87	NA	9-8-87	28 days
Fluoride (IC)	3626-3633	water	8/15-17/87	8-18-87	NA	9/8-10/87	28 days
Fluoride (IC)	3648,3666-3668	water	8/17-20/87	8/20,24/87	NA	9/9-10/87	28 days
Fluoride (IC)	3673-3675	water	8/23-24/87	8-25-87	NA	9/9-10/87	28 days
Fluoride (IC)	3684-3689	water	8/24-25/87	8-27-87	NA	9/9,14/87	28 days
Fluoride (IC)	3690-3693,3715	water	8/26-27/87	8-31-87	NA	9/14-15/87	28 days
Fluoride (IC)	3742-3743	water	8/29-30/87	9-1-87	NA	9/14-15/87	28 days

NA= Not applicable

Table B-68.

VERSAR INC., ESM OPERATIONS
SAMPLE HOLDING TIME SUMMARY

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES: COLLECTION	SAMPLE DATES: LAB RECEIPT	SAMPLE DATES: PREPARATION EXTRACTION	SAMPLE DATES: ANALYSIS	HOLDING TIME REQUIREMENT
Fluoride (ISE)	3311-3314	water	7/27-28/87	7-29-87	NA	8-14-87	28 days
Fluoride (ISE)	3315-3320	water	7/28-29/87	7-30-87	NA	8-14-87	28 days
Fluoride (ISE)	3327-3333	water	7/29-30/87	8-3-87	NA	8-20-87	28 days
Fluoride (ISE)	3334-3337	water	7-30-87	8-3-87	NA	8-20-87	28 days
Fluoride (ISE)	3342-3345	water	8-2-87	8-4-87	NA	8-20-87	28 days
Fluoride (ISE)	3458-3465	water	8/3-4/87	8-5-87	NA	8-20-87	28 days
Fluoride (ISE)	3482-3488	water	8/4-5/87	8/6-7/87	NA	8-20-87	28 days
Fluoride (ISE)	3527-3531	water	8/5-7/87	8-10-87	NA	8-31-87	28 days
Fluoride (ISE)	3532-3544	water	8/8-9/87	8-11-87	NA	8-31-87	28 days
Fluoride (ISE)	3567-3577	water	8/10-11/87	8-12-87	NA	8-31-87	28 days
Fluoride (ISE)	3584-3591	water	8-11-87	8-13-87	NA	9/3-4/87	28 days
Fluoride (ISE)	3617-3621	water	8/12-13/87	8-14-87	NA	9-4-87	28 days
Fluoride (ISE)	3622-3623	water	8-13-87	8-17-87	NA	9-9-87	28 days
Fluoride (ISE)	3626-3633	water	8/15-17/87	8-18-87	NA	9-9-87	28 days
Fluoride (ISE)	3648 3666-3668	water	8/17-20/87	8/20,24/87	NA	9-9-87	28 days
Fluoride (ISE)	3673-3675	water	8/23-24/87	8-25-87	NA	9-9-87	28 days
Fluoride (ISE)	3684-3689	water	8/24-25/87	8-27-87	NA	9-14-87	28 days
Fluoride (ISE)	3690-3693,3715	water	8/26-27/87	8-31-87	NA	9-14-87	28 days
Fluoride (ISE)	3742-3743	water	8/29-30/87	9-1-87	NA		

NA= Not applicable

Table B-69.

VERSAR INC., ESM OPERATIONS
SAMPLE HOLDING TIME SUMMARY

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES: COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	HOLDING TIME REQUIREMENT
Sulfate (IC)	3311-3314	water	7/27-28/87	7-29-87	NA	8-10-87	28 days
Sulfate(IC)	3315-3320	water	7/28-29/87	7-30-87	NA	8-11-87	28 days
Sulfate(IC)	3327-3333	water	7/29-30/87	8-3-87	NA	8-12-87	28 days
Sulfate(IC)	3334-3337	water	7-30-87	8-3-87	NA	8-12-87	28 days
Sulfate(IC)	3342-3345	water	8-2-87	8-4-87	NA	8-13-87	28 days
Sulfate(IC)	3458-3465	water	8/3-4/87	8-5-87	NA	8/19-21/87	28 days
Sulfate(IC)	3482-3488	water	8/4-5/87	8/6-7/87	NA	8/19-20/87	28 days
Sulfate(IC)	3527-3531	water	8/5-7/87	8-10-87	NA	8/21,24/87	28 days
Sulfate(IC)	3532-3544	water	8/8-9/87	8-11-87	NA	8/24;9-1-87	28 days
Sulfate(IC)	3567-3577	water	8/10-11/87	8-12-87	NA	9/1-4/87	28 days
Sulfate(IC)	3584-3591	water	8-11-87	8-13-87	NA	9/3-4/87	28 days
Sulfate(IC)	3617-3621	water	8/12-13/87	8-14-87	NA	9-8-87	28 days
Sulfate(IC)	3622-3623	water	8-13-87	8-17-87	NA	9-8-87	28 days
Sulfate(IC)	3626-3633	water	8/15-17/87	8-18-87	NA	9/8-10/87	28 days
Sulfate(IC)	3648,3666-3668	water	8/17-20/87	8/20,24/87	NA	9/9-10/87	28 days
Sulfate(IC)	3673-3675	water	8/23-24/87	8-25-87	NA	9/9-10/87	28 days
Sulfate(IC)	3684-3689	water	8/24-25/87	8-27-87	NA	9/9-14/87	28 days
Sulfate(IC)	3690-3693,3715	water	8/26-27/87	8-31-87	NA	9/14-15/87	28 days
Sulfate(IC)	3742-3743	water	8/29-30/87	9-1-87	NA	9/14-15/87	28 days

NA= Not applicable

VERSAR INC., ESM OPERATIONS
SAMPLE HOLDING TIME SUMMARY

PARAMETER	SAMPLE ESM ID	SAMPLE MATRIX	SAMPLE DATES: COLLECTION	LAB RECEIPT	PREPARATION EXTRACTION	ANALYSIS	HOLDING TIME REQUIREMENT
Sulfate(Turb)	3311-3314	water	7/27-28/87	7-29-87	NA	8-5-87	28 days
Sulfate(Turb)	3315-3320	water	7/28-29/87	7-30-87	NA	8-5-87	28 days
Sulfate(Turb)	3327-3333	water	7/29-30/87	8-3-87	NA	8-6-87	28 days
Sulfate(Turb)	3334-3337	water	7-30-87	8-3-87	NA	8-6-87	28 days
Sulfate(Turb)	3342-3345	water	8-2-87	8-4-87	NA	8-29-87	28 days
Sulfate(Turb)	3458-3465	water	8/3-4/87	8-5-87	NA	8-29-87	28 days
Sulfate(Turb)	3482-3488	water	8/4-5/87	8/6-7/87	NA	8-29-87	28 days
Sulfate(Turb)	3527-3531	water	8/5-7/87	8-10-87	NA	9-3-87	28 days
Sulfate(Turb)	3532-3544	water	8/8-9/87	8-11-87	NA	9/3-4/87	28 days
Sulfate(Turb)	3567-3577	water	8/10-11/87	8-12-87	NA	9-4-87	28 days
Sulfate(Turb)	3584-3591	water	8-11-87	8-13-87	NA	9-4-87	28 days
Sulfate(Turb)	3617-3621	water	8/12-13/87	8-14-87	NA	9-4-87	28 days
Sulfate(Turb)	3622-3623	water	8-13-87	8-17-87	NA	9-9-87	28 days
Sulfate(Turb)	3626-3633	water	8/15-17/87	8-18-87	NA	9-9-87	28 days
Sulfate(Turb)	3648,3666-3668	water	8/17-20/87	8/20,24/87	NA	9-9-87	28 days
Sulfate(Turb)	3673-3675	water	8/23-24/87	8-25-87	NA	9-10-87	28 days
Sulfate(Turb)	3684-3689	water	8/24-25/87	8-27-87	NA	9-10-87	28 days
Sulfate(Turb)	3690-3693,3715	water	8/26-27/87	8-31-87	NA	9-10-87	28 days
Sulfate(Turb)	3742-3743	water	8/29-30/87	9-1-87	NA		

NA= Not applicable

Ground Water Analysis
July - September 1987

GC/MS Tuning and Performance

Parameters: VOCs (BFB) N B/N/A (DFTPP) A

Criteria:

A - Acceptable: All criteria met; spectra of good quality;

P - Provisional: All criteria not met, spectra of reasonable quality; data useable;

U - Unacceptable: Criteria not met, spectra of poor quality, data unuseable.

N - Not applicable.

Remarks:

See attached.

Ground Water Analysis
July - September 1987

Initial and Continuing Calibration Checks - Organics

Parameters: VOCs N B/N A Acids A

Criteria:

A - Acceptable: All criteria met;

P - Provisional: Some criteria met, data useable;

U - Unacceptable: Criteria not met, data unuseable;

N - Not applicable.

Remarks:

All SPCC and CCC compounds within acceptance criteria.

Ground Water Analysis
July - September 1987

Laboratory Blanks - Organics and Inorganics

Parameters:

VOCs	N	B/N	A	Acids	A	Alkalinity	A
Chloride	A	T. Cyanide	A	F. Cyanide	A		
Fluoride	A	Sulfate	A	Calcium	A		
Magnesium	A	Potassium	A	Sodium (Dissolved)	A		
Sodium (Total)	A						

Criteria:

A - Acceptable: No contaminants above minimum detection limits, no interference with sample results, appropriate blank used for each GC/MS system and extraction method;

P - Provisional: Contaminants present, but minimal interference with sample results;

U - Unacceptable: Gross contamination, too much interference to use data for certain compounds or the entire fraction; appropriate blanks not analyzed;

N - Not applicable.

Remarks:

None.

Ground Water Analysis
July - September 1987

Surrogate Spike Results

Parameters: VOCs N B/N A Acids A

Criteria: (General)

Valid Performance: All surrogate recoveries within QC limits (VOCs, BNAs, PCBs) or one surrogate out of QC limits per fraction but % recovery >10% (BNAs, PCBs);

Invalid Performance: VOC - one or more surrogates out of QC limits; BNA or PCB - two or more surrogates out of QC limits per fraction or one surrogate out of QC limits but % R <10%.

A. Individual Sample Flagging Criteria:

Analysis Acceptable: All surrogate recoveries within criteria;

Analysis Suspect: Any surrogate recoveries outside criteria and/or recoveries <10% substantiated as a matrix effect by re-purge re-inject or re-extract and reanalyze;

Invalid Analysis: Any compound recoveries of <10% that are unsubstantiated as a matrix effect by re-purge, re-inject, or re-extract and re-analyze.

Parameters	No. Samples	No. Suspect	No. Invalid
VOC	0	0	0
B/N	1	0	0
Acid	1	0	0

B. Summary for Evaluation

Criteria:

A - Acceptable: <10% of samples reported as suspect;

P - Provisional: >10% but <50% of samples reported as suspect;

U - Unacceptable: >50% of samples reported as suspect and/or >10% samples reported as invalid.

Remarks:

Ground Water Analysis
July - September 1987

Matrix Spike/Matrix Spike Duplicates - Organics

A. Matrix Spikes:

Parameters: VOC N B/N A Acids A

Note: No action is taken on organic matrix spikes above.

Criteria:

A - Acceptable: <10% of compounds outside criteria;

P - Provisional: >10% but <50% of compounds outside criteria;

U - Unacceptable: >50% of compounds outside criteria and/or >10% of compounds with recoveries of <10%;

N - Not applicable.

Performance:

Parameters	No. Compounds	No. Outside Criteria	No. <10% R
VOC	0	0	0
B/N	6 x 1 = 6	0	0
Acids	5 x 1 = 5	1	0

B. Matrix Spike Duplicates:

Parameters: VOC N B/N A Acids A

Performance:

Parameters	No. Compounds	No. Outside Criteria	No. <10% R
VOC	0	0	0
B/N	6 x 1 = 6	0	0
Acids	5 x 1 = 5	1	0

Remarks:

Ground Water Analysis
July - September 1987

Calibration Curve Standards - Inorganics

Parameters: Fluoride A Sulfate A T. Cyanide A F. Cyanide A Calcium A Magnesium A Potassium A Sodium A

Criteria:

A - Acceptable: All curves five-point curves with lowest standard at the LOQ; ICP - one point;

P - Provisional: Three-point curve with lowest standard at the LOQ;

U - Unacceptable: Less than three-point curve and/or lowest standard not at the LOQ; no one-point verification for ICP.

Remarks:

Ground Water Analysis
July - September 1987

Initial and Continuing Calibration Verification - Inorganics

Parameters:

Calcium	A	Magnesium	A	Potassium	A
Sodium	A	Sodium (Total)	A	Fluoride	A
Sulfate	P				

Criteria:

A - Acceptable: %R of ICVS and CCVS inside QC limits;

P - Provisional: %R of ICVS or CCVS outside QC limits but not less than 50% or greater than 150%;

U - Unacceptable: %R of ICVS or CCVS outside QC limits but less than 50% or greater than 150%;

N - Not applicable

Remarks:

P - Sulfate batches 3327-3333, 3334-3337 and 3342-3345 (c,d, and e batches) had ICVS and/or CCVS outside QC limits. The %R were low but not less than 50%. The data is flagged J and the user is advised the data may be slightly biased low.

Ground Water Analysis
July - September 1987

Laboratory Duplicates

Parameters:

Bicarbonate	A	Carbonate	A	Chloride	A
Fluoride (ISE)	A	Sulfate (Turb)			A
Calcium	A	Magnesium	A	Potassium	A
Sodium	A	Sodium (total)	A	T. Cyanide	P
F. Cyanide	A				

Criteria:

A - Acceptable: All relative percent difference (RPDs) are within QC limits;

P - Provisional: Some RPDs outside QC limits but <35%;

U - Unacceptable: All RPDs outside QC limits and <35%.

Remarks:

P - Total cyanide batch B (3315 - 3320) lab duplicate outside QC limits but less than 35% RPD. Data has been flagged with a J. See Data Qualifiers Table.

Ground Water Analysis
July - September 1987

Matric Spike - Inorganics

Parameters:

Chloride	A	T. Cyanide	P_1	F. Cyanide	P_1
Fluoride	A	Sulfate	A	Calcium	A
Magnesium	A	Potassium	A	Sodium	A
Sodium (total)	A				

Criteria:

A - Acceptable: All %R within QC limits or meet CLP criteria;

P_1 - Provisional: Some %R not within QC limits but are <30%; or are >125% and analyte is >IDL- flag J;

P_2 - Provisional: Some %R not within QC limits but are not <30% and analyte was reported <IDL - flag J;

P_3 - Provisional: %R are less than 30% and analyte was detected at >LOQ - flag J;

U - Unacceptable - %R <30% and sample results are reported as <IDL - flag R.

Remarks:

P_1 - Total Cyanide - batches D and J (3334-3337 and 3567-3577) has low %R but >30%. All samples in these batches were flagged J.

P_1 - Free Cyanide - batch A (3311-3314) had low %R but >30%. All samples flagged J.

Ground Water Analysis
July - September 1987

Laboratory Control Samples (LCS) - Inorganics

Parameters: T. Cyanide A F. Cyanide A Sodium A

Criteria:

A -	Acceptable:	All %R within QC limits or CLP criteria;
P -	Provisional:	%R outside QC limits but not <30% or >120%. Flag all data associated as J.
U -	Unacceptable:	If LCS recovery falls less than 30%, this is indicative of several laboratory or method deficiencies and the data should be reported as unuseable - flag R.

Remarks:

Ground Water Analysis
July - September 1987

Independent QC Check Samples - Organics and Inorganics

Parameters: VOCs N B/N/A A Alkalinity A Chloride A T. Cyanide A F. Cyanide A

Criteria:

A - Acceptable: %R within QC limits;

P - Provisional: %R outside QC limits but not <30% or is >120% - flag J;

U - Unacceptable: If QC check sample falls less than 30%, this is indicative of service laboratory analytical (instrument) deficiences and the data should be reported as unuseable - flag R.

N - Not applicable

Remarks:

DATA CLASSIFICATION

GROUND WATER

JULY - SEPTEMBER 1987

DATA CLASSIFICATION

Sampling and Analysis July - September 1987

A second round of ground-water samples was collected and analyzed during this time period from selected monitor well locations. Like the laboratory data developed in 1986, the 1987 laboratory data have been validated and the data requiring QC qualifer codes have been flagged as required. To determine the data usefulness and applicability, the data have been further classified as follows:

Classification Process

As with the laboratory data validation, the classification of data is based on specifically defined criteria. Samples are evaluated by matrix against the criteria and judged as acceptable, provisional, or unacceptable. The explanation of the criteria is as follows:

A - Acceptable: All criteria have been successfully met for all samples.

P - Provisional: Some samples have not fully met the criteria but the information is obtainable.

U - Unacceptable: The criteria has not been met with any samples and is not obtainable. This data may not be classified for use unless sufficient other data criteria have been met and scientific judgement indicate the data may be useful if classified.

N - Not Applicable.

Ground Water - 1987

During the period 27 July to 2 September 1987, 101 ground-water samples, 14 field blanks, and 2 trip blanks were collected at the Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon, by G&M and submitted to Versar, Inc., EDM Operations Environmental Chemistry Laboratory. In additin, 16 field splits were collected and submitted along with an aqueous field blank to Compuchem Laboratories in North Carolina.

Samples submitted to both laboratories were analyzed for total and free cyanide, fluoride, sulfate, and sodium. Samples submitted to Versar were also analyzed for calcium, magnesium, potassium, chloride, biocarbonate, and carbonate.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level A Criteria

Matrix: Ground Water - 1987

To be classified for Level A use, the data must meet the following criteria:

	Criteria	Evaluation Result
1.	Sampling dates were recorded;	A
2.	Signatures of Sampling Team on each water sample log or soil sample log;	A
3.	Sampling locations were clearly designated and described;	A
4.	Sampling depth increment for soils was recorded;	A
5.	Sample collection technique was described on water sample log or soil sample log;	A
6.	Field preparation techniques were clearly described where applicable;	A
7.	Sample preservation techniques were clearly described, consistent, and adequate for the parameters to be analyzed and the sample matrix;	A
8.	Shipping bill of lading or constant surveillance documentation is available;	A
9.	The laboratory sample preparation or extraction date is recorded and available;	A
10.	The laboratory sample analysis date is recorded and available;	A

Criteria	Evaluation Result
11. The laboratory sample preparation technique is recorded and available either in the laboratory report or in the laboratories approved SOP;	A
12. The methods of analysis are listed in the laboratory reports and are consistent with the methods specified in the QAPP and laboratory contract;	A
13. The laboratory analytical detection limits or limits of quantitation (LOQ) are given in lab reports and are adequate for project objectives;	A
14. Field records include:	
o Soil/sediment log sheets	N
o Water sampling log sheets	A
o QC field checklist	A
o Field instrument calibration logs	A
o Master log book bound with sequentially numbered pages	A
o Daily log book	A
o Chain-of-Custody forms	A
15. All applicable records described above were properly created and are on file;	A
16. Samples passed laboratory data validation without any R flags (samples with J flags may be accepted at this level).	A

Remarks:

All ground water data developed during this sampling round is classified Level A for qualitative use.

DATA CLASSIFICATION SUMMARY CHECKLIST

Level B Criteria

Matrix: Ground Water - 1987

To be classified for Level B use, the data must meet the following criteria:

Criteria	Evaluation Result
A. Data Validation Result	
1. Samples of this matrix have not been flagged J or R during data validation;	P
2. All samples of this matrix have been classified as Level A data;	A
B. Quantitative Statistical Significance	
1. Laboratory and field instruments were properly standardized (calibrated) employing proper methods and records are available;	A
2. Sample bottle preparation was proper and appropriate for the parameters measured and the sample matrix;	A
3. All laboratory procedures were referenced to approved EPA methods and were contained in an approved SOP manual;	A
4. Analytical QC data was available to demonstrate proper instrument calibration;	A
5. Laboratory QC check sample standards are EPA and NBS traceable and were used at least once each three months;	A

Level B Criteria - Ground Water (Continued)

	Criteria	Evaluation Result
6.	Laboratory reagent (method) blanks were analyzed at a frequency of at least 1 per 20 samples;	A
7.	Laboratory duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
8.	Laboratory matrix spikes and matrix spike duplicates were analyzed at a frequency of at least 1 per 20 samples;	A
9.	Field replicates were analyzed at a frequency of at least 1 per 20 samples;	A
10.	Field blanks were submitted at a frequency of at least 1 per 20 samples;	A
11.	One trip blank was submitted for VOCs analysis with each cooler;	A
12.	Field split samples were analyzed at a frequency of at least 1 per 20 samples per matrix;	A
13.	Appropriate and sufficient QC data with acceptance criteria were presented to allow data validation by the project QA officer;	A
14.	The laboratories used were approved by the EPA for participation in the Contract Laboratory Program (CLP);	A
15.	The laboratories participated in round-robin testing program by EPA or other accrediting agency;	A
16.	Quality control limits were consistent with the limits established for EPA's CLP;	A
17.	All samples submitted were analyzed for the requested parameters.	A

Criteria	Evaluation Result
C. Custody and Document Control	
1. Field custody of all samples was noted in a bound field log book;	A
2. Transfer of custody documentation (chain-of-custody form) signed by field and laboratory sample custodians is available and properly completed;	A
3. Laboratory custody is documented by a designated lab sample custodian in a master log and a secured sample storage area;	A
4. Sample identification and assigned laboratory tracking numbers are traceable through the entire monitoring system;	A
5. Field notebooks, log sheets, log books, checklists, reports, data validations, and all custody documents are stored in a secure repository or under the control of a document custodian;	A
6. All records, forms, log books, etc., are filled out completely in indelible ink without alterations except as initialed;	A
7. All sample log sheets have been signed by the sample collector;	A
8. Field log book sheets signed by the field sample custodian.	A
D. Sample Representativeness	
1. Compatibility exists between field and laboratory measurements, where applicable, or incompatibilities have been suitably explained;	A

Criteria	Evaluation Result
2. Laboratory analysis and/or sample preparation or extraction were within allowable holding times established for the sample preservation and methods used;	A
3. Sample storage was maintained within suitable temperature, light and moisture conditions to guarantee sample integrity;	A
4. Proper sample containers were used for the parameters analyzed;	A
5. Proper sample collection equipment was used such that the equipment would neither contribute nor remove any substance to or from the sample;	A
6. The sample site selection criteria are consistent with the objectives of the investigation and will provide the required data.	A

Remarks:

Section A.1. P The following list summarizes the number of samples flagged with J or UJ:

Parameter	No. of Groundwater Samples
Free Cyanide	4
Total Cyanide	31
Sulfate	15

The identification of these samples and the reasons for the flagging are given in the Data Qualifier table for Groundwater samples collected during 1987 in the Laboratory Data Validation Section. The values reported for these samples are estimated (Level A) and may not be classified for Level B use.

Level B Criteria - Ground Water (Continued)

Conclusion:

All the groundwater data reported for the period August - September 1987 except for those samples described in remarks above are classified as Level B.

QC SUPPORT DATA

FOR

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

GC/MS TUNING AND PERFORMANCE

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: VERSAR ESMO Contract: _____

Lab Code: _____ Case No.: D903 SAS No.: _____ SDG No.: _____

Lab File ID: 0903DFTA1 DFTPP Injection Date: 09/03/87

Instrument ID: MS-A DFTPP Injection Time: _____

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	53.0
68	Less than 2.0% of mass 69	(0.0)1
69	Mass 69 relative abundance	74.0
70	Less than 2.0% of mass 69	(0.0)1
127	40.0 - 60.0% of mass 198	52.3
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.6
275	10.0 - 30.0% of mass 198	28.6
365	Greater than 1.00% of mass 198	8.97
441	Present, but less than mass 443	15.8
442	Greater than 40.0% of mass 198	89.9
443	17.0 - 23.0% of mass 442	(19.0)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0903S2A1	0903S2A1	0903S2A1	09/03/87	1041
02	ABLK0901	0901SWBA1	0901SWBA1	09/03/87	1157
03	AMSTD901	0901MSTD	0901MSTD	09/03/87	1240
04	REPLICATE	3716	BNA3716	09/03/87	1323
05	LEACHATE	3717AE	BNA3717AE	09/03/87	1406
06	LEACHATE	3717BE	BNA3717BE	09/03/87	1450

5B

SEMIVOLATILE ORGANIC GC/MS TUNING AND MASS CALIBRATION - DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: VERSAR ESMO Contract: _____

Lab Code: _____ Case No.: D903 SAS No.: _____ SDG No.: _____

Lab File ID: 0903DFTA1 DFTPP Injection Date: 09/03/87

Instrument ID: MS-A DFTPP Injection Time: _____

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	53.0
68	Less than 2.0% of mass 69	(0.0)1
69	Mass 69 relative abundance	74.0
70	Less than 2.0% of mass 69	(0.0)1
127	40.0 - 60.0% of mass 198	52.3
197	Less than 1.0% of mass 198	0.0
198	Base peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.6
275	10.0 - 30.0% of mass 198	28.6
365	Greater than 1.00% of mass 198	8.97
441	Present, but less than mass 443	15.8
442	Greater than 40.0% of mass 198	89.9
443	17.0 - 23.0% of mass 442	(19.0)2

1-Value is % mass 69 2-Value is % mass 442

THIS TUNE APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	0903S2A1	0903S2A1	0903S2A1	09/03/87	1041
02	ABLK0901	0901SWBA1	0901SWBA1	09/03/87	1157
03	AMSTD901	0901MSTD	0901MSTD	09/03/87	1240
04	REPLICATE	3716	BNA3716	09/03/87	1323
05	LEACHATE	3717AE	BNA3717AE	09/03/87	1406
06	LEACHATE	3717BE	BNA3717BE	09/03/87	1450

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

INITIAL AND CONTINUING CALIBRATION CHECKS

ORGANICS

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 3716, 3717

FRACTION: BNA's

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 1)

CASE NO: 5203 REGION: LAB INSTRUMENT ID: HSA
CONTRACTOR: VERSAR ESMO CALIBRATION DATE: 01/27/87
CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050 MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2			
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	%RSD	CCC* SPCC**
PHENOL	1.927	1.839	1.613	1.610	1.528	1.703	10.0	*
BIS(2-CHLOROETHYL)ETHER	1.839	1.762	1.664	1.652	1.582	1.700	5.9	
2-CHLOROPHENOL	1.725	1.618	1.450	1.441	1.455	1.538	8.3	
1,3-DICHLOROBENZENE	1.938	1.802	1.719	1.692	1.707	1.772	5.8	
1,4-DICHLOROBENZENE	2.047	1.863	1.789	1.708	1.722	1.826	7.6	*
BENZYL ALCOHOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
1,2-DICHLOROBENZENE	1.960	1.775	1.700	1.664	1.634	1.757	6.9	
2-METHYLPHENOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
BIS(2-CHLOROISOPROPYL)ETHER	2.096	2.056	1.860	1.914	1.849	1.955	5.8	
4-METHYLPHENOL	1.509	1.384	1.273	1.244	1.255	1.333	8.5	
N-NITROSO-DI-N-PROPYLAMINE	1.621	1.628	1.478	1.902	1.871	1.700	10.6	* *
HEXACHLOROETHANE	0.936	0.918	0.882	0.864	0.884	0.897	3.3	
NITROBENZENE	0.543	0.518	0.486	0.479	0.487	0.502	5.4	
ISOPHORONE	1.011	0.950	0.954	0.968	0.962	0.969	2.5	
2-NITROPHENOL	0.198	0.201	0.206	0.214	0.215	0.207	3.7	*
2,4-DIMETHYLPHENOL	0.319	0.307	0.311	0.314	0.314	0.313	1.4	
BENZOIC ACID	X	0.109	0.095	0.177	0.090	0.118	34.2	
BIS(2-CHLOROETHOXY)METHANE	0.535	0.497	0.493	0.493	0.495	0.503	3.6	
2,4-DICHLOROPHENOL	0.325	0.290	0.291	0.293	0.292	0.298	5.0	*
1,2,4-TRICHLOROBENZENE	0.403	0.353	0.353	0.336	0.336	0.356	7.7	
NAPHTHALENE	1.153	1.028	0.996	0.951	0.947	1.015	8.3	
4-CHLOROANILINE	0.135	0.166	0.182	0.258	0.154	0.179	26.5	
HEXACHLOROBUTADIENE	0.264	0.228	0.241	0.225	0.220	0.236	7.5	*
4-CHLORO-3-METHYLPHENOL	0.402	0.368	0.374	0.372	0.359	0.375	4.3	*
2-METHYLNAPHTHALENE	1.048	0.850	0.841	0.819	0.816	0.875	11.2	
HEXACHLOROCYCLOPENTADIENE	0.252	0.230	0.239	0.287	0.301	0.252	11.9	* *
2,4,6-TRICHLOROPHENOL	0.427	0.405	0.429	0.491	0.556	0.462	13.4	*
2,4,5-TRICHLOROPHENOL	X	0.423	0.418	0.346	0.279	0.367	18.6	
2-CHLORONAPHTHALENE	1.463	1.285	1.285	1.261	1.263	1.311	6.5	
2-NITROANILINE	X	0.461	0.390	0.402	0.434	0.422	7.6	
DIMETHYL PHTHALATE	1.868	1.674	1.289	1.599	1.154	1.517	19.2	
ACENAPHTHALENE	1.983	1.832	1.800	1.698	1.723	1.807	6.4	
3-NITROANILINE	X	0.109	0.084	0.060	0.117	0.093	27.9	
ACENAPHTHENE	1.514	1.290	1.273	0.998	0.874	1.190	21.4	*
2,4-DINITROPHENOL	X	0.117	0.108	0.113	0.114	0.113	3.3	* *
4-NITROPHENOL	X	0.109	0.115	1.055	0.121	0.370	123.9	* *
DIBENZOFURAN	2.321	1.872	1.926	1.786	1.209	1.803	22.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20 NG

FORM VI

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 2)

CASE NO: 5203 REGION: LAB INSTRUMENT ID: MSA
CONTRACTOR: VERSAR ESMO CALIBRATION DATE: 01/27/87
CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050 MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2			
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	%RSD	CCC* SPCC**
2,4-DINITROTOLUENE	0.370	0.381	0.347	0.312	0.312	0.344	9.3	
2,6-DINITROTOLUENE								
DIETHYLPHTHALATE	2.052	1.783	1.596	1.542	1.456	1.686	14.1	
4-CHLOROPHENYL-PHENYLETHER	0.827	0.764	0.724	0.563	0.502	0.676	20.4	
FLUORENE	1.425	1.315	1.266	1.177	1.194	1.275	7.9	
4-NITROANILINE	X	0.114	0.130	0.065	0.079	0.097	31.1	
4,6-DINITRO-2-METHYLPHENOL	X	0.122	0.128	0.134	0.126	0.128	3.9	
N-NITROSODIPHENYLAMINE	0.644	0.512	0.472	0.453	0.391	0.494	19.1	*
4-BROMOPHENYL-PHENYLETHER	0.327	0.308	0.333	0.307	0.304	0.316	4.2	
HEXACHLOROBENZENE	0.455	0.359	0.387	0.352	0.311	0.373	14.3	
PENTACHLOROPHENOL	X	0.151	0.175	0.163	0.151	0.160	7.2	*
PHENANTHRENE	1.318	1.211	1.252	1.122	1.061	1.193	8.6	
ANTHRACENE	1.384	1.149	1.221	1.108	1.089	1.194	9.9	
DI-N-BUTYLPHTHALATE	1.611	1.543	1.690	1.652	1.581	1.615	3.6	
FLUORANTHENE	1.191	1.162	1.437	1.192	1.160	1.228	9.6	*
PYRENE	1.748	1.427	1.386	1.354	1.329	1.449	11.8	
BUTYLBENZYLPHTHALATE	0.799	0.805	0.757	0.692	0.736	0.758	6.2	
3,3'-DICHLOROBENZIDINE	0.077	0.073	0.041	0.032	0.033	0.051	43.1	
BENZO(A)ANTHRACENE	1.124	1.132	1.144	1.047	1.051	1.100	4.3	
CHRYSENE	1.275	1.186	1.175	0.982	1.020	1.128	10.9	
BIS(2-ETHYLHEXYL)PHTHALATE	1.041	1.092	1.093	1.073	1.062	1.072	2.0	
DI-N-OCTYL PHTHALATE	2.242	2.323	2.903	3.061	2.750	2.656	13.5	*
BENZO(B)FLUORANTHENE	1.539	1.468	1.551	1.595	1.469	1.564	4.7	
BENZO(K)FLUORANTHENE	1.964	1.421	1.492	1.511	1.434	1.568	15.0	
BENZO(A)PYRENE	1.347	1.185	1.148	1.210	1.153	1.209	6.7	*
INDENO(1,2,3-CD)PYRENE	0.834	0.762	0.704	0.607	0.597	0.701	14.5	
DIBENZ(A,H)ANTHRACENE	0.841	0.783	0.685	0.598	0.616	0.705	14.9	
BENZO(G,H,I)PERYLENE	1.022	0.744	0.695	0.586	0.571	0.724	25.2	
NITROBENZENE-D5	0.801	0.833	0.764	0.787	0.811	0.799	3.2	
2-FLUOROBIPHENYL	1.584	1.367	1.284	1.255	1.308	1.358	9.2	
TERPHENYL-D14	0.761	0.694	0.762	0.627	0.614	0.692	10.2	
PHENOL-D5	1.813	1.809	1.655	1.608	1.620	1.701	6.0	
2-FLOUROPHENOL	1.430	1.389	1.334	1.388	1.476	1.403	3.8	
2,4,6-TRIBROMOPHENOL	0.263	0.214	0.219	0.183	0.173	0.210	16.8	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20 NG

FORM VI

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No: D903 Region: _____ Calibration Date: 09/03/87
Contractor: VERSAR ESMO Time: 10:41
Contract No: _____ Laboratory ID: 0903S2A1
Instrument ID: _____ Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.936	-13.7	*	
bis(2-Chloroethyl)Ether		1.700	1.724	-1.4		
2-Chlorophenol		1.538	1.547	-0.6		
1,3-Dichlorobenzene		1.772	1.589	10.3		
1,4-Dichlorobenzene		1.826	1.612	11.7	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.568	10.8		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether		1.955	2.280	-16.6		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine		1.700	1.527	10.2		* *
Hexachloroethane		0.897	0.988	-10.1		
Nitrobenzene		0.502	0.536	-6.8		
Isophorone		0.969	0.972	-0.3		
2-Nitrophenol		0.207	0.214	-3.4	*	
2,4-Dimethylphenol		0.313	0.473	-51.1		
Benzoic Acid	x	0.118				
bis(2-Chloroethoxy)Methane		0.503	0.612	-21.7		
2,4-Dichlorophenol		0.298	0.272	8.7	*	
1,2,4-Trichlorobenzene		0.356	0.320	10.1		
Naphthalene		1.015	1.072	-5.6		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.233	1.3	*	
4-Chloro-3-Methylphenol		0.375	0.414	-10.4	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene		0.262	0.280	-6.9		* *
2,4,6-Trichlorophenol		0.462	0.376	18.6	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.006	23.3		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.328	12.5		
Acenaphthalene		1.807	1.657	8.3		
2,6-Dinitrotoluene		0.263	0.238	9.5		
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.106	7.1	*	
2,4-Dinitrophenol	x	0.113	0.140	-23.9		* *

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No: D903 Region: Calibration Date: 09/03/87
Contractor: VERSAR ESMO Time: 10:41
Contract No: Laboratory ID: 0903S2A1
Instrument ID: Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.936	-13.7	*	
bis(2-Chloroethyl)Ether		1.700	1.724	-1.4		
2-Chlorophenol		1.538	1.547	-0.6		
1,3-Dichlorobenzene		1.772	1.589	10.3		
1,4-Dichlorobenzene		1.826	1.612	11.7	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.568	10.8		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether		1.955	2.280	-16.6		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine		1.700	1.527	10.2		* *
Hexachloroethane		0.897	0.988	-10.1		
Nitrobenzene		0.502	0.536	-6.8		
Isophorone		0.969	0.972	-0.3		
2-Nitrophenol		0.207	0.214	-3.4	*	
2,4-Dimethylphenol		0.313	0.473	-51.1		
Benzoic Acid	x	0.118				
bis(2-Chloroethoxy)Methane		0.503	0.612	-21.7		
2,4-Dichlorophenol		0.298	0.272	8.7	*	
1,2,4-Trichlorobenzene		0.356	0.320	10.1		
Naphthalene		1.015	1.072	-5.6		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.233	1.3	*	
4-Chloro-3-Methylphenol		0.375	0.414	-10.4	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene		0.262	0.280	-6.9		* *
2,4,6-Trichlorophenol		0.462	0.376	18.6	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.006	23.3		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.328	12.5		
Acenaphthalene		1.807	1.657	8.3		
2,6-Dinitrotoluene		0.263	0.238	9.5		
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.106	7.1	*	
2,4-Dinitrophenol	x	0.113	0.140	-23.9		* *

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

QUALITY CONTROL DATA SUMMARY
FOR ORGANIC ANALYSIS

ASSOCIATED SAMPLES: 3668, 3669, 3676

FRACTION: BNA's

A. TUNING (In chronological order)

B. INITIAL (5-POINT) CALIBRATION

C. CONTINUING CALIBRATION (In chronological order)

D. QC SAMPLE

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 1)

CASE NO: 5203 REGION: LAB INSTRUMENT ID: HSA
CONTRACTOR: VERSAR ESMO CALIBRATION DATE: 01/27/87
CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050 MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2			CCC*
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	%RSD	SPCC**
PHENOL	1.927	1.839	1.613	1.610	1.528	1.703	10.0	*
BIS(2-CHLOROETHYL)ETHER	1.839	1.762	1.664	1.652	1.582	1.700	5.9	
2-CHLOROPHENOL	1.725	1.618	1.450	1.441	1.455	1.538	8.3	
1,3-DICHLOROBENZENE	1.938	1.802	1.719	1.692	1.707	1.772	5.8	
1,4-DICHLOROBENZENE	2.047	1.863	1.789	1.708	1.722	1.826	7.6	*
BENZYL ALCOHOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
1,2-DICHLOROBENZENE	1.960	1.775	1.700	1.664	1.684	1.757	6.9	
2-METHYLPHENOL	0.952	0.961	0.891	0.910	0.940	0.931	3.2	
BIS(2-CHLOROISOPROPYL)ETHER	2.096	2.056	1.860	1.914	1.849	1.955	5.8	
4-METHYLPHENOL	1.509	1.394	1.273	1.244	1.255	1.333	8.5	
N-NITROSO-DI-N-PROPYLAMINE	1.621	1.628	1.478	1.992	1.871	1.700	10.6	* *
HEXACHLOROETHANE	0.936	0.918	0.882	0.864	0.884	0.897	3.3	
NITROBENZENE	0.543	0.518	0.486	0.479	0.487	0.502	5.4	
ISOPHORONE	1.011	0.950	0.954	0.968	0.962	0.969	2.5	
2-NITROPHENOL	0.198	0.201	0.206	0.214	0.215	0.207	3.7	*
2,4-DIMETHYLPHENOL	0.319	0.307	0.311	0.314	0.314	0.313	1.4	
BENZOIC ACID	X	0.109	0.095	0.177	0.090	0.118	34.2	
BIS(2-CHLOROETHOXY)METHANE	0.535	0.497	0.493	0.493	0.495	0.503	3.6	
2,4-DICHLOROPHENOL	0.325	0.290	0.291	0.293	0.292	0.298	5.0	*
1,2,4-TRICHLOROBENZENE	0.403	0.353	0.353	0.336	0.336	0.356	7.7	
NAPHTHALENE	1.153	1.028	0.996	0.951	0.947	1.015	8.3	
4-CHLOROANILINE	0.125	0.166	0.182	0.258	0.154	0.179	26.5	
HEXACHLOROBUTADIENE	0.264	0.228	0.241	0.225	0.220	0.236	7.5	*
4-CHLORO-3-METHYLPHENOL	0.402	0.368	0.374	0.372	0.359	0.375	4.3	*
2-METHYLNAPHTHALENE	1.048	0.850	0.841	0.819	0.816	0.875	11.2	
HEXACHLOROCYCLOPENTADIENE	0.252	0.230	0.239	0.287	0.301	0.262	11.9	* *
2,4,6-TRICHLOROPHENOL	0.427	0.405	0.429	0.491	0.556	0.462	13.4	*
2,4,5-TRICHLOROPHENOL	X	0.423	0.418	0.346	0.279	0.367	18.6	
2-CHLORONAPHTHALENE	1.463	1.285	1.285	1.261	1.263	1.311	6.5	
2-NITROANILINE	X	0.461	0.390	0.402	0.434	0.422	7.6	
DIMETHYL PHTHALATE	1.868	1.674	1.289	1.599	1.154	1.517	19.2	
ACENAPHTHALENE	1.988	1.832	1.800	1.690	1.723	1.807	6.4	
3-NITROANILINE	X	0.109	0.084	0.060	0.117	0.093	27.9	
ACENAPHTHENE	1.514	1.290	1.273	0.998	0.874	1.190	21.4	*
2,4-DINITROPHENOL	X	0.117	0.108	0.113	0.114	0.113	3.3	* *
4-NITROPHENOL	X	0.129	0.115	1.055	0.121	0.370	123.9	* *
DIBENZOFURAN	2.321	1.872	1.826	1.736	1.209	1.803	22.0	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20 NG

FORM VI

INITIAL CALIBRATION DATA
SEMIVOLATILE HSL COMPOUNDS
(PAGE 2)

CASE NO: 5203 REGION: LA8 INSTRUMENT ID: MSA
CONTRACTOR: VERSAR ESMO CALIBRATION DATE: 01/27/87
CONTRACT NO:

MINIMUM AVE RF FOR SPCC IS 0.050 MAXIMUM %RSD FOR CCC IS 30%

LABORATORY ID	012751A1	012752A1	012753A1	012754A2	012755A2			
COMPOUND	RF(20)	RF(50)	RF(80)	RF(120)	RF(160)	AVE RF	% RSD	CCC# SPCC##
2,4-DINITROTOLUENE	0.370	0.381	0.347	0.312	0.312	0.344	9.3	
2,6-DINITROTOLUENE								
DIETHYLPHTHALATE	2.052	1.783	1.596	1.542	1.456	1.686	14.1	
4-CHLOROPHENYL-PHENYLETHER	0.827	0.764	0.724	0.563	0.502	0.676	20.4	
FLUORENE	1.425	1.315	1.266	1.177	1.194	1.275	7.9	
4-NITROANILINE	X	0.114	0.130	0.065	0.079	0.097	31.1	
4,6-DINITRO-2-METHYLPHENOL	X	0.122	0.128	0.134	0.126	0.128	3.9	
N-NITROSODIPHENYLAMINE	0.644	0.512	0.472	0.453	0.391	0.494	19.1	*
4-BROMOPHENYL-PHENYLETHER	0.327	0.308	0.333	0.307	0.304	0.316	4.2	
HEXACHLOROBENZENE	0.455	0.359	0.387	0.352	0.311	0.373	14.3	
PENTACHLOROPHENOL	X	0.151	0.175	0.163	0.151	0.160	7.2	*
PHENANTHRENE	1.318	1.211	1.252	1.122	1.061	1.193	8.6	
ANTHRACENE	1.384	1.169	1.221	1.108	1.089	1.194	9.9	
DI-N-BUTYLPHTHALATE	1.611	1.543	1.698	1.652	1.581	1.615	3.6	
FLUORANTHENE	1.191	1.162	1.437	1.192	1.160	1.228	9.6	*
PYRENE	1.748	1.427	1.386	1.354	1.329	1.449	11.8	
BUTYLBENZYLPHTHALATE	0.799	0.805	0.757	0.692	0.736	0.758	6.2	
3,3'-DICHLOROBENZIDINE	0.877	0.873	0.841	0.832	0.833	0.851	43.1	
BENZO(A)ANTHRACENE	1.124	1.132	1.144	1.047	1.051	1.100	4.3	
CHRYSENE	1.275	1.186	1.175	0.982	1.020	1.128	10.9	
BIS(2-ETHYLHEXYL)PHTHALATE	1.041	1.092	1.093	1.073	1.062	1.072	2.0	
DI-N-OCTYL PHTHALATE	2.242	2.323	2.903	3.061	2.758	2.656	13.5	*
BENZO(B)FLUORANTHENE	1.539	1.668	1.551	1.595	1.469	1.564	4.7	
BENZO(K)FLUORANTHENE	1.964	1.421	1.492	1.511	1.434	1.568	15.0	
BENZO(A)PYRENE	1.347	1.185	1.148	1.210	1.153	1.209	6.7	*
INDENO(1,2,3-CD)PYRENE	0.834	0.762	0.704	0.607	0.597	0.701	14.5	
DIBENZ(A,H)ANTHRACENE	0.841	0.783	0.685	0.598	0.616	0.705	14.9	
BENZO(G,H,I)PERYLENE	1.022	0.744	0.695	0.586	0.571	0.724	25.2	
NITROBENZENE-D5	0.881	0.833	0.764	0.787	0.811	0.799	3.2	
2-FLUOROBIPHENYL	1.584	1.367	1.284	1.255	1.308	1.358	9.2	
TERPHENYL-D14	0.761	0.694	0.762	0.627	0.614	0.692	10.2	
PHENOL-D5	1.813	1.839	1.655	1.606	1.629	1.701	6.0	
2-FLOUROPHENOL	1.438	1.389	1.334	1.388	1.476	1.403	3.8	
2,4,6-TRIBROMOPHENOL	0.263	0.214	0.219	0.183	0.173	0.210	16.8	

RESPONSE FACTOR (NUMBER IS THE AMOUNT OF NANOGRAMS)
AVE RF - AVERAGE RESPONSE FACTOR
%RSD - - PERCENT RELATIVE STANDARD DEVIATION
CCC - - CALIBRATION CHECK COMPOUNDS (*)
SPCC - - SYSTEM PERFORMANCE CHECK COMPOUNDS (**)
X - - - NOT DETECTABLE AT 20 NG

FORM VI

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 1)

Case No: D827 Region: _____ Calibration Date: 08/27/87
Contractor: VERSAR ESMO Time: 11:12
Contract No: _____ Laboratory ID: 0827S2A1
Instrument ID: MS-A Initial Cali. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
Phenol		1.703	1.853	-8.8	*	
bis(2-Chloroethyl)Ether		1.700	1.710	-0.6		
2-Chlorophenol		1.538	1.531	0.5		
1,3-Dichlorobenzene		1.772	1.602	9.6		
1,4-Dichlorobenzene		1.826	1.616	11.5	*	
Benzyl Alcohol		0.931				
1,2-Dichlorobenzene		1.757	1.548	11.9		
2-Methylphenol		0.931				
bis(2-Chloroisopropyl)Ether		1.955	2.038	-4.2		
4-Methylphenol		1.333				
N-Nitroso-Di-n-Propylamine		1.700	1.524	10.4		* *
Hexachloroethane		0.897	0.955	-6.5		
Nitrobenzene		0.502	0.539	-7.4		
Isophorone		0.969	0.989	-2.1		
2-Nitrophenol		0.207	0.224	-8.2	*	
2,4-Dimethylphenol		0.313	0.540	-72.5		
Benzoic Acid	x	0.118				
bis(2-Chloroethoxy)Methane		0.503	0.589	-17.1		
2,4-Dichlorophenol		0.298	0.293	1.7	*	
1,2,4-Trichlorobenzene		0.356	0.331	7.0		
Naphthalene		1.015	1.073	-5.7		
4-Chloroaniline		0.179				
Hexachlorobutadiene		0.236	0.260	-10.2	*	
4-Chloro-3-Methylphenol		0.375	0.441	-17.6	*	
2-Methylnaphthalene		0.875				
Hexachlorocyclopentadiene		0.262	0.291	-11.1		* *
2,4,6-Trichlorophenol		0.462	0.396	14.3	*	
2,4,5-Trichlorophenol	x	0.367				
2-Chloronaphthalene		1.311	1.034	21.1		
2-Nitroaniline	x	0.422				
Dimethyl Phthalate		1.517	1.342	11.5		
Acenaphthalene		1.807	1.627	10.0		
2,6-Dinitrotoluene		0.263	0.239	9.1		
3-Nitroaniline	x	0.093				
Acenaphthene		1.190	1.147	3.6	*	
2,4-Dinitrophenol	x	0.113	0.155	-37.2		* *

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

CONTINUING CALIBRATION CHECK
SEMIVOLATILE HSL COMPOUNDS
(Page 2)

Case No: D827 Region: _____ Calibration Date: 08/27/87
Contractor: VERSAR ESMO Time: 11:12
Contract No: _____ Laboratory ID: 0827S2A1
Instrument ID: MS-A Initial Call. Date: 01/27/87

Minimum RF for SPCC is 0.050 Maximum %D for CCC is 25%

Compound		AVE RF	RF(50)	% D	CCC	SPCC
4-Nitrophenol	x	0.370	0.302	18.4		* *
Dibenzofuran		1.803				
2,4-Dinitrotoluene		0.344	0.372	-8.1		
Diethylphthalate		1.686	1.688	-0.1		
4-Chlorophenyl-phenylether		0.676	0.571	15.5		
Fluorene		1.275	1.256	1.5		
4-Nitroaniline	x	0.097				
4,6-Dinitro-2-Methylphenol	x	0.128	0.155	-21.1		
N-Nitrosodiphenylamine		0.494	0.430	13.0	*	
4-Bromophenyl-phenylether		0.316	0.285	9.8		
Hexachlorobenzene		0.373	0.397	-6.4		
Pentachlorophenol	x	0.160	0.174	-8.8	*	
Phenanthrene		1.193	1.054	11.7		
Anthracene		1.194	1.038	13.1		
Di-n-Butylphthalate		1.615	1.955	-21.1		
Fluoranthene		1.228	1.253	-2.0	*	
Pyrene		1.449	1.532	-5.7		
Butylbenzylphthalate		0.758	0.911	-20.2		
3,3'-Dichlorobenzidine		0.051	0.183	-258.8		
Benzo(a)Anthracene		1.100	1.119	-1.7		
Chrysene		1.128	1.066	5.5		
bis(2-Ethylhexyl)Phthalate		1.072	1.221	-13.9		
Di-n-Octyl Phthalate		2.656	2.584	2.7	*	
Benzo(b)fluoranthene		1.564				
Benzo(k)fluoranthene		1.568				
Benzo(a)Pyrene		1.209	1.155	4.5	*	
Indeno(1,2,3-cd)Pyrene		0.701	0.813	-16.0		
Dibenz(a,h)Anthracene		0.705	0.511	27.5		
Benzo(g,h,i)Perylene		0.724	0.578	20.2		

RF(50) - Response Factor from daily standard file at concentration indicated (50 total nanograms)
AVE RF - Average Response Factor from initial calibration Form VI
%D - - - Percent Difference
x - - - Due to low response analyze at 80 total nanograms
CCC - - Calibration Check Compounds (*)
SPCC - - System Performance Check Compounds (**)

Form VII

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

LABORATORY BLANKS

ORGANICS AND INORGANICS

Table B-1. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3311-3314	1.0	<1.0	403
Chloride	3311-3314	0.25	<0.25	325.3
CyanideTot	3311-3314	0.010	<0.010	335.2
CyanideFree	3311-3314	0.010	<0.010	412H
FluorideIC	3311-3314	1.6	<1.6	300.0
FluorideISE	3311-3314	1.0	<1.0	340.2
Sulfate IC	3311-3314	2.0	<2.0	300.0
SulfateTurb	3311-3314	5.0	<5.0	375.4
CalciumDiss	3311-3314	0.500	<0.500	200.7
MagnesiumDiss	3311-3314	0.500	<0.500	200.7
PotassiumDiss	3311-3314	1.00	<1.00	200.7
SodiumDiss	3311-3314	1.00	<1.00	200.7
SodiumTot	3311-3314	1.00	<1.00	200.7

Table B-4. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3315-3320	1.0	<1.0	403
Chloride	3315-3320	0.25	<0.25	325.3
CyanideTot	3315-3320	0.010	<0.010	335.2
CyanideFree	3315-3320	0.010	<0.010	412H
FluorideIC	3315-3320	1.6	<1.6	300.0
FluorideISE	3315-3320	1.0	<1.0	340.2
Sulfate IC	3315-3320	2.0	<2.0	300.0
SulfateTurb	3315-3320	5.0	<5.0	375.4
CalciumDiss	3315-3320	0.500	<0.500	200.7
MagnesiumDiss	3315-3320	0.500	<0.500	200.7
PotassiumDiss	3315-3320	1.00	<1.00	200.7
SodiumDiss	3315-3320	1.00	<1.00	200.7
SodiumTot	3315-3320	1.00	<1.00	200.7

Table B-6. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3327-3333	1.0	<1.0	403
Chloride	3327-3333	0.64	<0.64	325.3
CyanideTot	3327-3333	0.010	<0.010	335.2
CyanideFree	3327-3333	0.010	<0.010	412H
FluorideIC	3327-3333	1.6	<1.6	300.0
FluorideISE	3327-3333	1.0	<1.0	340.2
Sulfate IC	3327-3333	2.0	<2.0	300.0
SulfateTurb	3327-3333	5.0	<5.0	375.4
CalciumDiss	3327-3333	0.500	<0.500	200.7
MagnesiumDiss	3327-3333	0.500	<0.500	200.7
PotassiumDiss	3327-3333	1.00	<1.00	200.7
SodiumDiss	3327-3333	1.00	<1.00	200.7
SodiumTot	3327-3333	1.00	<1.00	200.7

Table B-7. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3334-3337	1.0	<1.0	403
Chloride	3334-3337	0.25	<0.25	325.3
CyanideTot	3334-3337	0.010	<0.010	335.2
CyanideFree	3334-3337	0.010	<0.010	412H
FluorideIC	3334-3337	1.6	<1.6	300.0
FluorideISE	3334-3337	1.0	<1.0	340.2
Sulfate IC	3334-3337	2.0	<2.0	300.0
SulfateTurb	3334-3337	5.0	<5.0	375.4
CalciumDiss	3334-3337	0.500	<0.500	200.7
MagnesiumDiss	3334-3337	0.500	<0.500	200.7
PotassiumDiss	3334-3337	1.00	<1.00	200.7
SodiumDiss	3334-3337	1.00	<1.00	200.7
SodiumTot	3334-3337	1.00	<1.00	200.7

Table B-11. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3342-3345	1.0	<1.0	403
Chloride	3342-3345	0.25	<0.25	325.3
CyanideTot	3342-3345	0.010	<0.010	335.2
CyanideFree	3342-3345	0.010	<0.010	412H
FluorideIC	3342-3345	1.6	<1.6	300.0
FluorideISE	3342-3345	1.0	<1.0	340.2
Sulfate IC	3342-3345	2.0	<2.0	300.0
SulfateTurb	3342-3345	5.0	<5.0	375.4
CalciumDiss	3342-3345	0.500	<0.500	200.7
MagnesiumDiss	3342-3345	0.500	<0.500	200.7
PotassiumDiss	3342-3345	1.00	<1.00	200.7
SodiumDiss	3342-3345	1.00	<1.00	200.7
SodiumTot	3342-3345	1.00	<1.00	200.7

Table B-13. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3458-3465	1.0	<1.0	403
Chloride	3458-3465	1.4	<1.4	300.0
CyanideTot	3458-3465	0.010	<0.010	335.2
CyanideFree	3458-3465	0.010	<0.010	412H
FluorideIC	3458-3465	1.6	<1.6	300.0
FluorideISE	3458-3465	1.0	<1.0	340.2
Sulfate IC	3458-3465	2.0	<2.0	300.0
SulfateTurb	3458-3465	5.0	<5.0	375.4
CalciumDiss	3458-3465	0.500	<0.500	200.7
MagnesiumDiss	3458-3465	0.500	<0.500	200.7
PotassiumDiss	3458-3465	1.00	<1.00	200.7
SodiumDiss	3458-3465	1.00	<1.00	200.7
SodiumTot	3458-3465	1.00	<1.00	200.7

Table B-16. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3482-3488	1.0	<1.0	403
Chloride	3482-3488	0.25	<0.25	325.3
CyanideTot	3482-3488	0.010	<0.010	335.2
CyanideFree	3482-3488	0.010	<0.010	412H
FluorideIC	3482-3488	1.6	<1.6	300.0
FluorideISE	3482-3488	1.0	<1.0	340.2
Sulfate IC	3482-3488	2.0	<2.0	300.0
SulfateTurb	3482-3488	5.0	<5.0	375.4
CalciumDiss	3482-3488	0.500	<0.500	200.7
MagnesiumDiss	3482-3488	0.500	<0.500	200.7
PotassiumDiss	3482-3488	1.00	<1.00	200.7
SodiumDiss	3482-3488	1.00	<1.00	200.7
SodiumTot	3482-3488	1.00	<1.00	200.7

Table B-18. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3527-3531	1.0	<1.0	403
Chloride	3527-3531	0.25	<0.25	325.3
CyanideTot	3527-3531	0.010	<0.010	335.2
CyanideFree	3527-3531	0.010	<0.010	412H
FluorideIC	3527-3531	1.6	<1.6	300.0
FluorideISE	3527-3531	1.0	<1.0	340.2
Sulfate IC	3527-3531	2.0	<2.0	300.0
SulfateTurb	3527-3531	5.0	<5.0	375.4
CalciumDiss	3527-3531	0.500	<0.500	200.7
MagnesiumDiss	3527-3531	0.500	<0.500	200.7
PotassiumDiss	3527-3531	1.00	<1.00	200.7
SodiumDiss	3527-3531	1.00	<1.00	200.7
SodiumTot	3527-3531	1.00	<1.00	200.7

Table B-20. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3532-3544	1.0	<1.0	403
Chloride	3532-3544	0.25	<0.25	325.3
CyanideTot	3532-3544	0.010	<0.010	335.2
CyanideFree	3532-3544	0.010	<0.010	412H
FluorideIC	3532-3544	1.6	<1.6	300.0
FluorideISE	3532-3544	1.0	<1.0	340.2
Sulfate IC	3532-3544	2.0	<2.0	300.0
SulfateTurb	3532-3544	5.0	<5.0	375.4
CalciumDiss	3532-3544	0.500	<0.500	200.7
MagnesiumDiss	3532-3544	0.500	<0.500	200.7
PotassiumDiss	3532-3544	1.00	<1.00	200.7
SodiumDiss	3532-3544	1.00	<1.00	200.7
SodiumTot	3532-3544	1.00	<1.00	200.7

Table B-23. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3567-3577	1.0	<1.0	403
Chloride	3567-3577	0.25	<0.25	325.3
CyanideTot	3567-3577	0.010	<0.010	335.2
CyanideFree	3567-3577	0.010	<0.010	412H
FluorideIC	3567-3577	1.6	<1.6	300.0
FluorideISE	3567-3577	1.0	<1.0	340.2
Sulfate IC	3567-3577	2.0	<2.0	300.0
SulfateTurb	3567-3577	5.0	<5.0	375.4
CalciumDiss	3567-3577	0.500	<0.500	200.7
MagnesiumDiss	3567-3577	0.500	<0.500	200.7
PotassiumDiss	3567-3577	1.00	<1.00	200.7
SodiumDiss	3567-3577	1.00	<1.00	200.7
SodiumTot	3567-3577	1.00	<1.00	200.7

Table B-26. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3584-3591	1.0	<1.0	403
Chloride	3584-3591	0.25	<0.25	325.3
CyanideTot	3584-3591	0.010	<0.010	335.2
CyanideFree	3584-3591	0.010	<0.010	412H
FluorideIC	3584-3591	1.6	<1.6	300.0
FluorideISE	3584-3591	1.0	<1.0	340.2
Sulfate IC	3584-3591	2.0	<2.0	300.0
SulfateTurb	3584-3591	5.0	<5.0	375.4
CalciumDiss	3584-3591	0.500	<0.500	200.7
MagnesiumDiss	3584-3591	0.500	<0.500	200.7
PotassiumDiss	3584-3591	1.00	<1.00	200.7
SodiumDiss	3584-3591	1.00	<1.00	200.7
SodiumTot	3584-3591	1.00	<1.00	200.7

Table B-29. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3617-3621	1.0	<1.0	403
Chloride	3617-3621	0.25	<0.25	325.3
CyanideTot	3617-3621	0.010	<0.010	335.2
CyanideFree	3617-3621	0.010	<0.010	412H
FluorideIC	3617-3621	1.6	<1.6	300.0
FluorideISE	3617-3621	1.0	<1.0	340.2
Sulfate IC	3617-3621	2.0	<2.0	300.0
SulfateTurb	3617-3621	5.0	<5.0	375.4
CalciumDiss	3617-3621	0.500	<0.500	200.7
MagnesiumDiss	3617-3621	0.500	<0.500	200.7
PotassiumDiss	3617-3621	1.00	<1.00	200.7
SodiumDiss	3617-3621	1.00	<1.00	200.7
SodiumTot	3617-3621	1.00	<1.00	200.7

Table B-31. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3622-3623,3626-3633	1.0	<1.0	403
Chloride	3622-3623,3626-3633	0.25	<0.25	325.3
CyanideTot	3622-3623,3626-3633	0.010	<0.010	335.2
CyanideFree	3622-3623,3626-3633	0.010	<0.010	412H
FluorideIC	3622-3623,3626-3633	1.6	<1.6	300.0
FluorideISE	3622-3623,3626-3633	1.0	<1.0	340.2
Sulfate IC	3622-3623,3626-3633	2.0	<2.0	300.0
SulfateTurb	3622-3623,3626-3633	5.0	<5.0	375.4
CalciumDiss	3622-3623,3626-3633	0.500	<0.500	200.7
MagnesiumDiss	3622-3623,3626-3633	0.500	<0.500	200.7
PotassiumDiss	3622-3623,3626-3633	1.00	<1.00	200.7
SodiumDiss	3622-3623,3626-3633	1.00	<1.00	200.7
SodiumTot	3622-3623,3626-3633	1.00	<1.00	200.7

Table B-33. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3648, 3666-3669	1.0	<1.0	403
Chloride	3648, 3666-3669	0.25	<0.25	325.3
CyanideTot	3648, 3666-3669	0.010	<0.010	335.2
CyanideFree	3648, 3666-3669	0.010	<0.010	412H
FluorideIC	3648, 3666-3669	1.6	<1.6	300.0
FluorideISE	3648, 3666-3669	1.0	<1.0	340.2
Sulfate IC	3648, 3666-3669	2.0	<2.0	300.0
SulfateTurb	3648, 3666-3669	5.0	<5.0	375.4
CalciumDiss	3648, 3666-3669	0.500	<0.500	200.7
MagnesiumDiss	3648, 3666-3669	0.500	<0.500	200.7
PotassiumDiss	3648, 3666-3669	1.00	<1.00	200.7
SodiumDiss	3648, 3666-3669	1.00	<1.00	200.7
SodiumTot	3648, 3666-3669	1.00	<1.00	200.7

Table B-35. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3673-3676	1.0	<1.0	403
Chloride	3673-3676	0.25	<0.25	325.3
CyanideTot	3673-3676	0.010	<0.010	335.2
CyanideFree	3673-3676	0.010	<0.010	412H
FluorideIC	3673-3676	1.6	<1.6	300.0
FluorideISE	3673-3676	1.0	<1.0	340.2
Sulfate IC	3673-3676	2.0	<2.0	300.0
SulfateTurb	3673-3676	5.0	<5.0	375.4
CalciumDiss	3673-3676	0.500	<0.500	200.7
MagnesiumDiss	3673-3676	0.500	<0.500	200.7
PotassiumDiss	3673-3676	1.00	<1.00	200.7
SodiumDiss	3673-3676	1.00	<1.00	200.7
SodiumTot	3673-3676	1.00	<1.00	200.7

Table B-37. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3684-3689	1.0	<1.0	403
Chloride	3684-3689	0.25	<0.25	325.3
CyanideTot	3684-3689	0.010	<0.010	335.2
CyanideFree	3684-3689	0.010	<0.010	412H
FluorideIC	3684-3689	1.6	<1.6	300.0
FluorideISE	3684-3689	1.0	<1.0	340.2
Sulfate IC	3684-3689	2.0	<2.0	300.0
SulfateTurb	3684-3689	5.0	<5.0	375.4
CalciumDiss	3684-3689	0.500	<0.500	200.7
MagnesiumDiss	3684-3689	0.500	<0.500	200.7
PotassiumDiss	3684-3689	1.00	<1.00	200.7
SodiumDiss	3684-3689	1.00	<1.00	200.7
SodiumTot	3684-3689	1.00	<1.00	200.7

Table B-39. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3690-3693, 3715	1.0	<1.0	403
Chloride	3690-3693, 3715	0.25	<0.25	325.3
CyanideTot	3690-3693, 3715	0.010	<0.010	335.2
CyanideFree	3690-3693, 3715	0.010	<0.010	412H
FluorideIC	3690-3693, 3715	1.6	<1.6	300.0
FluorideISE	3690-3693, 3715	1.0	<1.0	340.2
Sulfate IC	3690-3693, 3715	2.0	<2.0	300.0
SulfateTurb	3690-3693, 3715	5.0	<5.0	375.4
CalciumDiss	3690-3693, 3715	0.500	<0.500	200.7
MagnesiumDiss	3690-3693, 3715	0.500	<0.500	200.7
PotassiumDiss	3690-3693, 3715	1.00	<1.00	200.7
SodiumDiss	3690-3693, 3715	1.00	<1.00	200.7
SodiumTot	3690-3693, 3715	1.00	<1.00	200.7

Table B-40. QC Summary -- Laboratory Blanks

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	Blank Result	Method #
Alkalinity	3742-3744	1.0	<1.0	403
Chloride	3742-3744	0.25	<0.25	325.3
CyanideTot	3742-3744	0.010	<0.010	335.2
CyanideFree	3742-3744	0.010	<0.010	412H
FluorideIC	3742-3744	1.6	<1.6	300.0
FluorideISE	3742-3744	1.0	<1.0	340.2
Sulfate IC	3742-3744	2.0	<2.0	300.0
SulfateTurb	3742-3744	5.0	<5.0	375.4
CalciumDiss	3742-3744	0.500	<0.500	200.7
MagnesiumDiss	3742-3744	0.500	<0.500	200.7
PotassiumDiss	3742-3744	1.00	<1.00	200.7
SodiumDiss	3742-3744	1.00	<1.00	200.7
SodiumTot	3742-3744	1.00	<1.00	200.7

Table C-1. Laboratory extraction blanks

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	ABLK0825 BLANK	ABLK0901 BLANK
LAB SAMPLE ID:	0825SWBA1	0901SWBA1
SAMPLE DATE:	08/25/87	09/01/87
EXTRACTION DATE:	08/25/87	09/01/87
ANALYSIS DATE:	08/27/87	09/03/87
FILE NAME:	0825SWBA1	0901SWBA1
INSTRUMENT ID:	MS-A	MS-A
MATRIX:	WATER	WATER
UNITS:	UG/L	UG/L
COMPOUNDS		
Acenaphthalene	< 10	< 10
Acenaphthene	< 10	< 10
Anthracene	< 10	< 10
Benzidine	< 80	< 80
Benzo(a)Anthracene	< 10	< 10
Benzo(a)Pyrene	< 10	< 10
Benzo(b+k)fluoranthenes	< 10	< 10
Benzo(g,h,i)Perylene	< 10	< 10
4-Bromophenyl-phenylether	< 10	< 10
Butylbenzylphthalate	< 10	< 10
4-Chloro-3-Methylphenol	< 10	< 10
bis(2-Chloroethoxy)Methane	< 10	< 10
bis(2-Chloroethyl)Ether	< 10	< 10
bis(2-Chloroisopropyl)Ether	< 10	< 10
2-Chloronaphthalene	< 10	< 10
2-Chlorophenol	< 10	< 10
4-Chlorophenyl-phenylether	< 10	< 10
Chrysene	< 10	< 10
Di-n-Butylphthalate	< 10	< 10
Di-n-Octyl Phthalate	< 10	< 10
Dibenz(a,h)Anthracene	< 10	< 10
1,2-Dichlorobenzene	< 10	< 10
1,4-Dichlorobenzene	< 10	< 10
1,3-Dichlorobenzene	< 10	< 10
3,3'-Dichlorobenzidine	< 20	< 20
2,4-Dichlorophenol	< 10	< 10
Diethylphthalate	< 10	< 10
Dimethyl Phthalate	< 10	< 10
2,4-Dimethylphenol	< 10	< 10
4,6-Dinitro-2-Methylphenol	< 50	< 50
2,4-Dinitrophenol	< 50	< 50
2,4-Dinitrotoluene	< 10	< 10
2,6-Dinitrotoluene	< 10	< 10
1,2-Diphenylhydrazine	< 10	< 10
bis(2-Ethylhexyl)Phthalate	< 10	< 10
Fluoranthene	< 10	< 10

Table C-1. Continued

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	ABLK0825 BLANK	ABLK0901 BLANK
LAB SAMPLE ID:	0825SWBA1	0901SWBA1
SAMPLE DATE:	08/25/87	09/01/87
EXTRACTION DATE:	08/25/87	09/01/87
ANALYSIS DATE:	08/27/87	09/03/87
FILE NAME:	0825SWBA1	0901SWBA1
INSTRUMENT ID:	MS-A	MS-A
MATRIX:	WATER	WATER
UNITS:	UG/L	UG/L
COMPOUNDS		
Fluorene	< 10	< 10
Hexachlorobenzene	< 10	< 10
Hexachlorobutadiene	< 10	< 10
Hexachlorocyclopentadiene	< 10	< 10
Hexachloroethane	< 10	< 10
Indeno(1,2,3-cd)Pyrene	< 10	< 10
Isophorone	< 10	< 10
N-Nitroso-Di-n-Propylamine	< 10	< 10
N-Nitrosodimethylamine	< 5	< 5
N-Nitrosodiphenylamine	< 10	< 10
Naphthalene	< 10	< 10
Nitrobenzene	< 10	< 10
4-Nitrophenol	< 50	< 50
2-Nitrophenol	< 10	< 10
Pentachlorophenol	< 50	< 50
Phenanthrene	< 10	< 10
Phenol	< 10	< 10
Pyrene	< 10	< 10
1,2,4-Trichlorobenzene	< 10	< 10
2,4,6-Trichlorophenol	< 10	< 10

Table C-3. Method blank summaries

Lab File ID: 0825SWBA1 Lab Sample ID: 0825SWBA1

Date Extracted: 08/25/87 Extraction: (SepF/Cont/Sonc) ____

Date Analyzed: 08/27/87 Time Analyzed: 1211

Matrix: (soil/water) WATER Level: (low/med) LOW

Instrument ID: MS-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	AMSTD0825	0825MSTD	0825MSTD	08/27/87
02	MW-15S	3676	BNA3676	08/27/87
03	MWREP-15	3669	BNA3669	08/27/87
04	RESIDENCE	3668	BNA3668	08/27/87
05	RESIDENCEMS	3668MS	BNA3668MS	08/27/87
06	RESIDENCEMSD	3668MSD	BNA3668MSD	08/27/87

COMMENTS: LAB BLANK 8/25/87
MS-A 35DEG(2 MIN) TO 300DEG AT 15DEG/MIN

Lab File ID: 0901SWBA1 Lab Sample ID: 0901SWBA1

Date Extracted: 09/01/87 Extraction: (SepF/Cont/Sonc) ____

Date Analyzed: 09/03/87 Time Analyzed: 1157

Matrix: (soil/water) WATER Level: (low/med) LOW

Instrument ID: MS-A

THIS METHOD BLANK APPLIES TO THE FOLLOWING SAMPLES, MS AND MSD:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED
01	AMSTD901	0901MSTD	0901MSTD	09/03/87
02	LEACHATE	3717AE	BNA3717AE	09/03/87
03	LEACHATE	3717BE	BNA3717BE	09/03/87
04	REPLICATE	3716	BNA3716	09/03/87

COMMENTS: BNA LAB BLANK ED=9/1/87 FOR DALLES 3716-17
MS-A 35DEG(2 MIN) TO 300DEG AT 10DEG/MIN

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

SURROGATE SPIKE RESULTS

Table C-4. Surrogate spike recoveries

	EPA SAMPLE NO.	S1 (NBZ)#	S2 (FBP)#	S3 (TPH)#	S4 (PHL)#	S5 (2FP)#	S6 (TBP)#	OTHER	TOT OUT
01	ABLK0825	79	70	77	62	71	77		0
02	AMSTD0825	91	71	90	87	86	84		0
03	MW-15S	81	81	82	72	82	78		0
04	MWREP-15	97	85	85	40	34	47		0
05	RESIDENCE	74	73	89	53	54	61		0
06	RESIDENCEMS	86	84	87	74	64	61		0
07	RESIDENCEMSD	82	78	79	47	41	47		0

	GC LIMITS
S1 (NBZ) = Nitrobenzene-d5	(35-114)
S2 (FBP) = 2-Fluorobiphenyl	(43-116)
S3 (TPH) = Terphenyl	(33-141)
S4 (PHL) = Phenol-d5	(10-94)
S5 (2FP) = 2-Fluorophenol	(21-100)
S6 (TBP) = 2,4,6-Tribromophenol	(10-123)

	EPA SAMPLE NO.	S1 (NBZ)#	S2 (FBP)#	S3 (TPH)#	S4 (PHL)#	S5 (2FP)#	S6 (TBP)#	OTHER	TOT OUT
01	ABLK0901	81	64	101	52	56	29		0
02	AMSTD901	86	71	96	82	86	87		0
03	LEACHATE	70	62	64	60	69	61		0
04	LEACHATE	72	70	69	62	70	70		0
05	REPLICATE	70	68	59	59	67	73		0

	GC LIMITS
S1 (NBZ) = Nitrobenzene-d5	(35-114)
S2 (FBP) = 2-Fluorobiphenyl	(43-116)
S3 (TPH) = Terphenyl	(33-141)
S4 (PHL) = Phenol-d5	(10-94)
S5 (2FP) = 2-Fluorophenol	(21-100)
S6 (TBP) = 2,4,6-Tribromophenol	(10-123)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

MATRIX SPIKE/MATRIX SPIKE DUPLICATE

Table C-2. Matrix spike (MS) and matrix spike duplicate (MSD) recoveries: semivolatiles in groundwater matrix

Sample No.: RESIDENCE

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	MS CONCENTRATION (ug/L)	MS % REC	#	QC LIMITS REC.
Phenol	200	0	158	79		12- 89
2-Chlorophenol	200	0	157	79		27-123
1,4-Dichlorobenzene	100	0	71.0	71		36 97
N-Nitroso-di-n-prop.(1)	100	0	68.4	68		41 116
1,2,4-Trichlorobenzene	100	0	69.6	70		39 98
4-Chloro-3-methylphenol	200	0	182	91		23 97
Acenaphthene	100	0	79.6	80		46-118
4-Nitrophenol	200	0	220	110	*	10- 80
2,4-Dinitrotoluene	100	0	84.8	85		24- 96
Pentachlorophenol	200	0	108	54		9-103
Pyrene	100	0	81.2	81		26-127

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	MSD % REC	#	% RPD	#	GC LIMITS RPD	GC LIMITS REC.
Phenol	200	101	51		44	*	42	12- 89
2-Chlorophenol	200	104	52		41	*	40	27-123
1,4-Dichlorobenzene	100	64.2	64		10		28	36 97
N-Nitroso-di-n-prop.(1)	100	77.6	78		-13		38	41 116
1,2,4-Trichlorobenzene	100	71.0	71		-2		28	39 98
4-Chloro-3-methylphenol	200	147	74		21		42	23 97
Acenaphthene	100	79.0	79		1		31	46-118
4-Nitrophenol	200	184	92	*	18		50	10- 80
2,4-Dinitrotoluene	100	100	100	*	-16		38	24- 96
Pentachlorophenol	200	95.8	48		12		50	9-103
Pyrene	100	90.2	90		-11		31	26-127

(1) N-Nitroso-di-n-propylamine

Column to be used to flag recovery and RPD values with an asterisk
* Values outside of QC limits

RPD: 2 out of 11 outside limits
Spike Recovery: 3 out of 22 outside limits

COMMENTS: BNA 3668 RESIDENCE WELL S-8/19/87 E-8/25/87
MS-A 35DEG(2 MIN) TO 300DEG AT 15DEG/MIN

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

CALIBRATION CURVE STANDARDS - INORGANICS

Table B-42. Concentration of Calibration Curve Standards

Parameter	Method	Standard Concentration	Units
Fluoride	300.0	1.0	mg/L
Fluoride	300.0	5.0	mg/L
Fluoride	300.0	10	mg/L
Fluoride	300.0	20	mg/L
Fluoride	340.2	0.10	mg/L
Fluoride	340.2	1.0	mg/L
Fluoride	340.2	10	mg/L
Fluoride	340.2	50	mg/L
Fluoride	340.2	100	mg/L
Fluoride	340.2	250	mg/L
Fluoride	340.2	500	mg/L
Fluoride	340.2	1000	mg/L
Sulfate	300.0	1.0	mg/L
Sulfate	300.0	5.0	mg/L
Sulfate	300.0	10	mg/L
Sulfate	300.0	20	mg/L

Table B-42. Continued

Parameter	Method	Standard Concentration	Units
Sulfate	375.4	5.0	mg/L
Sulfate	375.4	10	mg/L
Sulfate	375.4	15	mg/L
Sulfate	375.4	20	mg/L
Sulfate	375.4	25	mg/L
Sulfate	375.4	30	mg/L
Sulfate	375.4	35	mg/L
Sulfate	375.4	40	mg/L
Total Cyanide	335.2	2.5	ug/250mL
Total Cyanide	335.2	12.5	ug/250mL
Total Cyanide	335.2	50	ug/250mL
Total Cyanide	335.2	100	ug/250mL
Total Cyanide	335.2	200	ug/250mL
Free Cyanide	412H	2.5	ug/250mL
Free Cyanide	412H	12.5	ug/250mL
Free Cyanide	412H	50	ug/250mL
Free Cyanide	412H	100	ug/250mL
Free Cyanide	412H	200	ug/250mL

Table B-42. Continued

Parameter	Method	Standard Concentration	Units
Calcium	200.7	100	mg/L
Magnesium	200.7	100	mg/L
Potassium	200.7	50	mg/L
Sodium	200.7	250	mg/L

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

INITIAL AND CONTINUING CALIBRATION VERIFICATION

INORGANICS

Table B-43. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE):_____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Calcium(b)	10	10.3	103	10	10.2	102
Calcium(c)	10	10.3	103	10	10.4	104
Calcium(d)	10	10.2	102	10	10.2	102
Calcium(e)	10	10.2	102	10	10.2	102
Calcium(f)	10	10.2	102	10	9.9	99
Calcium(g)	10	10.2	102	10	9.8	98
Calcium(h)	10	10.2	102	10	9.3	93
Calcium(i)	10	10.0	100	10	9.7	97
Calcium(j)	10	10.0	100	10	9.4	94
Calcium(k)	10	10.0	100	10	9.4	94
Calcium(l)	10	10.0	100	10	9.5	95
Calcium(m)	10	10.4	104	10	10.5	105
Calcium(n)	10	10.4	104	10	10.5	105
Calcium(o)	10	10.4	104	10	10.8	108
Calcium(p)	10	10.4	104	10	10.0	100
Calcium(q)	10	10.4	104	10	9.8	98
Calcium(r)	10	10.3	103	10	10.2	102
Calcium(s)	10	10.3	103	10	10.3	103

Table B-43. Continued

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Calcium(t)	10	9.9	99	10	9.8	98
Calcium(u)	10	9.9	99	10	10.5	105
Calcium(v)	10	10.1	101	10	10.3	103
Calcium(w)	10	10.1	101	10	10.4	104
Calcium(x)	10	10.1	101	10	10.5	105
Calcium(y)	10	10.1	101	10	10.5	105

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 3311-3312
(c) Samples 3313-3314
(d) Samples 3315-3320
(e) Samples 3327
(f) Samples 3328-3331
(g) Samples 3332-3334, 3337
(h) Samples 3335
(i) Samples 3342-3345, 3358-3359
(j) Samples 3460-3465, 3482
(k) Samples 3482-3485
(l) Samples 3486-3488
(m) Samples 3527-3532
(n) Samples 3533-3540
(o) Samples 3540-3544
(p) Samples 3567-3572
(q) Samples 3573-3577
(r) Samples 3584-3589
(s) Samples 3590-3591, 3617-3619
(t) Samples 3620-3623, 3626-3627
(u) Samples 3628-3633
(v) Samples 3648, 3666-3668, 3673-3675, 3684
(w) Samples 3668, 3684-3687
(x) Samples 3668-3693, 3715
(y) Samples 3742-3743

Table B-44. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE):_____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Magnesium(b)	10	10.7	107	10	10.4	104
Magnesium(c)	10	10.7	107	10	10.8	108
Magnesium(d)	10	10.6	106	10	10.6	106
Magnesium(e)	10	10.6	106	10	10.6	106
Magnesium(f)	10	10.6	106	10	9.7	97
Magnesium(g)	10	10.6	106	10	9.4	94
Magnesium(h)	10	10.6	106	10	9.2	92
Magnesium(i)	10	10.2	102	10	10.1	101
Magnesium(j)	10	10.2	102	10	9.9	99
Magnesium(k)	10	10.2	102	10	10.2	102
Magnesium(l)	10	10.2	102	10	10.2	102
Magnesium(m)	10	10.9	109	10	11.0	110
Magnesium(n)	10	10.4	104	10	10.5	105
Magnesium(o)	10	10.9	109	10	10.9	109
Magnesium(p)	10	10.9	109	10	10.5	105
Magnesium(q)	10	10.9	109	10	10.6	106
Magnesium(r)	10	10.5	105	10	10.7	107
Magnesium(s)	10	10.5	105	10	10.9	109

Table B-44. Continued

Parameter	Initial Calibration True Value	Amount Found	(a) %R	Continuing Calibration True Value	Amount Found	(a) %R
Magnesium(t)	10	10.1	101	10	10.2	102
Magnesium(u)	10	10.1	101	10	10.6	106
Magnesium(v)	10	10.3	103	10	10.4	104
Magnesium(w)	10	10.3	103	10	10.6	106
Magnesium(x)	10	10.3	103	10	10.6	106
Magnesium(y)	10	10.3	103	10	10.4	104

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 3311-3312
(c) Samples 3313-3314
(d) Samples 3315-3320
(e) Sample 3327
(f) Samples 3328-3331
(g) Samples 3332-3334, 3337
(h) Sample 3335
(i) Samples 3342-3345, 3458-3459
(j) Samples 3460-3465
(k) Samples 3482-3485
(l) Samples 3486-3488
(m) Samples 3527-3532
(n) Samples 3533-3540
(o) Samples 3540-3544
(p) Samples 3567-3572
(q) Samples 3573-3577
(r) Samples 3584-3589
(s) Samples 3590-3591, 3617-3619
(t) Samples 3620-3623, 3626-3627
(u) Samples 3628-3633
(v) Samples 3648, 3666-3668, 3673-3675, 3684
(w) Samples 3668, 3684-3687
(x) Samples 3688-3693, 3715
(y) Samples 3742-3743

Table B-45. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE):_____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Potassium(b)	10	10.7	107	10	10.4	104
Potassium(c)	10	10.0	100	10	10.1	101
Potassium(d)	10	10.0	100	10	9.9	99
Potassium(e)	10	10.0	100	10	10.2	102
Potassium(f)	10	10.3	103	10	10.5	105
Potassium(g)	10	10.3	103	10	10.0	100
Potassium(h)	10	10.3	103	10	10.4	104
Potassium(i)	10	9.8	98	10	10.0	100
Potassium(j)	10	9.8	98	10	9.8	98
Potassium(k)	10	9.8	98	10	10.1	101
Potassium(l)	10	9.8	98	10	10.4	104
Potassium(m)	10	9.6	96	10	9.6	96
Potassium(n)	10	9.6	96	10	9.8	98
Potassium(o)	10	9.6	96	10	9.8	98
Potassium(p)	10	9.6	96	10	10.0	100

Table B-45. Continued

Parameter	Initial Calibration True Value	Amount Found	(a) %R	Continuing Calibration True Value	Amount Found	(a) %R
Potassium(q)	10	9.7	97	10	9.9	99
Potassium(r)	10	9.7	97	10	9.6	96
Potassium(s)	10	9.7	97	10	9.7	97
Potassium(t)	10	9.7	97	10	9.6	96

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 3311-3314
(c) Samples 3315-3320
(d) Samples 3327-3331
(e) Samples 3332-3337
(f) Samples 3342-3345, 3358-3359
(g) Samples 3460-3465, 3482
(h) Samples 3483-3488
(i) Samples 3527-3534
(j) Samples 3535-3541
(k) Samples 3542-3544, 3567-3569
(l) Samples 3570-3577
(m) Samples 3584-3589
(n) Samples 3590-3591, 3617-3621
(o) Samples 3622-3623, 3626-3630
(p) Samples 3631-3633
(q) Samples 3648, 3666-3668, 3673-3675
(r) Samples 3684-3689
(s) Samples 3668, 3690-3693, 3715
(t) Samples 3742-3743

Table B-46. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE): _____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Sodium(b)	50	52.3	105	50	50.38	101
Sodium(c)	10	10.1	101	10	10.1	101
Sodium(d)	10	10.1	101	10	10.1	101
Sodium(e)	10	10.1	101	10	10.3	103
Sodium(f)	10	10.9	109	10	10.8	108
Sodium(g)	10	10.9	109	10	10.6	106
Sodium(h)	10	10.9	109	10	10.7	107
Sodium(i)	10	10.9	109	10	10.8	108
Sodium(j)	10	10.9	109	10	10.7	107
Sodium(k)	10	10.7	107	10	10.7	107
Sodium(l)	10	10.7	107	10	10.7	107
Sodium(m)	10	10.7	107	10	10.8	108
Sodium(n)	10	10.7	107	10	11.0	110
Sodium(o)	10	10.7	107	10	10.9	109
Sodium(p)	10	10.9	109	10	10.2	102

Table B-46. Continued

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Sodium(q)	10	10.9	109	10	10.0	100
Sodium(r)	10	10.9	109	10	9.9	99
Sodium(s)	10	10.9	109	10	10.8	108
Sodium(t)	10	10.9	109	10	11.0	110
Sodium(u)	10	10.9	109	10	10.6	106
Sodium(v)	10	10.9	109	10	10.7	107
Sodium(w)	10	10.9	109	10	10.6	106

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 3311-3314
(c) Samples 3315-3320
(d) Samples 3327-3332
(e) Samples 3332-3337
(f) Samples 3342-3345, 3458
(g) Samples 3459-3462
(h) Samples 3463-3465
(i) Samples 3482-3485
(j) Samples 3486-3488
(k) Samples 3527-3532
(l) Samples 3533-3539
(m) Samples 3540-3544
(n) Samples 3567-3571
(o) Samples 3572-3577
(p) Samples 3584-3590
(q) Samples 3591, 3617-3621
(r) Samples 3622-3623, 3626-3628
(s) Samples 3628-3633
(t) Samples 3648, 3666-3668
(u) Samples 3673-3675, 3684-3686
(v) Samples 3687-3693, 3715
(w) Samples 3691, 3742-3743

Table B-47. Initial and Continuing Calibration Verification

Associated Samples (ESM ID RANGE): see footnotes

Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
SodiumTot(b)	1.50	1.62	108	9.0	9.62	107
SodiumTot(c)	1.50	1.62	108	9.0	9.74	108
SodiumTot(d)	1.50	1.55	103	9.0	8.94	99
SodiumTot(e)	1.50	1.55	103	9.0	9.17	102
SodiumTot(f)	9.0	9.35	104	9.0	9.83	109
SodiumTot(g)	9.0	9.35	104	9.0	9.91	110
SodiumTot(h)	9.0	9.35	104	9.0	9.73	108
SodiumTot(i)	9.0	9.35	104	9.0	9.39	104
SodiumTot(j)	9.0	9.35	104	9.0	9.05	101
SodiumTot(k)	9.0	9.35	104	9.0	9.55	106
SodiumTot(l)	25	26.3	105	9.0	9.12	101
SodiumTot(m)	25	26.3	105	9.0	9.08	101
SodiumTot(n)	25	26.3	105	9.0	8.54	95
SodiumTot(o)	9.0	9.57	106	25	27.1	108
SodiumTot(p)	9.0	9.57	106	25	26.4	106

Table B-47. Continued

Parameter	Initial Calibration			Continuing Calibration		
	True Value	Amount Found	(a) %R	True Value	Amount Found	(a) %R
SodiumTot(q)	9.0	9.57	106	9.0	9.18	102
SodiumTot(r)	9.0	9.38	104	9.0	9.40	104
SodiumTot(s)	9.0	9.38	104	10	9.52	95
SodiumTot(t)	9.0	9.38	104	9.0	9.47	105
SodiumTot(u)	9.0	9.38	104	9.0	9.45	105

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 3311-3314
(c) Samples 3315-3320
(d) Samples 3327-3328, 3330-3331, 3333
(e) Samples 3329, 3332
(f) Samples 3334-3337
(g) Samples 3342-3345
(h) Samples 3458-3462
(i) Samples 3463-3465, 3482-3484
(j) Samples 3485-3488
(k) Samples 3527-3531
(l) Samples 3532-3535, 3537-3538
(m) Samples 3536, 3539-3544
(n) Samples 3567-3577
(o) Samples 3584-3590
(p) Samples 3591, 3617-3623, 3626-3630
(q) Samples 3631-3633
(r) Samples 3648, 3666-3668, 3673
(s) Samples 3674-3675, 3684-3688
(t) Samples 3689-3693, 3715
(u) Samples 3742-3743

Table B-48. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE):_____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Fluoride(b)	5.0	4.8	96	5.0	5.0	100
Fluoride(c)	5.0	4.8	96	5.0	4.8	96
Fluoride(d)	5.0	4.8	96	5.0	4.8	96
Fluoride(e)	5.0	4.8	96	5.0	4.9	98
Fluoride(f)	5.0	5.3	106	5.0	5.1	102
Fluoride(g)	5.0	5.3	106	5.0	4.7	94
Fluoride(h)	5.0	5.3	106	5.0	4.6	92
Fluoride(i)	5.0	4.8	96	5.0	4.6	92
Fluoride(j)	5.0	4.8	96	5.0	4.8	96
Fluoride(k)	5.0	5.1	102	5.0	5.2	104
Fluoride(l)	5.0	5.1	102	5.0	5.3	106
Fluoride(m)	5.0	4.7	94	5.0	4.7	94
Fluoride(n)	5.0	4.7	94	5.0	5.1	102
Fluoride(o)	5.0	4.8	96	5.0	4.6	92
Fluoride(p)	5.0	4.6	92	5.0	4.6	92

Table B-48. Continued

Associated Samples see footnotes (ESM ID RANGE):_____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Fluoride(q)	5.0	4.6	92	5.0	4.6	92
Fluoride(r)	5.0	5.3	106	5.0	5.3	106
Fluoride(s)	5.0	5.3	106	5.0	5.3	106
Fluoride(t)	5.0	5.3	106	5.0	5.3	106
Fluoride(u)	5.0	5.3	106	5.0	5.4	108
Fluoride(v)	5.0	5.3	106	5.0	5.2	104
Fluoride(w)	5.0	5.0	100	5.0	5.0	100
Fluoride(x)	5.0	5.0	100	5.0	5.5	110
Fluoride(y)	5.0	4.9	98	5.0	4.9	98
Fluoride(z)	5.0	4.9	98	5.0	4.9	98
Fluoride(aa)	5.0	4.9	98	5.0	5.1	102
Fluoride(bb)	5.0	5.4	108	5.0	5.3	106
Fluoride(cc)	5.0	5.4	108	5.0	4.7	94
Fluoride(dd)	5.0	5.4	108	5.0	4.7	94
Fluoride(ee)	5.0	5.1	102	5.0	4.8	96
Fluoride(ff)	5.0	5.1	102	5.0	4.6	92
Fluoride(gg)	5.0	4.7	94	5.0	4.5	90

Table B-48. Continued

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 3313
(c) Samples 3311-3312, 3314
(d) Samples 3315-3318
(e) Samples 3319
(f) Samples 3327-3330
(g) Samples 3331-3334
(h) Samples 3335-3337
(i) Samples 3342-3344
(j) Samples 3345
(k) Samples 3458-3461, 3483, 3487-3488
(l) Samples 3462-3463
(m) Samples 3464-3465, 3482, 3484-3485
(n) Samples 3463, 3485-3486
(o) Samples 3463, 3485, 3527-3528
(p) Samples 3528-3531, 3533
(q) Samples 3532, 3534-3535
(r) Samples 3536-3540
(s) Samples 3541-3543
(t) Samples 3543-3544, 3567-3568
(u) Samples 3568-3570
(v) Samples 3571-3573
(w) Samples 3574-3577, 3584-3585
(x) Samples 3586-3591
(y) Samples 3595-3596, 3610
(z) Samples 3617-3621
(aa) Samples 3622-3623, 3626, 3632-3633
(bb) Samples 3532, 3536, 3627, 3629-3630, 3667
(cc) Samples 3628, 3631, 3648, 3666, 3668, 3674-3674
(dd) Samples 3675, 3684-3685
(ee) Samples 3673-3675, 3668, 3691
(ff) Samples 3668, 3684-3687
(gg) Samples 3688-3690, 3692-3693, 3715, 3742-3743

Table B-49. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE): _____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Fluoride(b)	1.0	1.08	108	1.0	1.06	106
Fluoride(c)	1.0	1.08	108	1.0	1.06	106
Fluoride(d)	1.0	0.97	97	1.0	0.92	92
Fluoride(e)	1.0	0.97	97	1.0	0.92	92
Fluoride(f)	1.0	0.97	97	1.0	0.90	90
Fluoride(g)	1.0	0.97	97	1.0	0.90	90
Fluoride(h)	1.0	0.96	96	1.0	0.94	94
Fluoride(i)	1.0	0.96	96	1.0	0.94	94
Fluoride(j)	1.0	0.96	96	1.0	0.91	91
Fluoride(k)	1.0	0.90	90	1.0	0.91	91
Fluoride(l)	1.0	0.99	99	1.0	0.96	96
Fluoride(m)	1.0	1.0	100	1.0	0.95	95
Fluoride(n)	1.0	1.0	100	1.0	0.99	99
Fluoride(o)	1.0	1.0	100	1.0	0.94	94
Fluoride(p)	1.0	1.0	100	1.0	0.92	92
Fluoride(q)	1.0	0.96	96	1.0	0.94	94

Table B-49. Continued

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) 3311-3314
(c) Samples 3315-3320
(d) Samples 3327-3334
(e) Samples 3335-3337, 3342-3345
(f) Samples 3458-3464
(g) Samples 3465, 3482-3488
(h) Samples 3527-3534
(i) Samples 3535-3542
(j) Samples 3543-3544, 3567-3572
(k) Samples 3573-3577
(l) Samples 3584-3590
(m) Samples 3591, 3617-3621, 3627
(n) Samples 3622-3626, 3628-3631, 3668
(o) Samples 3632-3633, 3648, 3666-3667, 3673-3675, 3684
(p) Samples 3685-3689
(q) Samples 3690-3693, 3715, 3742-3743

Table B-50. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE):_____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Sulfate(b)	5.0	4.7	94	5.0	4.8	96
Sulfate(c)	5.0	4.7	94	5.0	4.6	92
Sulfate(d)	5.0	4.9	98	5.0	4.8	96
Sulfate(e)	5.0	4.9	98	5.0	4.9	98
Sulfate(f)	5.0	5.5	110	5.0	5.1	102
Sulfate(g)	5.0	5.5	110	5.0	4.9	98
Sulfate(h)	5.0	5.5	110	5.0	4.7	94
Sulfate(i)	5.0	4.5	90	5.0	4.8	96
Sulfate(j)	5.0	4.5	90	5.0	4.8	96
Sulfate(k)	5.0	5.2	104	5.0	5.3	106
Sulfate(l)	5.0	5.2	104	5.0	5.4	108
Sulfate(m)	5.0	4.7	94	5.0	4.6	92
Sulfate(n)	5.0	4.7	94	5.0	4.7	94
Sulfate(o)	5.0	4.7	94	5.0	4.6	92
Sulfate(p)	5.0	4.7	94	5.0	4.7	94

Table B-50. Continued

Parameter	Initial Calibration			Continuing Calibration		
	True Value	Amount Found	(a) %R	True Value	Amount Found	(a) %R
Sulfate(q)	5.0	5.1	102	5.0	5.1	102
Sulfate(r)	5.0	5.1	102	5.0	5.1	102
Sulfate(s)	5.0	5.1	102	5.0	4.7	94
Sulfate(t)	5.0	5.1	102	5.0	5.2	104
Sulfate(u)	5.0	4.9	98	5.0	4.9	98
Sulfate(v)	10	9.4	94	10	9.6	96
Sulfate(w)	10	9.4	94	10	9.2	92
Sulfate(x)	5.0	4.9	98	5.0	4.9	98
Sulfate(y)	5.0	4.9	98	5.0	4.9	98
Sulfate(z)	5.0	4.9	98	5.0	5.2	104
Sulfate(aa)	10	9.3	93	10	9.0	90
Sulfate(bb)	5.0	4.9	98	5.0	4.8	96
Sulfate(cc)	5.0	4.9	98	5.0	5.0	100
Sulfate(dd)	5.0	4.9	98	5.0	4.7	94
Sulfate(ee)	5.0	4.9	98	5.0	4.9	98

Table B-50. Continued

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Sample 3313
(c) Samples 3311-3312, 3314
(d) Samples 3315-3318
(e) Sample 3319
(f) Samples 3327-3330
(g) Samples 3331-3334
(h) Samples 3335-3337
(i) Samples 3342-3344
(j) Sample 3345
(k) Samples 3458-3461, 3483, 3487-3488
(l) Samples 3462-3463
(m) Samples 3464-3465, 3482, 3484-3485
(n) Samples 3463, 3485, 3527-3528
(o) Samples 3528-3531, 3533
(p) Samples 3532, 3534-3535
(q) Samples 3536-3541
(r) Samples 3541-3543
(s) Samples 3543-3544, 3567-3568
(t) Samples 3568-3570
(u) Samples 3571-3573
(v) Samples 3574-3577, 3584-3588
(w) Samples 3589-3591
(x) Samples 3595-3596, 3610
(y) Samples 3617-3621
(z) Samples 3622-3623, 3626, 3623-3633
(aa) Samples 3627-3631, 3648, 3666-3667
(bb) Samples 3668, 3673-3675, 3691
(cc) Samples 3684-3687
(dd) Samples 3687-3690, 3692
(ee) Samples 3693, 3715, 3742-3743

Table B-51. Initial and Continuing Calibration Verification

Associated Samples see footnotes (ESM ID RANGE): _____ Units: mg/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a) %R
Sulfate(b)	40	39	98	40	39	98
Sulfate(c)	30	26	85	30	26	85
Sulfate(d)	30	26	85	20	17.2	86
Sulfate(e)	30	26	85	20	19	95
Sulfate(f)	20	20.2	101	30	28.4	95
Sulfate(g)	20	20.2	101	20	19.6	98
Sulfate(h)	20	20.2	101	20	19.3	97
Sulfate(i)	20	20	100	20	18	90
Sulfate(j)	20	20	100	20	20	100
Sulfate(k)	20	19.1	96	20	19.4	97
Sulfate(l)	20	19.1	96	20	19.4	97
Sulfate(m)	20	19.1	96	20	18	90
Sulfate(n)	20	19.1	96	20	18.8	94
Sulfate(o)	20	21	105	20	20	100
Sulfate(p)	20	21	105	20	21	105

Table B-51. Continued

Associated Samples see footnotes (ESM ID RANGE): _____ Units: mg/L

Sulfate(q)	20	21	105	20	20.4	102
Sulfate(r)	20	19.4	97	20	20	100
Sulfate(s)	20	19.4	97	20	19.4	97
Sulfate(t)	20	19.4	97	20	19.8	99

(a) %R = [(true value - amount found)/true value] x 100
Control limits = 90-110%
(b) Samples 3311-3320
(c) Samples 3327-3334
(d) Samples 3335-3337
(e) Samples 3342-3345
(f) Samples 3458-3460
(g) Samples 3461-3463, 3465, 3482
(h) Samples 3464, 3483-3488
(i) Samples 3527-3535
(j) Samples 3536-3540
(k) Samples 3541-3544, 3567-3570
(l) Samples 3571-3577
(m) Samples 3584-3591
(n) Samples 3617-3622
(o) Samples 3623, 3626-3629
(p) Samples 3630-3633, 3648, 3667-3668
(q) Samples 3666, 3673
(r) Samples 3674-3675, 3684-3687
(s) Samples 3688-3693, 3715, 3742
(t) Sample 3743

Table B-54. Initial and Continuing Calibration Verification

Associated Samples (ESM ID RANGE): see footnotes

Units: ug/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a)(b) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a)(b) %R
TotCyanide(c)	200	200	100	200	214	107
TotCyanide(d)	200	200	100	200	209	105
TotCyanide(e)	200	200	100	200	214	107
TotCyanide(f)	200	200	100	200	207	103
TotCyanide(g)	200	204	102	200	209	105
TotCyanide(h)	200	206	103	200	190	95
TotCyanide(i)	200	206	103	200	189	95
TotCyanide(j)	200	195	98	200	186	93
TotCyanide(k)	200	193	96	200	204	102
TotCyanide(l)	200	193	96	200	196	98
TotCyanide(m)	200	193	96	200	196	98
TotCyanide(n)	200	207	104	200	209	105
TotCyanide(o)	200	207	104	200	209	105
TotCyanide(p)	200	213	106	200	209	105
TotCyanide(q)	200	213	106	200	209	105
TotCyanide(r)	200	214	107	200	193	96

Table B-54. Continued

Associated Samples (ESM ID RANGE): see footnotes

Units: ug/L

Parameter	Initial Calibration True Value	Amount Found	(a)(b) %R	Continuing Calibration True Value	Amount Found	(a)(b) %R
TotCyanide(s)	200	210	105	200	209	105
TotCyanide(t)	200	210	105	200	209	105
TotCyanide(u)	200	199	100	200	204	102
TotCyanide(v)	200	209	105	200	202	101
TotCyanide(w)	200	209	105	200	202	101
TotCyanide(x)	200	209	105	200	204	102
TotCyanide(y)	200	190	95	200	195	98
TotCyanide(z)	200	201	100	200	199	99
TotCyanide(aa)	200	202	101	200	202	101
TotCyanide(ab)	200	202	101	200	202	101
TotCyanide(ac)	200	208	104	200	204	102
TotCyanide(ad)	200	208	104	200	204	102
TotCyanide(ae)	200	190	95	200	197	98
TotCyanide(af)	200	210	105	200	207	103
TotCyanide(ag)	200	205	103	200	202	101

(a) %R = [(true value - amount found)/true value] x 100
(b) Control limits for ICVS and CCVS are 90-100 %R
(c) Samples 3311-3314
(d) Sample 3315
(e) Sample 3316
(f) Sample 3317-3320
(g) Samples 3327-3331, 3333
(h) Samples 3332, 3334, 3336-3337
(i) Sample 3335
(j) Samples 3342-3345

Table B-54. Continued

(k) Samples 3458-3463
(l) Samples 3464-3465
(m) Samples 3482-3484
(n) Samples 3485-3488
(o) Samples 3527-3528
(p) Samples 3529-3531
(q) Samples 3532-3534, 3536
(r) Samples 3535, 3537-3540, 3542
(s) Samples 3541, 3543-3544
(t) Samples 3567-3569
(u) Samples 3570-3575
(v) Samples 3576-3577
(w) Samples 3584-3586
(x) Samples 3587-3591
(y) Samples 3617-3622
(z) Samples 3623, 3626-3630, 3633
(aa) Samples 3631-3632
(ab) Samples 3648, 3666-3667
(ac) Sample 3668
(ad) Samples 3673-3675
(ae) Samples 3684-3689
(af) Samples 3690-3693, 3715
(ag) Samples 3742-3744

Table B-55. Initial and Continuing Calibration Verification

Associated Samples (ESM ID RANGE): see footnotes

Units: ug/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a)(b) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a)(b) %R
FreeCyanide(c)	200	206	103	200	192	96
FreeCyanide(d)	200	206	103	200	192	96
FreeCyanide(e)	200	206	103	200	209	104
FreeCyanide(f)	200	208	104	200	190	95
FreeCyanide(g)	200	203	102	200	205	103
FreeCyanide(h)	200	198	99	200	201	101
FreeCyanide(i)	200	193	96	200	207	104
FreeCyanide(j)	200	193	96	200	192	96
FreeCyanide(k)	200	193	96	200	192	96
FreeCyanide(l)	200	207	104	200	202	101
FreeCyanide(m)	200	207	104	200	202	101
FreeCyanide(n)	200	213	106	200	202	101
FreeCyanide(o)	200	213	106	200	202	101
FreeCyanide(p)	200	214	107	200	207	104

Table B-55. Continued

Associated Samples (ESM ID RANGE): see footnotes Units: ug/L

Parameter	Initial Calibration True Value	Initial Calibration Amount Found	Initial Calibration (a)(b) %R	Continuing Calibration True Value	Continuing Calibration Amount Found	Continuing Calibration (a)(b) %R
FreeCyanide(q)	200	210	105	200	198	99
FreeCyanide(r)	200	210	105	200	198	99
FreeCyanide(s)	200	199	100	200	198	99
FreeCyanide(t)	200	209	105	200	192	96
FreeCyanide(u)	200	209	105	200	192	96
FreeCyanide(v)	200	209	105	200	197	98
FreeCyanide(w)	200	190	95	200	198	99
FreeCyanide(x)	200	201	100	200	195	98
FreeCyanide(y)	200	202	101	200	198	99
FreeCyanide(z)	200	202	101	200	198	99
FreeCyanide(aa)	200	208	104	200	199	100
FreeCyanide(ab)	200	208	104	200	199	100
FreeCyanide(ac)	200	190	95	200	204	102
FreeCyanide(ad)	200	210	105	200	206	103
FreeCyanide(ae)	200	205	103	200	196	98

(a) %R = [(true value - amount found)/true value] x 100
(b) Control limits for ICVS and CCVS are 90-110 %R
(c) Samples 3311-3314
(d) Samples 3315-3316
(e) Samples 3317-3320
(f) Samples 3327-3331
(g) Samples 3334-3337
(h) Samples 3342-3345
(i) Samples 3458-3462
(j) Samples 3463-3465

Table B-55. Continued

(k) Samples 3482-3484
(l) Samples 3485-3488
(m) Samples 3527-3528
(n) Samples 3529-3531
(o) Samples 3532-3534, 3536
(p) Samples 3535, 3537-3540, 3542
(q) Samples 353541, 3543-3544
(r) Samples 3567-3569
(s) Samples 3570-3575
(t) Samples 3576-3577
(u) Samples 3584-3586
(v) Samples 3587-3591
(w) Samples 3617-3622
(x) Samples 3623, 3626-3630, 3633
(y) Samples 3631-3632
(z) Samples 3648, 3666-3667
(aa) Sample 3668
(ab) Samples 3673-3675
(ac) Samples 3684-3689
(ad) Samples 3690-3693, 3715
(ae) Samples 3742-3744

GROUND-WATER ANALYSIS

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LABORATORY DUPLICATES

Table B-2. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3311-3314 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3311	1.0	158	162	3%
CarbAlkalinity	3311	1.0	<1.0	<1.0	NC(b)
Chloride	3314	0.25	9.8	8.1	19%
FluorideIC	3311	1.6	2.40	2.30	(c)
FluorideISE	3314	1.0	<1.0	<1.0	NC
SulfateIC	3311	2.0	53	50	6%
SulfateTurb	3311	5.0	61	64	5%
CalciumDiss	3311	0.500	27.9	26.6	5%
MagnesiumDiss	3311	0.500	11.8	11.3	4%
PotassiumDiss	3311	1.00	8.55	8.48	<1%
SodiumDiss	3311	1.00	41.7	41.7	<1%
SodiumTot	3314	1.00	43	41.8	3%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL
(c) For results <5X QL, values must agree within ± QL

Table B-5. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3315-3320 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
Chloride	3315	0.25	8.8	9.8	11%
CyanideTot	3319	0.010	0.089	0.064	31%
CyanideFree	3319	0.010	0.020	0.016	(b)
FluorideIC	3319	1.6	<1.6	<1.6	NC(c)
FluorideISE	3316	1.0	<1.0	<1.0	NC
SulfateIC	3319	2.0	19	18	5%
SulfateTurb	3319	5.0	9.4	9.8	(b)
CalciumDiss	3319	0.500	24	24.8	3%
MagnesiumDiss	3319	0.500	12.9	12.4	4%
PotassiumDiss	3319	1.00	6.0	5.9	1%
SodiumDiss	3319	1.00	15.3	14.9	3%
SodiumTot	3319	1.00	17.4	17.5	<1%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) For results <5X QL, values must agree within ± QL

(c) RPD not calculated (NC), result <QL

Table B-8. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3327-3337 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3335	1.0	100	98	2%
CarbAlkalinity	3335	1.0	<1.0	<1.0	NC(b)
Chloride	3327	0.64	5.1	5.7	11%
Chloride	3337	0.64	7.7	7.7	<1%
CyanideTot	3332	0.010	<0.010	<0.010	NC
CyanideFree	3332	0.010	<0.010	<0.010	NC
FluorideIC	3332	1.6	6.4	6.6	(c)
FluorideISE	3332	1.0	4.8	4.8	(c)
SulfateIC	3332	2.0	1310	1520	15%
SulfateTurb	3332	5.0	117	120	3%
CalciumDiss	3332	0.500	213	214	<1%
MagnesiumDiss	3332	0.500	107	111	4%
PotassiumDiss	3332	1.00	11.4	11.4	<1%
SodiumDiss	3332	1.00	243	242	<1%
SodiumTot	3332	1.00	246	229	7%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL
(c) For results <5X QL, values must agree within ± QL

Table B-12. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3342-3345 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3342	1.0	1.44	1.46	(b)
CarbAlkalinity	3342	1.0	<1.0	<1.0	NC(c)
CyanideTot	3342	0.010	<0.010	<0.010	NC
CyanideFree	3342	0.010	<0.010	<0.010	NC
FluorideIC	3342	1.6	<1.6	<1.6	NC
FluorideISE	3342	1.0	<1.0	<1.0	NC
SulfateIC	3342	2.0	21	22	5%
SulfateTurb	3342	5.0	22	22	(b)
CalciumDiss	3342	0.500	23.7	27	13%
MagnesiumDiss	3342	0.500	16	16	<1%
PotassiumDiss	3342	1.00	4.06	4.15	(b)
SodiumDiss	3342	1.00	18.1	18.1	<1%
SodiumTot	3342	1.00	18.4	17.9	3%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) For results <5X QL, values must agree within ± QL

(c) RPD not calculated (NC), result <QL

Table B-14. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3458-3465 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3459	1.0	82	82	<1%
CarbAlkalinity	3459	1.0	<1.0	<1.0	NC(b)
Chloride	3462	0.49	7.8	7.8	<1%
CyanideTot	3459	0.010	<0.010	<0.010	NC
CyanideFree	3459	0.010	<0.010	<0.010	NC
FluorideIC	3459	1.6	<1.6	<1.6	NC
FluorideISE	3459	1.0	<1.0	<1.0	NC
SulfateIC	3459	2.0	11	11	<1%
SulfateTurb	3459	5.0	10	11	(c)
CalciumDiss	3459	0.500	21	20.7	1%
MagnesiumDiss	3459	0.500	6.71	6.58	2%
PotassiumDiss	3459	1.00	3.86	3.86	(c)
SodiumDiss	3459	1.00	3.42	3.60	(c)
SodiumTot	3459	1.00	3.93	3.95	(c)

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL
(c) For results <5X QL, values must agree within ± QL

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Table B-19. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3527-3531 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3529	1.0	154	150	3%
CarbAlkalinity	3529	1.0	<1.0	<1.0	NC(b)
Chloride	3529	0.29	4.7	5.6	17%
FluorideIC	3529	1.6	<1.6	<1.6	NC
FluorideISE	3529	1.0	<1.0	<1.0	NC
SulfateIC	3529	2.0	18	18	<1%
SulfateTurb	3530	5.0	59	51	14%
CalciumDiss	3529	0.500	21.5	21.6	<1%
MagnesiumDiss	3529	0.500	9.62	9.86	3%
PotassiumDiss	3529	1.00	6.57	6.57	<1%
SodiumDiss	3529	1.00	38.5	39.1	2%
SodiumTot	3529	1.00	40	39.2	2%
CyanideTot	3529	0.010	0.01	<0.01	NC
CyanideFree	3529	0.010	<0.010	<0.010	NC

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL

Table B-21. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3532-3544 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3535	1.0	98	102	4%
CarbAlkalinity	3535	1.0	<1.0	<1.0	NC(b)
Chloride	3535	0.29	5.0	5.9	17%
CyanideTot	3535	0.010	<0.010	<0.010	NC
FluorideIC	3535	1.6	<1.6	<1.6	NC
FluorideISE	3535	1.0	<1.0	<1.0	NC
SulfateIC	3535	2.0	15	13	14%
SulfateTurb	3535	5.0	<5.0	<5.0	NC
CalciumDiss	3535	0.500	15	14.2	6%
MagnesiumDiss	3535	0.500	4.3	4.05	6%
PotassiumDiss	3535	1.00	6.65	6.40	4%
SodiumDiss	3535	1.00	30.9	30.3	2%
SodiumTot	3535	1.00	28.3	28.6	1%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL

Table B-24. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3567-3577 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3572	1.0	136	132	3%
CarbAlkalinity	3572	1.0	<1.0	<1.0	NC(b)
Chloride	3572	0.29	3.8	4.4	15%
CyanideTot	3572	0.010	0.200	0.222	10%
CyanideFree	3572	0.010	0.016	0.015	4%
FluorideIC	3571	1.6	<1.6	<1.6	NC
FluorideISE	3572	1.0	1.0	1.0	(c)
SulfateIC	3571	2.0	52	56	7%
SulfateTurb	3576	5.0	25	23	(c)
CalciumDiss	3572	0.500	20.4	20.9	2%
MagnesiumDiss	3572	0.500	8.54	8.64	1%
PotassiumDiss	3572	1.00	7.48	7.47	<1%
SodiumDiss	3572	1.00	33.3	33.4	<1%
SodiumTot	3572	1.00	28.1	29.2	4%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL
(c) For results <5X QL, values must agree within ± QL

Table B-27. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples (ESM ID RANGE): 3584-3591 Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3590	1.0	344	346	1%
CarbAlkalinity	3590	1.0	<1.0	<1.0	NC(b)
Chloride	3589	0.29	6.7	7.0	4%
CyanideTot	3590	0.010	<0.010	<0.010	NC
CyanideFree	3590	0.010	<0.010	<0.010	NC
FluorideIC	3590	1.6	<1.6	<1.6	NC
FluorideISE	3591	1.0	<1.0	<1.0	NC
SulfateIC	3590	2.0	165	165	<1%
SulfateTurb	3590	5.0	125	128	2%
CalciumDiss	3590	0.500	96	97.2	1%
MagnesiumDiss	3590	0.500	54.3	52.8	3%
PotassiumDiss	3590	1.00	8.26	8.39	2%
SodiumDiss	3590	1.00	18.8	18.9	<1%
SodiumTot	3590	1.00	20.5	21.2	3%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL

Table B-30. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3617-3621 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3618	1.0	114	116	2%
CarbAlkalinity	3618	1.0	<1.0	<1.0	NC(b)
Chloride	3620	0.29	10.2	10.5	3%
CyanideTot	3618	0.010	0.557	0.512	8%
CyanideFree	3618	0.010	0.062	0.057	8%
FluorideIC	3618	1.6	1.6	1.8	(c)
FluorideISE	3618	1.0	1.0	1.0	(c)
SulfateIC	3618	2.0	24	24	<1%
SulfateTurb	3618	5.0	22	22	(c)
CalciumDiss	3618	0.500	15.9	16.0	<1%
MagnesiumDiss	3618	0.500	4.99	4.96	<1%
PotassiumDiss	3618	1.00	6.98	7.05	1%
SodiumDiss	3618	1.00	31.6	31.7	<1%
SodiumTot	3618	1.00	34.9	34.3	2%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) RPD not calculated (NC), result <QL
(c) For results <5X QL, values must agree within ± QL

Table 32b . QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR), calculated RPDs are listed in the table. Required RPD control limits are + 20%
-

Asociated Samples: 3622-3623;3626-3633 Matrix: Water Units: mg/L
(ESM ID RANGE)

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	Calc. RPD (a)
BicarbAlkalin:	3631	1.0	88	90	2%
CarbAlkalinity:	3631	1.0	20	20	0%
Chloride	3631	0.29	8.5	8.5	0%
CyanideTot	3631	0.01	1.18	0.94	22%(b)
CyanideFree	3631	0.01	0.034	0.032	4%
Fluoride IC	3631	1.6	1.6	1.5	6%
Fluoride ISE	3631	1.0	<1.0	<1.0	NC(c)
Sulfate IC	3631	2.0	81	86	6%
Sulfate Turb	3632	5.0	91	98	8%
Calcium diss	3631	0.50	28	28	0%
Magnesiumdiss:	3631	0.50	7.4	7.3	1%
Potassiumdiss:	3631	1.0	9.4	9.6	3%
Sodium diss	3631	1.0	52	52	0%
Sodium tot	3631	1.0	48	49	1%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) High RPD due to matrix interferences
(c) RPD not calculated (NC), result <QL

Table B-36. QC Summary -- Duplicate Analysis

One sample per batch received was analyzed as a laboratory duplicate. The Relative Percent Difference (RPD) was calculated and interpreted according to the Contract Laboratory Program (CLP) Statement of Work 5/87 (see clarifications below the table) where applicable or according to data quality objectives in ESM Standard Operating Procedures. Sample result (SR), duplicate result (DR) and calculated RPDs are listed in the table. Required RPD control limits are ± 20%.

Associated Samples: 3673-3676 (ESM ID RANGE) Matrix: Water Units: mg/L

Parameter	Lab ID	Quantitation Limit (QL)	Sample Result (SR)	Duplicate Result (DR)	(a) Calc RPD
BicarbAlkalin	3674	1.0	170	168	1%
CarbAlkalinity	3674	1.0	4	4	(b)
Chloride	3674	0.29	6.1	5.6	9%
CyanideTot	3674	0.010	1.02	1.24	20%
CyanideFree	3674	0.010	0.052	0.044	(b)
FluorideIC	3674	1.6	3.2	3.3	(b)
FluorideISE	3674	1.0	2.5	2.6	(b)
SulfateIC	3674	2.0	30	31	3%
SulfateTurb	3673	5.0	21	18	(b)
CalciumDiss	3674	0.500	37.8	38.6	2%
MagnesiumDiss	3674	0.500	14.4	14.4	<1%
PotassiumDiss	3674	1.00	10	9.91	<1%
SodiumDiss	3674	1.00	24.9	24.8	<1%
SodiumTot	3674	1.00	24.5	24.8	1%

(a) RPD = (SR-DR)/[(SR+DR)/2] X 100
(b) For results <5X QL, values must agree within ± QL

GROUND-WATER ANALYSIS

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MATRIX SPIKE - ORGANICS

Table B-3. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3311-3314 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Chloride	3312	85-115	93	6.2	82	106
CyanideTot	3311	75-125	0.400	0.037	0.400	91
CyanideFree	3311	75-125	0.293	0.062	0.400	58(b)
FluorideIC	3311	85-115	13	2.2	10	108
FluorideISE	3312	85-115	44	0.95	50	86
SulfateIC	3311	85-115	14	4.8	10	92
SulfateTurb	3311	85-115	41	15	25	103
CalciumDiss	3311	75-125	43.6	22.4	20	106
MagnesiumDiss	3311	75-125	30.2	9.43	20	104
PotassiumDiss	3311	75-125	16.8	6.84	10	99
SodiumDiss	3311	75-125	44.5	33.4	10	111
SodiumTot	3311	75-125	56.9	35	20	110

(a) %R = [(SSR-SR)/SA] x 100
(b) Low spike recovery due to matrix interferences

Table B-9. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3327-3333 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Chloride(b)	3329	85-115	74.2	3.6	72.5	97
CyanideTot	3329	75-125	0.474	0.023	0.400	113
CyanideFree	3329	75-125	0.335	0	0.400	84
FluorideIC	3329	85-115	11	0.64	10	104
FluorideISE	3329	85-115	4.8	1.0	4.0	95
SulfateIC	3329	85-115	13	3.6	10	94
SulfateTurb	3329	85-115	37.7	19.3	20	92
CalciumDiss	3329	75-125	25.4	15.6	10	98
MagnesiumDiss	3329	75-125	15.6	5.91	10	97
PotassiumDiss	3329	75-125	15.2	5.76	10	94
SodiumDiss	3329	75-125	34.8	24.7	10	101
SodiumTot	3329	75-125	44.8	25.4	20	97

(a) %R = [(SSR-SR)/SA] x 100
(b) Associated with samples 3327-3337

Table B-10. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3334-3337 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Chloride(b)	3342	85-115	74.8	5.4	72.5	96
CyanideTot	3335	75-125	0.430	0.180	0.400	63(c)
CyanideFree	3335	75-125	0.332	0.015	0.400	79
FluorideIC	3335	85-115	11	0	10	110
FluorideISE	3335	85-115	3.9	0.33	4	92
SulfateIC	3335	85-115	13	4.2	10	88
SulfateTurb	3335	85-115	27	8.6	20	92
CalciumDiss	3335	75-125	27.6	18.6	10	90
MagnesiumDiss	3335	75-125	14.6	4.4	10	102
PotassiumDiss	3335	75-125	16.7	6.5	10	102
SodiumDiss	3335	75-125	24	13.7	10	103
SodiumTot	3335	75-125	37.4	15.1	20	112

(a) %R = [(SSR-SR)/SA] x 100
(b) Associated with samples 3342-3345
(c) Low spike recovery due to matrix interferences

Note: Sample results for cations do not reflect necessary dilutions.

Table B-15. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3458-3465 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Chloride	3464	85-115	22.6	4.8	20	91
CyanideTot	3463	75-125	0.566	0.502	0.016	(b)
CyanideFree	3463	75-125	0.199	0.053	0.160	91
FluorideIC	3463	85-115	19	6.0	10	130(c)
FluorideISE	3463	85-115	7.1	3.3	4	95
SulfateIC	3463	85-115	15	7.7	10	73(d)
SulfateTurb	3463	85-115	146	100	40	113
CalciumDiss	3463	75-125	31.4	21.8	10	96
MagnesiumDiss	3463	75-125	17.6	7.69	10	99
PotassiumDiss	3463	75-125	18.6	8.46	10	101
SodiumDiss	3463	75-125	23	13.7	10	93
SodiumTot	3463	75-125	85.9	67	20	95

(a) %R = [(SSR-SR)/SA] x 100
(b) Sample concentration >4x SA, %R not calculated
(c) High spike recovery due to matrix interferences
(d) Low spike recovery due to matrix interferences

Table B-17. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3482-3488 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Chloride	3486	85-115	47.9	6.2	43.9	95
CyanideTot	3485	75-125	0.413	0.014	0.400	100
CyanideFree	3485	75-125	0.329	0.007	0.400	80
FluorideIC	3485	85-115	17	6.3	10	107
FluorideISE	3485	85-115	6.2	2.6	4	90
SulfateIC	3485	85-115	18	7.3	10	107
SulfateTurb	3485	85-115	1320	871	400	112
CalciumDiss	3486	75-125	26.1	17	10	91
MagnesiumDiss	3486	75-125	17.5	7.19	10	103
PotassiumDiss	3486	75-125	22	11.8	10	102
SodiumDiss	3486	75-125	18.8	7.74	10	111
SodiumTot	3485	75-125	93.6	72.4	20	106

* %R = [(SSR-SR)/SA] x 100

Table B-22. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3532-3544 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Chloride	3541	85-115	55.8	12.3	43.9	99
CyanideTot	3541	75-125	0.408	0.016	0.400	98
CyanideFree	3541	75-125	0.443	0	0.400	111
FluorideIC	3541	85-115	12	0.77	10	112
FluorideISE	3541	85-115	3.8	0.37	4	86
SulfateIC	3540	85-115	14	3.9	10	101
CalciumDiss	3541	75-125	31.1	21.2	10	99
MagnesiumDiss	3541	75-125	18.5	7.79	10	107
PotassiumDiss	3541	75-125	17.7	6.9	10	108
SodiumDiss	3541	75-125	31.9	20.1	10	118
SodiumTot	3541	75-125	38.5	18.4	20	100

* %R = [(SSR-SR)/SA] x 100

Table B-25. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3567-3577 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	(a) %R
Chloride	3569	85-115	48.8	5.9	43.9	98
CyanideTot	3567	75-125	0.222	0	0.400	55(b)
CyanideFree	3567	75-125	0.377	0	0.400	94
FluorideIC	3567	85-115	12	1.2	10	108
FluorideISE	3567	85-115	4.0	0.60	4	85
SulfateIC	3567	85-115	75	26	50	98
SulfateTurb	3567	85-115	37.5	20	20	87
CalciumDiss	3567	75-125	27.2	17.2	10	100
MagnesiumDiss	3567	75-125	19.5	8.76	10	107
PotassiumDiss	3567	75-125	17.2	6.46	10	107
SodiumDiss	3567	75-125	45.9	34.5	10	114
SodiumTot	3567	75-125	51.7	31.1	20	103

(a) %R = [(SSR-SR)/SA] x 100
(b) Low spike recovery due to matrix interferences

Table B-28. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3584-3591 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Chloride	3586	85-115	38.7	8.6	30.2	100
CyanideTot	3586	75-125	0.686	0.270	0.400	104
CyanideFree	3586	75-125	0.431	0.052	0.400	95
FluorideIC	3586	85-115	13	1.6	10	114
FluorideISE	3586	85-115	4.2	0.70	4	88
SulfateIC	3586	85-115	130	43	100	87
SulfateTurb	3586	85-115	65.7	43.9	20	109
CalciumDiss	3586	75-125	30.2	19.7	10	105
MagnesiumDiss	3586	75-125	17.2	6.53	10	107
PotassiumDiss	3586	75-125	17.5	7.60	10	99
SodiumDiss	3586	75-125	38	28	10	100
SodiumTot	3586	75-125	39.9	29.6	10	103

* %R = [(SSR-SR)/SA] x 100

Table B-32. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3622-3623,3626-3633 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Chloride	3627	85-115	38.4	8.0	30.2	101
CyanideTot	3627	75-125	1.34	0.953	0.400	97
CyanideFree	3627	75-125	0.427	0.035	0.400	98
FluorideIC	3627	85-115	11	1.5	10	95
FluorideISE	3627	85-115	4.1	0.56	4	88
SulfateIC	3627	85-115	13	3.4	10	96
SulfateTurb	3627	85-115	39.6	29.8	10	98
CalciumDiss	3627	75-125	51.6	40.5	10	111
MagnesiumDiss	3627	75-125	30.7	20.2	10	105
PotassiumDiss	3627	75-125	17	7.0	10	100
SodiumDiss	3627	75-125	31.8	21.1	10	107
SodiumTot	3627	75-125	32.2	22.2	10	100

* %R = [(SSR-SR)/SA] x 100

Table B-34. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the meters listed in the table below. Spiked sample result (SSR sample result (SR), spike added (SA), percent recovery (%R), control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3648, 3666-3669 Unit

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added
Chloride	3668	85-115	51.9	24	30.2
CyanideTot	3668	75-125	0.421	0.055	0.4
CyanideFree	3668	75-125	0.442	0	0.4
FluorideIC	3668	85-115	14	3.9	
FluorideISE	3668	85-115	4.5	0.63	4
SulfateIC	3668	85-115	20	8.1	10
SulfateTurb	3668	85-115	17.4	8.6	10
CalciumDiss	3668	75-125	29.4	18.9	10
MagnesiumDiss	3668	75-125	18.5	8.18	10
PotassiumDiss	3668	75-125	18.7	8.72	10
SodiumDiss	3668	75-125	16.9	7.36	10
SodiumTot	3668	75-125	86.2	76.1	10

* %R = [(SSR-SR)/SA] x 100

Table B-38. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3684-3689 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Chloride	3685	85-115	35	2.2	30.2	108
CyanideTot	3685	75-125	0.400	0	0.400	100
CyanideFree	3685	75-125	0.411	0	0.400	103
FluorideIC	3685	85-115	10	0	10	100
FluorideISE	3685	85-115	4.0	0	4.0	100
SulfateIC	3685	85-115	13	4	10	90
SulfateTurb	3685	85-115	18	9	10	90
CalciumDiss	3685	75-125	26.8	16.1	10	107
MagnesiumDiss	3685	75-125	15	4.81	10	102
PotassiumDiss	3685	75-125	11.2	1.03	10	102
SodiumDiss	3685	75-125	14.9	4.97	10	99
SodiumTot	3685	75-125	14.5	4.8	10	97

* %R = [(SSR-SR)/SA] x 100

Table B-41. QC Summary--Spike Recoveries

One sample per batch was spiked and analyzed for the parameters listed in the table below. Spiked sample result (SSR), sample result (SR), spike added (SA), percent recovery (%R), and control limits are also listed.

Matrix: Water Associated Samples (ESM ID RANGE): 3690-3693, 3715, 3742-3744 Units: mg/L

Parameter	Lab ID	Control Limits	Spiked Sample Result	Sample Result	Spike Added	* %R
Chloride	3742	85-115	37	6.0	30.2	103
CyanideTot	3742	75-125	0.895	0.403	0.400	123
CyanideFree	3742	75-125	0.197	0.026	0.200	85
FluorideIC	3742	85-115	9.8	0	10	98
FluorideISE	3742	85-115	5.0	0.60	4	110
SulfateIC	3742	85-115	14	3.6	10	104
SulfateTurb	3743	85-115	59.8	38.1	20	108
CalciumDiss	3742	75-125	36.2	25.8	10	104
MagnesiumDiss	3742	75-125	22.7	13.1	10	96
PotassiumDiss	3742	75-125	15.7	5.33	10	104
SodiumDiss	3742	75-125	25.1	15.2	10	99
SodiumTot	3742	75-125	24.7	14.8	10	99

* %R = [(SSR-SR)/SA] x 100

GROUND-WATER ANALYSIS

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LABORATORY CONTROL SAMPLES (LCS)

INORGANICS

Table B-56. QC Summary -- Laboratory Control Sample

Matrix: Water Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	True Value	Amount Found	* %R
TotCyanide	3311-3314	10	400	421	105
TotCyanide	3315-3316	10	400	421	105
TotCyanide	3317-3320	10	400	367	92
TotCyanide	3327-3331, 3333	10	400	411	103
TotCyanide	3332, 3334-3337	10	400	364	91
TotCyanide	3342-3345	10	400	346	87
TotCyanide	3458-3462	10	400	421	105
TotCyanide	3463-3465	10	400	356	89
TotCyanide	3482-3484	10	400	356	89
TotCyanide	3485-3488	10	400	368	92
TotCyanide	3527-3528	10	400	368	92
TotCyanide	3529-3531	10	400	414	104
TotCyanide	3532-3534, 3536	10	400	414	104
TotCyanide	3535, 3537-3542	10	400	424	106

Control limits (%R) = 80-120%

* %R = [(true value - amount found)/true value] x 100

Table B-56. Continued

Matrix: Water Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	True Value	Amount Found	(a) %R
TotCyanide	3567-3569	10	400	437	109
TotCyanide	3570-3575	10	400	439	110
TotCyanide	3576-3577	10	400	398	99
TotCyanide	3584-3586	10	400	398	99
TotCyanide	3587-3591	10	400	397	99
TotCyanide	3617-3622	10	400	416	102
TotCyanide	3623,3626-3630,3633	10	400	356	89
TotCyanide	3631-3632	10	400	418	104
TotCyanide	3648, 3666-3667	10	400	418	104
TotCyanide	3668	10	400	399	100
TotCyanide	3673-3675	10	400	399	100
TotCyanide	3684-3689	10	400	348	87
TotCyanide	3690-3693, 3715	10	400	378	94
TotCyanide	3742-3743	10	400	395	99

Control limits (%R) = 80-120%

Table B-57 . QC Summary -- Laboratory Control Sample

Matrix: Water Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	True Value	Amount Found	(a) %R
FreeCyanide	3311-3314	10	400	351	88
FreeCyanide	3315-3316	10	400	351	88
FreeCyanide	3317-3320	10	400	349	87
FreeCyanide	3327-3331	10	400	348	87
FreeCyanide	3332-3337	10	400	348	87
FreeCyanide	3342-3345	10	400	343	86
FreeCyanide	3458-3462	10	400	343	86
FreeCyanide	3463-3465	10	400	388	97
FreeCyanide	3482-3484	10	400	388	97
FreeCyanide	3485-3488	10	400	358	89
FreeCyanide	3527-3528	10	400	35.7	89
FreeCyanide	3529-3531	10	400	356	89

Control limits (%R) = 80-120%

(a) %R = [(true value - amount found)/true value] x 100

Table B-57. Continued

Matrix: Water Units: ug/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	True Value	Amount Found	(a) %R
FreeCyanide	3567-3569	10	400	420	105
FreeCyanide	3570-3575	10	400	398	99
FreeCyanide	3576-3577	10	400	384	96
FreeCyanide	3584-3586	10	400	384	96
FreeCyanide	3587-3591	10	400	350	88
FreeCyanide	3617-3622	10	400	405	101
FreeCyanide	3623,3626-3630,3633	10	400	384	96
FreeCyanide	3631-3632	10	400	395	99
FreeCyanide	3648, 3666-3667	10	400	395	99
FreeCyanide	3668	10	400	403	101
FreeCyanide	3673-3675	10	400	403	101
FreeCyanide	3684-3689	10	400	421	105
FreeCyanide	3690-3693, 3715	10	400	379	94
FreeCyanide	3742-3744	10	400	393	98

Control limits (%R) = 80-120%

Table B-58. QC Summary -- Laboratory Control Sample

Matrix: Water Units: mg/L

Parameter	Associated Samples (ESM ID RANGE)	Quantitation Limit	True Value	Amount Found	* %R
Sodium(tot)	3311-3320	1.0	20	22	110
Sodium(tot)	3327-3333	1.0	30	31	102
Sodium(tot)	3334-3337	1.0	30	32.6	109
Sodium(tot)	3342-3345	1.0	30	32.7	109
Sodium(tot)	3458-3465,3482-3484	1.0	30	33.1	110
Sodium(tot)	3485-3488,3527-3531	1.0	30	30	100
Sodium(tot)	3532-3544,3567-3577	1.0	30	31.1	104
Sodium(tot)	3584-3491,3617-3621	1.0	30	32	107
Sodium(tot)	3622-3623,3626-3633	1.0	30	32	107
Sodium(tot)	3648,3666-3668, 3674-3675,3684-3689	1.0	30	31.6	105
Sodium(tot)	3690-3693, 3715	1.0	30	31.6	105
Sodium(tot)	3742-3743	1.0	30	32.2	107

Control limits (%R) = 80-120%

* %R = [(true value - amount found)/true value] x 100

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

INDEPENDENT QC CHECK SAMPLES

ORGANICS/INORGANICS

Table B-52. Independent QC Samples

Matrix: Water Units: ug/L

Parameter	Control Limits	Associated Samples (ESM ID RANGE)	True Value	Amount Found	* %R
Alkalinity	80-120	3311-3314, 3320	2500	2440	98
Alkalinity	80-120	3315-3319	2500	2270	91
Alkalinity	80-120	3315-3320	2500	2270	91
Alkalinity	80-120	3327-3337	2500	2380	95
Alkalinity	80-120	3342-3345	2500	2460	98
Alkalinity	80-120	3458-3465	2500	2420	97
Alkalinity	80-120	3482-3488	2500	2325	93
Alkalinity	80-120	3527-3542	2500	2325	93
Alkalinity	80-120	3543-3544,3567-3577	2500	2325	93
Alkalinity	80-120	3584-3591	2500	2325	93
Alkalinity	80-120	3617-3623	2500	2325	93
Alkalinity	80-120	3626-3623	2500	2263	91
Alkalinity	80-120	3648	2500	2338	94
Alkalinity	80-120	3666-3675	2500	2400	96
Alkalinity	80-120	3684-3689	2500	2380	95
Alkalinity	80-120	3690-3693, 3715	2500	2420	97
Alkalinity	80-120	3742-3743	2500	2380	95

* %R = [(true value - amount found)/true value] x 100

Table B-53. Independent QC Samples

Matrix: Water Units: ug/L

Parameter	Control Limits	Associated Samples (ESM ID RANGE)	True Value	Amount Found	* %R
Chloride	80-120	3311-3314	1522	1504	99
Chloride	80-120	3311-3314	1522	1528	100
Chloride	80-120	3315-3320	1522	1528	100
Chloride	80-120	3327-3334	1522	1481	97
Chloride	80-120	3335-3337,3342-3345	1522	1494	98
Chloride	80-120	3458-3465	1000	980	98
Chloride	80-120	3482-3488	886	859	97
Chloride	80-120	3527-3544	886	859	97
Chloride	80-120	3567-3577	886	859	97
Chloride	80-120	3584-3591	1539	1522	99
Chloride	80-120	3617-3623,3626-3629	1539	1522	99
Chloride	80-120	3630-3633,3648,3666-3675	1522	1536	101
Chloride	80-120	3690-3693, 3715	1522	1536	101
Chloride	80-120	3684-3689	1522	1536	101
Chloride	80-120	3742-3743	1539	1521	99

* %R = [(true value - amount found)/true value] x 100

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	AMSTD0825 MSTD
LAB SAMPLE ID:	0825MSTD
SAMPLE DATE:	08/25/87
EXTRACTION DATE:	08/25/87
ANALYSIS DATE:	08/27/87
FILE NAME:	0825MSTD
INSTRUMENT ID:	MS-A
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS		% Recovery
Acenaphthalene	< 10	79
Acenaphthene	79	
Anthracene	< 10	
Benzidine	< 80	
Benzo(a)Anthracene	< 10	
Benzo(a)Pyrene	< 10	
Benzo(b+k)fluoranthenes	< 10	
Benzo(g,h,i)Perylene	< 10	
4-Bromophenyl-phenylether	< 10	
Butylbenzylphthalate	< 10	85
4-Chloro-3-Methylphenol	170	
bis(2-Chloroethoxy)Methane	< 10	
bis(2-Chloroethyl)Ether	< 10	
bis(2-Chloroisopropyl)Ether	< 10	
2-Chloronaphthalene	< 10	
2-Chlorophenol	184	92
4-Chlorophenyl-phenylether	< 10	
Chrysene	< 10	
Di-n-Butylphthalate	< 10	
Di-n-Octyl Phthalate	< 10	
Dibenz(a,h)Anthracene	< 10	
1,2-Dichlorobenzene	< 10	
1,4-Dichlorobenzene	62	62
1,3-Dichlorobenzene	< 10	
3,3'-Dichlorobenzidine	< 20	
2,4-Dichlorophenol	< 10	
Diethylphthalate	< 10	
Dimethyl Phthalate	< 10	
2,4-Dimethylphenol	< 10	
4,6-Dinitro-2-Methylphenol	< 50	
2,4-Dinitrophenol	< 50	
2,4-Dinitrotoluene	100	100
2,6-Dinitrotoluene	< 10	
1,2-Diphenylhydrazine	< 10	
bis(2-Ethylhexyl)Phthalate	< 10	
Fluoranthene	< 10	

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	AMSTD0825 MSTD
LAB SAMPLE ID:	0825MSTD
SAMPLE DATE:	08/25/87
EXTRACTION DATE:	08/25/87
ANALYSIS DATE:	08/27/87
FILE NAME:	0825MSTD
INSTRUMENT ID:	MS-A
MATRIX:	WATER
UNITS:	UG/L

COMPOUNDS		% Recovery
Fluorene	< 10	
Hexachlorobenzene	< 10	
Hexachlorobutadiene	< 10	
Hexachlorocyclopentadiene	< 10	
Hexachloroethane	< 10	
Indeno(1,2,3-cd)Pyrene	< 10	
Isophorone	< 10	
N-Nitroso-Di-n-Propylamine	82	82
N-Nitrosodimethylamine	< 5	
N-Nitrosodiphenylamine	< 10	
Naphthalene	< 10	
Nitrobenzene	< 10	
4-Nitrophenol	230	115
2-Nitrophenol	< 10	
Pentachlorophenol	152	76
Phenanthrene	< 10	
Phenol	177	89
Pyrene	95	95
1,2,4-Trichlorobenzene	63	63
2,4,6-Trichlorophenol	< 10	

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	AMSTD901 MSTD
LAB SAMPLE ID:	0901MSTD
SAMPLE DATE:	09/01/87
EXTRACTION DATE:	09/01/87
ANALYSIS DATE:	09/03/87
FILE NAME:	0901MSTD
INSTRUMENT ID:	MS-A
MATRIX:	WATER
UNITS:	UG/L

% recovery

COMPOUNDS		
Acenaphthalene	< 10	
Acenaphthene	74	74
Anthracene	< 10	
Benzidine	< 80	
Benzo(a)Anthracene	< 10	
Benzo(a)Pyrene	< 10	
Benzo(b+k)fluoranthenes	< 10	
Benzo(g,h,i)Perylene	< 10	
4-Bromophenyl-phenylether	< 10	
Butylbenzylphthalate	< 10	
4-Chloro-3-Methylphenol	164	82
bis(2-Chloroethoxy)Methane	< 10	
bis(2-Chloroethyl)Ether	< 10	
bis(2-Chloroisopropyl)Ether	< 10	
2-Chloronaphthalene	< 10	88
2-Chlorophenol	175	
4-Chlorophenyl-phenylether	< 10	
Chrysene	< 10	
Di-n-Butylphthalate	< 10	
Di-n-Octyl Phthalate	< 10	
Dibenz(a,h)Anthracene	< 10	
1,2-Dichlorobenzene	< 10	
1,4-Dichlorobenzene	36	36
1,3-Dichlorobenzene	< 10	
3,3'-Dichlorobenzidine	< 20	
2,4-Dichlorophenol	< 10	
Diethylphthalate	< 10	
Dimethyl Phthalate	< 10	
2,4-Dimethylphenol	< 10	
4,6-Dinitro-2-Methylphenol	< 50	
2,4-Dinitrophenol	< 50	9.8
2,4-Dinitrotoluene	98	
2,6-Dinitrotoluene	< 10	
1,2-Diphenylhydrazine	< 10	
bis(2-Ethylhexyl)Phthalate	45	
Fluoranthene	< 10	

ORGANICS ANALYSIS DATA SHEETS
Versar Inc., ESM Operations

Semivolatile Compounds

CLIENT SAMPLE ID:	AMSTD901 MSTD
LAB SAMPLE ID:	0901MSTD
SAMPLE DATE:	~~09/01/87~~
EXTRACTION DATE:	09/01/87
ANALYSIS DATE:	09/03/87
FILE NAME:	0901MSTD
INSTRUMENT ID:	MS-A
MATRIX:	WATER
UNITS:	UG/L

% Recovery

COMPOUNDS		
Fluorene	< 10	
Hexachlorobenzene	< 10	
Hexachlorobutadiene	< 10	
Hexachlorocyclopentadiene	< 10	
Hexachloroethane	< 10	
Indeno(1,2,3-cd)Pyrene	< 10	
Isophorone	< 10	
N-Nitroso-Di-n-Propylamine	67	67
N-Nitrosodimethylamine	< 5	
N-Nitrosodiphenylamine	< 10	
Naphthalene	< 10	
Nitrobenzene	< 10	
4-Nitrophenol	210	105
2-Nitrophenol	< 10	
Pentachlorophenol	166	84
Phenanthrene	< 10	
Phenol	169	84
Pyrene	91	91
1,2,4-Trichlorobenzene	43	43
2,4,6-Trichlorophenol	< 10	

GROUND-WATER ANALYSIS

JULY - SEPTEMBER 1987

FIELD REPLICATE COMPARISON

3/4

LABORATY DATA VALIDATION
MARTIN MARIETTA - THE DALLES
FIELD REPLICATE COMPARISON
GROUND WATER
SAMPLES COLLECTED
JULY-SEPTEMBER 1987

Parameter	Sample	Replicate	RPD	Sample	Replicate	RPD
	Batch A				Batch B	
Well No.	8A	Rep4	%	6B	Rep3	%
Lab No.	3312	3314		3315	3317	
Calcium	25,100	24,400	2.8	41,400	38,900	6.2
Magnesium	7,570	7,590	.3	20,400	19,500	4.5
Potassium	9,710	9,270	4.6	8,000	7,440	7.3
Sodium	39,900	39,600	.8	24,600	22,800	7.6
Sodium (T)	42,700	43,000	.7	25,100	26,600	5.8
Bicarbonate	128	120	6.5	230	182	23.3
Carbonate	<1.0	16		<1.0	<1.0	
Chloride	6.8	9.8	36.1	8.8	8.8	0
Cyanide, F.	30	35	15.3	51	76	39.3
Cyanide, T.	1780	1840	3.3	1120	790	34.5
Fluoride	1.0	<1.0		<1.0	<1.0	
Sulfate	76	72	5.4	73	85	15.1
	Batch C				Batch D	
Well No.	MW13B	Rep7		20S	REP8	
Lab No.	3328	3333		3334	3337	
Calcium	24,400	20,700		26,000	22,500	
Magnesium	12,800	10,700		5,660	5,790	
Potassium	6,280	5,970		9,730	10,100	
Sodium	14,200	13,600		45,300	46,300	
Sodium (T)	14,800	14,400		49,900	50,500	
Bicarbonate	129	131		133	137	
Carbonate	<1.0	<1.0		<1.0	<1.0	
Chloride	5.1	4.5		8.3	7.7	
Cyanide, F.	22	29	27.4	<10	21	
Cyanide, T.	138	139	.7	<10	<62	
Fluoride	<1.0	<1.0		<1.0	<1.0	
Sulfate	20	21		66	49	

Laboratory Data Validation (continued)

Parameter	Sample	Replicate	RPD	Sample	Replicate	RPD
	Batch E				Batch F	
Well No.	22S	Rep9	%	9A	Rep5	%
Lab No.	3344	3345		3463	3461	
Calcium	15,100	21,500		27,300	27,800	
Magnesium	4,320	3,910		9,610	9,490	
Potassium	5,560	5,340		10,600	9,820	
Sodium	32,900	29,600		171,000	173,000	
Sodium (T)	32,000	31,100		167,000	159,000	
Bicarbonate	112	90		314	268	
Carbonate	18	10		12	12	
Chloride	5.7	12		9.6	8.2	
Cyanide, F.	12	12	0	132	105	22.8
Cyanide, T.	112	89	22.9	12,600	13,000	3.1
Fluoride	<1.0	<1.0		10	12	18.1
Sulfate	46	24	62.8	100	101	.9
	Batch I				Batch I	
Well No.	25S	Rep10		4A	Rep2	
Lab No.	3542	3532		3537	3534	
Calcium	23,900	50,700		29,500	30,300	
Magnesium	6,890	15,600		13,300	13,200	
Potassium	5,010	5,970		7,820	8,000	
Sodium	8,680	9,080		31,200	31,900	
Sodium (T)	11,300	12,200		29,100	29,500	
Bicarbonate	99	<1.0		127	132	
Carbonate	<1.0	<1.0		<1.0	<1.0	
Chloride	9.1	24		5.0	5.0	
Cyanide, F.	<10	<10		<10	11	9.5
Cyanide, T.	<10	<10		213	43	132
Fluoride	<1.0	<1.0		<1.0	<1.0	
Sulfate	33	9.9		64	53	18.8

Parameter	Sample	Replicate	RPD	Sample	Replicate	RPD
	Batch I				Batch J	
Well No.	11D	Rep6	%	PW-3	Rep11	%
Lab No.	3539	3544		3567	3569	
Calcium	20,400	18,500		21,500	21,500	
Magnesium	9,690	9,270		11,000	11,100	
Potassium	4,830	5,130		8,070	8,080	
Sodium	18,200	17,400		43,100	42,600	
Sodium (T)	16,400	16,400		38,900	38,900	
Bicarbonate	97	114		160	178	
Carbonate	<1.0	<1.0		<1.0	<1.0	
Chloride	6.5	9.7		5.2	6.2	
Cyanide, F.	<10	<10	0	<10	<10	0
Cyanide, T.	<10	<10	0	<10	<10	0
Fluoride	<1.0	<1.0		<1.0	<1.0	
Sulfate	22	22		20	38	
	Batch M				Batch O	
Well No.	2B	Rep1		32S	Rep16	
Lab No.	3631	3626		3674	3675	
Calcium	27,700	27,300		37,800	39,000	
Magnesium	7,380	7,330		14,400	14,500	
Potassium	9,370	9,970		10,000	9,840	
Sodium	51,700	47,900		24,900	25,500	
Sodum (T)	48,300	49,600		24,500	25,000	
Bicarbonate	88	90		170	172	
Carbonate	20	20		4.0	2.0	
Chloride	8.5	7.9		6.1	4.7	
Cyanide, F.	34	32	6.0	52	65	22.2
Cyanide, T.	1180	800	38.3	1,020	1,060	3.8
Fluoride	<1.0	<1.0		2.5	2.6	
Sulfate	100	86		45	41	

Laboratory Data Validation (continued)

Parameter	Sample	Replicate	RPD	Sample	Replicate	RPD
	Batch J				Batch K	
Well No.	16A	Rep14	%	Klindt	Rep12	%
Lab No.	3576	3574		3591	3585	
Calcium	9,270	9,040		49,100	49,200	
Magnesium	2,100	2,140		20,400	20,400	
Potassium	6,610	6,200		5,990	5,820	
Sodium	49,200	46,400		12,800	13,200	
Sodium (T)	41,200	42,200		14,000	14,300	
Bicarbonate	106	117		152	160	
Carbonate	12	<1.0		<1.0	<1.0	
Chloride	3.2	3.2		5.5	5.3	
Cyanide, F.	12	11	8.6	37	35	5.5
Cyanide, T.	40	42	4.9	777	1,190	148
Fluoride	<1.0	<1.0		<1.0	<1.0	
Sulfate	25	22		55	47	

SECTION THREE

FIELD SPLITS

EPA FIELD SPLIT SAMPLE COMPARISON

Summary of results of split samples collected at Martin Marietta Reduction Facility (MMRF), The Dalles, Oregon and Analyzed by Martin Marietta Environmental Systems (MMES) and an EPA Region X Labs

Six samples (Client ID) LLCW, LFDS (LFCGs analyzed for PCB's only), RRAS, OCAS and SSP2ES, collected during 19-28 March 1986 (LLCW, RRAS, OCAS and SSP2ES) and 10 May 1986 (LFDS) at MMRF, were split and analyzed by MMES and an EPA Region X Lab. LLCW is a water sample while the others are sediment/sludge samples.

Samples LLCW, LFDS and SSP2ES were analyzed for volatile organics and no compounds were reported above detectable levels by either lab. Samples LLCW and LFGCS were analyzed for PCB's and no compounds were reported above detectable levels. Base/neutral acid extractable compounds results detected by both labs and results for other parameters are summarized in Tables 1 to 5. The complete lists of organic compounds (volatile, base/neutral acid extractables and PCB's) analyzed by both labs can be found in Appendix A.

Preparatory and analytical methods used by the labs are summarized in Table 6. In the case of fluoride sludge analyses, differences in preparatory methods account for discrepancies between results reported. Region X distilled the sludge samples and analyzed them for total fluoride while MMES leached the samples and analyzed them for total dissolved fluoride. Samples to be analyzed for cyanide were prepared by the same method at both labs but the instrumentation used for colorimetric determination differed. MMES used a Shimadzu UV-160 spectrophotometer while EPA Region X Lab used the Technicon Autoanalyzer.

In general, results for the organic parameters showed good agreement between the two labs. Results for sulfate and metals also showed good agreement. The differences mentioned above may explain some differences between results reported for fluoride and cyanide.

Table 1. Summary of results for sample (Client ID) LLCW
MMES ID - 2704

EP Toxicity Test Metals (µg/L)	MMES Results	EPA Results
Arsenic	354	182
Barium	<200	755
Cadmium	<50	0.6
Chromium	88	105
Lead	<200	102
Mercury	0.55	0.35
Selenium	<200	16
Silver	<50	0.4

Parameter (mg/L)	MMES Result	EPA Result
Total Cyanide	9.4	43
Free Cyanide	0.91	11.7
Fluoride	2440	1700
Sulfate	2660	2218
Sodium (Total)	5900	8180
Arsenic (Total)	455	291

Base/Neutral Acid Extractables (µg/L)	MMES Result	EPA Result
Benzo-a-Anthracene	<5	7.1
Benzo-(b+k)-fluoranthene	<5	20[1]
Benzo-g,h,i-Perylene	<10	4.5
Benzo-a-Pyrene	<5	3.6
Chrysene	<5	3.9
Fluoranthene	<5	8.3
Indeno(1,2,3 cd)Pyrene	<10	9.4
Phenathrene	<5	8.3
Pyrene	<5	4.5

1 Result is the sum of two isomers (b,k) reported separately by EPA (See Appendix A).

Table 2. Summary of results for sample (Client ID) LFDS MMES ID-3294

EP Toxicity Test Metals (µg/L)	MMES Results	EPA Results
Arsenic	<200	2.0
Barium	<200	157
Cadmium	<50	9.1
Chromium	<50	7.0
Lead	<200	1066
Mercury	<0.3	0.054
Selenium	<200	5.0
Silver	<50	0.24

Parameter (mg/kg)	MMES Result (dry wt)	EPA Result (Dry wt)
Total Cyanide	1.70	1.76
Fluoride	1250	57500
Sodium	69100	45700

Base/Neutral Acid Extractables (µg/L)	MMES Result	EPA Result
Acenaphthene	11,000	3,600
Anthracene	11,000	3,300
Benzo-a-Pyrene	110,000	72,000
Benzo-b+k-fluroanthene	210,000	340,000[1]
Benzo-a-Anthracene	100,000	72,000
Chrysene	110,000	94,000
Dibenzofuran	NA[2]	1,500
Fluoranthene	150,000	13,000
Fluorene	9,000	2,800
Phenathrene	82,000	57,000
Pyrene	120,000	11,000

1 Result is a sum of two isomers (b,k) reported separately by EPA (See Appendix A).
2 Not Analyzed.

Table 3. Summary of results for sample (Client ID) SSP2ES
MMES ID-2796

Parameter (mg/kg)	MMES Result (Dry wt)	EPA Result (Dry wt)
Sodium (total)	17,700	13,560
Arsenic (total)	71	35.4

Base/Neutral Acid Extractables (µg/L)	MMES Result	EPA Result
Benzo-a-Anthracene	340,000	860,000
Benzo-b+k-fluoranthene	1,430,000	1,020,000[1]
Benzo-(g,h,i)-Penylene	470,000	130,000
Benzo-a-Pyrene	330,000	110,000
Chrysene	1,240,000	670,000
Fluoranthene	1,780,000	1,600,000
Indeno(1,2,3 cd)	370,000	200,000
Phenathrene	<62,500	340,000
Pyrene	1,220,000	680,000

* Result is a sum of two isomers (b,k) reported separately by EPA (See Appendix A).

Table 4. Summary of results for sample (Client ID) RRAS MMES ID-2730

Parameter (mg/kg)	MMES Result (Dry wt)	EPA Result (Dry wt)
Free Cyanide	< 0.96	NA[1]
Total Cyanide	NR[2]	0.33
Fluoride	232	1866
Sodium	3620	3140

[1] Not analyzed
[2] Not requested

Table 5. Summary of results for sample (Client ID) OCAS MMES ID-2732

Parameter (mg/kg)	MMES Result (Dry wt)	EPA Result (Dry wt)
Total Cyanide	NR[1]	0.2
Fluoride	67	3,580
Sodium	8704	12,000

[1] Not requested

Table 6. Summary of methods used by Martin Marietta Environmental Systems (MMES) and EPA Region X Lab

Parameter	MMES Method	EPA Reg. X Method[1]
Total cyanide	335.2[2]	335.2
Free Cyanide	412-H	412-H
Fluoride	300.0[3]	300.0
Sodium	Flame AA	Flame AA
Arsenic	Flame AA	Flame AA
EP Toxicity Test Metals	1310, 200 series	1310, 7000, 8000 series
Volatiles	624	624
Base-neutral/acids	625	625
PCB's	608	608

1 Information furnished by Mr. Jerry Muth of EPA Region X
2 Instrumentation for measuring colorimetrically differed (see text)
3 Preparation methods differed (see text)

APPENDIX A

LIST OF ORGANIC PARAMETERS ANALYZED BY MMES AND EPA REGION X TESTING LAB AND CORRESPONDING DETECTION LEVELS

Table A-I-1. Results of analysis for volatile organic compounds in an aqueous sample (LLCW) - analysis performed by EPA Region X Lab

11-AUG-86
13:28:58

EPA Region X Lab Management System
Sample/Project Analysis Results

MARTIN MARIETTA

Officer: BCZ Account: GB10P647

Project: TEC-266A

Station No: LLCW

Sample No: 86 130415 Begin Sample Date: 86/03/26 15:50 Source: Landfill Surface Run Depth: QA Code:

Laboratory: RX Description: LANDFILL LEACHATE,STATION C,WATER

VOA - PP Scan (GCMS) Parameter	Water-Total Result	Units
Methane, Tetrachloro-	5U	ug/l
Acetone	17UJ	ug/l
Methane, Trichloro-	5U	ug/l
Benzene	5U	ug/l
Ethane, 1,1,1-Trichloro	5U	ug/l
Methane, Bromo-	10U	ug/l
Methane, Chloro-	10U	ug/l
Ethane, Chloro-	10U	ug/l
Ethylene, Chloro-	10U	ug/l
Methane, Dichloro-	3UJ	ug/l
Carbon Disulfide	5U	ug/l
Methane, Tribromo-	5U	ug/l
Methane, Dichlorobromo-	5U	ug/l
Ethane, 1,1-Dichloro-	5U	ug/l
Ethylene, 1,1-Dichloro-	5U	ug/l
Propane, 1,2-Dichloro-	5U	ug/l
Methyl Ethyl Ketone (ME	9UJ	ug/l
Ethane, 1,1,2-Trichloro	5U	ug/l
Ethylene, 1,1,2-Trichlo	1J	ug/l
Ethane, 1,1,2,2-Tetrach	5U	ug/l
o-Xylene	5U	ug/l
Benzene, Ethyl-	5U	ug/l
Styrene	5U	ug/l
Ethane, 1,2-Dichloro-	5U	ug/l
Vinyl Acetate	10U	ug/l
Ketone, Methyl Isobutyl	10U	ug/l
Toluene	5U	ug/l
Benzene, Chloro-	5U	ug/l
Ether, Chloroethyl Viny	10U	ug/l
Methane, Chlorodibromo-	5U	ug/l
Ethylene, Tetrachloro-	5U	ug/l
Cis-1,2-Dichloroethene	5U	ug/l
Ethylene, 1,2-Trans-Dic	5U	ug/l
2-Hexanone	10U	ug/l
Propene, cis-1,3-Dichlo	5U	ug/l
Propene, trans-1,3-Dich	5U	ug/l

Table A-I-2. Results of analysis for volatile organic compounds in an aqueous sample - LLCW - analysis performed by Martin Marietta Environmental Systems (MMES)

	1	4
SAMPLE DATE:	3/26/86	3/26/86
ANALYSIS DATE:	4/8/86	4/8/86
MMES SAMPLE ID:	2716	2704
CLIENT SAMPLE ID:	LLFB	LLCW
NOTE:		(a)
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)	
acrolein	<10	<20
acrylonitrile	<10	<20
benzene	<5	<10
bromodichloromethane	<5	<10
bromoform	<5	<10
bromomethane	<5	<10
carbon tetrachloride	<5	<10
chlorobenzene	<5	<10
chloroethane	<5	<10
chloroform	<5	<10
chloromethane	<5	<10
2-chloroethylvinyl ether	<10	<20
cis-1,3-dichloropropene	<5	<10
dibromochloromethane	<5	<10
1,1-dichloroethane	<5	<10
1,2-dichloroethane	<5	<10
1,1-dichloroethylene	<5	<10
1,2-dichloropropane	<5	<10
ethylbenzene	<5	<10
methylene chloride	<10	<20
1,1,2,2-tetrachloroethane	<5	<10
tetrachloroethylene	<5	<10
toluene	<5	<10
trans-1,2-dichloroethylene	<5	<10
trans-1,3-dichloropropene	<5	<10
1,1,1-trichloroethane	<5	<10
1,1,2-trichloroethane	<5	<10
trichloroethylene	<5	<10
vinyl chloride	<5	<10
cis-1,2-dichloroethylene	<5	<10

(a)Sample diluted 1:2 for analysis.

Table A-I-3. Results of analysis of base/neutral acid extractable compounds and PCB's in an aqueous sample - LLCW analysis performed by EPA Region X Lab

11-AUG-86
13:28:58

EPA Region X Lab Management System
Sample/Project Analysis Results

Project: TEC-286A MARTIN MARIETTA Officer: BCZ Account: GB10P647

Station No: LLCW

Sample No: 86 130410 Begin Sample Date: 86/03/26 15:50 Source: Landfill Surface Run Depth: QA Code:

Laboratory: RX Description: LANDFILL LEACHATE,STATION C,WATER

B/N/Acid Scan Parameter	Water-Total Result	Units
Pyrene, Benzo[a]-	3.6	ug/l
Phenol, 2,4-Dinitro-	18U	ug/l
Anthracene, Dibenzo[a,h	3.6U	ug/l
Anthracene, Benzo[a]-	7.1	ug/l
M-Cresol, P-Chloro-	3.6U	ug/l
Benzoic Acid	18U	ug/l
Ethane, Hexachloro-	3.6U	ug/l
Cyclopentadiene, Hexach	3.6U	ug/l
Isophorone	3.6U	ug/l
Acenaphthene	3.6U	ug/l
Phthalate, Diethyl-	3.6U	ug/l
Phthalate, Di-n-Butyl-	3.6BU	ug/l
Phenanthrene	3.7	ug/l
Phthalate, n-Butyl Benz	3.6U	ug/l
Nitrosamine, Diphenyl-	3.6BU	ug/l
Fluorene	3.6U	ug/l
Butadiene, Hexachloro-	3.6U	ug/l
Pentachlorophenol	18U	ug/l
Phenol, 2,4,6-Trichloro	3.6U	ug/l
2-Nitroaniline	18U	ug/l
Phenol, 2-Nitro-	3.6U	ug/l
Napthalene	3.6U	ug/l
Naphthalene, 2-Methyl-	3.6U	ug/l
Napthalene, 2-Chloro-	3.6U	ug/l
Benzidine, 3,3'-Dichlor	7.1U	ug/l
o-Cresol	3.6U	ug/l
Benzene, 1,2-Dichloro-	3.6U	ug/l
Phenol, 2-Chloro-	3.6U	ug/l
Phenol, 2,4,5-Trichloro	18U	ug/l
Benzene, Nitro-	3.6U	ug/l
3-Nitroaniline	18U	ug/l
4-Nitroaniline	18U	ug/l
Phenol, 4-Nitro-	18U	ug/l
Benzyl Alcohol	3.6U	ug/l
Ether, 4-Bromophenyl Ph	3.6U	ug/l
Phenol, 2,4-Dimethyl-	3.6U	ug/l
p-Cresol	3.6U	ug/l
Benzene, 1,4-Dichloro-	3.6U	ug/l
Aniline, p-Chlor-	3.6U	ug/l
Phenol	3.6U	ug/l
Ether, bis[2-Chloroethy	3.6U	ug/l
Methane, bis[2-Chloroet	3.6U	ug/l
Phthalate, bis[2-Ethylh	1.1J	ug/l
Phthalate, Di-n-Octyl	3.6U	ug/l

B/N/Acid Scan Parameter *** Continued ***	Water-Total Result	Units
Anthracene	3.6U	ug/l
Benzene, 1,2,4-Trichlor	3.6U	ug/l
Phenol, 2,4-Dichloro-	3.6U	ug/l
Toluene, 2,4-Dinitro-	3.6U	ug/l
Pyrene	4.5	ug/l
Phthalate, Dimethyl	3.6U	ug/l
Dibenzofuran	3.6U	ug/l
Perylene, Benzo[g,h,i]-	4.5	ug/l
Pyrene, Indeno[1,2,3-c,	9.4	ug/l
Fluoranthene, 3,4-Benzo	10	ug/l
Fluoranthene	8.3	ug/l
Fluoranthene, Benzo[k]-	10	ug/l
Acenaphthylene	3.6U	ug/l
Chrysene	3.9	ug/l
o-Cresol, 4,6-Dinitro-	18U	ug/l
Benzene, 1,3-Dichloro-	3.6U	ug/l
Toluene, 2,6-Dinitro-	3.6U	ug/l
Nitrosamine, Di-n-Propy	3.6U	ug/l
Ether, 4-Chlorophenyl P	3.6U	ug/l
Ether, bis[2-Chloroisop	3.6U	ug/l

PCB Scan Parameter	Water-Total Result	Units
PCB-1260 (Arochlor 1260	0.10U	ug/l
PCB-1254 (Arochlor 1254	0.10U	ug/l
PCB-1221 (Arochlor 1221	0.10U	ug/l
PCB-1232 (Arochlor 1232	0.10U	ug/l
PCB-1248 (Arochlor 1248	0.10U	ug/l
PCB-1016 (Arochlor 1016	0.10U	ug/l
PCB-1242 (Arochlor 1242	0.10U	ug/l

Table A-I-4. Results of analysis for base/neutral acid extractable compounds in an aqueous sample - LLCW - analysis performed by Martin Marietta Environmental Systems (MMES)

	1	4
SAMPLE DATE:	3/26/86	3/26/86
ANALYSIS DATE:	4/17/86	4/17/86
MMES SAMPLE ID:	2716	2704
CLIENT SAMPLE ID:	LLFB	LLCW
NOTE:		
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)	
N-nitroso-dimethylamine	<5	<5
bis (2-chloroethyl) ether	<5	<5
1,3-dichlorobenzene	<5	<5
1,4-dichlorobenzene	<5	<5
1,2-dichlorobenzene	<5	<5
bis(2-chloroisopropyl) ether	<5	<5
N-nitroso-di-N-propylamine	<5	<5
hexachloroethane	<10	<10
nitrobenzene	<10	<10
isophorone	<5	<5
bis (2-chloroethoxy) methane	<5	<5
1,2,4-trichlorobenzene	<5	<5
naphthalene	<5	<5
hexachlorobutadiene	<5	<5
hexachlorocyclopentadiene	<10	<10
2-chloronaphthalene	<5	<5
dimethylphthalate	<5	<5
acenaphthalene	<5	<5
2,6-dinitrotoluene	<10	<10
acenaphthene	<5	<5
2,4-dinitrotoluene	<10	<10
diethylphthalate	<10	<10
fluorene	<5	<5
4-chlorophenylphenyl ether	<5	<5
N-nitrosodiphenylamine	<10	<10
4-bromophenylphenyl ether	<5	<5
hexachlorobenzene	<5	<5
phenanthrene	<5	<5
anthracene	<5	<5

Table A-I-4 . Continued

SAMPLE DATE:	3/26/86	3/26/86
ANALYSIS DATE:	4/17/86	4/17/86
MMES SAMPLE ID:	2716	2704
CLIENT SAMPLE ID:	LLFB	LLCW
NOTE:		
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)	
di-N-butylphthalate	<10	<10
fluoranthene	<5	<5
benzidine	<200	<200
pyrene	<5	<5
butylbenzylphthalate	<10	<10
3,3'-dichlorobenzidine	<10	<10
benzo (a) anthracene	<5	<5
chrysene	<5	<5
bis (2-ethylhexyl) phthalate	<10	<10
di-N-octylphthalate	<10	<10
benzo (b & k) fluoranthenes	<5	<5
benzo (a) pyrene	<5	<5
indeno-1,2,3 (c,d) pyrene	<10	<10
dibenzo (a,h) anthracene	<10	<10
benzo (g,h,i) perylene	<10	<10

COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)	
phenol	<10	<10
2-chlorophenol	<5	<5
2-nitrophenol	<5	<5
2,3-dimethylphenol	<5	<5
2,4-dichlorophenol	<5	<5
4-chloro-3-methylphenol	<5	<5
2,4,6-trichlorophenol	<5	<5
2,4-dinitrophenol	<15	<15
4-nitrophenol	<10	<10
4,6-dinitro-o-cresol	<15	<15
pentachlorophenol	<10	<10

Table A-I-5. Results of analysis for PCB's in an aqueous sample - LLCW - analysis performed by Martin Marietta Environmental Systems (MMES)

SAMPLE DATE:	3/26/86	3/26/86
ANALYSIS DATE:	4/16/86	4/28/86
MMES SAMPLE ID:	2716	2704
CLIENT SAMPLE ID:	LLFB	LLCW
NOTE:		
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/ml)	
aroclor 1016	<0.5	<0.5
aroclor 1221	<0.5	<0.5
aroclor 1232	<0.5	<0.5
aroclor 1242	<0.5	<0.5
aroclor 1248	<0.5	<0.5
aroclor 1254	<1.0	<1.0
aroclor 1260	<1.0	<1.0

Table A-II-1. Results of analysis for volatile organic compounds in a sediment sample - LFDS - analysis performed by EPA Region X.

12-AUG-86
14:46:46

EPA Region X Lab Management System
Sample/Project Analysis Results

Project: TEC-255C MARTIN MARIETTA Officer: NXL Account: GB10P647

Sample No: 86 190010 Begin Sample Date: 06/05/10 12:27 Source: Sediment (General) Depth: QA Code:

Laboratory: RX Description: LFDS LANDFILL NW QUAD (1)

VOA - PR Scan (GCMS) Parameter	Sediment Result	Units
Methane, Tetrachloro-	7.5U	ug/kg
Acetone	248	ug/kg
Methane, Trichloro-	7.5U	ug/kg
Benzene	7.5U	ug/kg
Ethane, 1,1,1-Trichloro	7.5U	ug/kg
Methane, Bromo-	15U	ug/kg
Methane, Chloro-	15U	ug/kg
Ethane, Chloro-	15U	ug/kg
Ethylene, Chloro-	4.1J	ug/kg
Methane, Dichloro-	29B	ug/kg
Carbon Disulfide	0.80J	ug/kg
Methane, Tribromo-	7.5U	ug/kg
Methane, Dichlorobromo-	7.5U	ug/kg
Ethane, 1,1-Dichloro-	7.5U	ug/kg
Ethylene, 1,1-Dichloro-	7.5U	ug/kg
Propane, 1,2-Dichloro-	7.5U	ug/kg
Methyl Ethyl Ketone (ME	15BU	ug/kg
Ethane, 1,1,2-Trichloro	7.5U	ug/kg
Ethylene, 1,1,2-Trichlo	7.5UJ	ug/kg
Ethane, 1,1,2,2-Tetrach	15U	ug/kg
o-Xylene	7.5U	ug/kg
Benzene, Ethyl-	7.5U	ug/kg
Styrene	7.5U	ug/kg
Ethane, 1,2-Dichloro-	7.5U	ug/kg
Vinyl Acetate	7.5U	ug/kg
Ketone, Methyl Isobutyl	15U	ug/kg
Toluene	7.5U	ug/kg
Benzene, Chloro-	7.5U	ug/kg
Ether, Chloroethyl Viny	15U	ug/kg
Methane, Chlorodibromo-	7.5U	ug/kg
Ethylene, Tetrachloro-	7.5U	ug/kg
Ethylene, 1,2-Trans-Dic	7.5U	ug/kg
2-Hexanone	15U	ug/kg
Propene, cis-1,3-Dichlo	7.5U	ug/kg
Propene, trans-1,3-Dich	7.5U	ug/kg

Table A-II-2. Results of analysis for volatile organic compounds in a sediment sample - LFDS - analysis performed by MMES

SAMPLE DATE:	5/10/86
ANALYSIS DATE:	5/16/86
MMES SAMPLE ID:	329*
CLIENT SAMPLE ID:	LFDS
NOTE:	
COMPOUNDS	
acrolein	<100
acrylonitrile	<100
benzene	<50
bromodichloromethane	<50
bromoform	<50
bromomethane	<50
carbon tetrachloride	<50
chlorobenzene	<50
chloroethane	<50
chloroform	<50
chloromethane	<50
2-chloroethylvinyl ether	<100
cis-1,3-dichloropropene	<50
dibromochloromethane	<50
1,1-dichloroethane	<50
1,2-dichloroethane	<50
1,1-dichloroethylene	<50
1,2-dichloropropane	<50
ethylbenzene	<50
methylene chloride	<100
1,1,2,2-tetrachloroethane	<50
tetrachloroethylene	<50
toluene	<50
trans-1,2-dichloroethylene	<50
trans-1,3-dichloropropene	<50
1,1,1-trichloroethane	<50
1,1,2-trichloroethane	<50
trichloroethylene	<50
vinyl chloride	<50
cis-1,2-dichloroethylene	<50

*Aqueous field blank

Table A-II-3. Results of analysis for base/neutral acid extractables in a sediment sample - LFDS - analysis performed by EPA Region X

12-AUG-86
14:46:46

EPA Region X Lab Management System
Sample/Project Analysis Results

Project: TEC-255C

MARTIN MARIETTA

Officer: NXL Account: GB10P647

Sample No: 86 190012 Begin Sample Date: 86/05/10 12:27 Source: Sediment (General) Depth: QA Code:

Laboratory: RX Description: LFDS LANDFILL NW QUAD (2)

B/N/Acid Scan Parameter	Sediment Result	Units
Pyrene, Benzo[a]-	72000	ug/kg
Phenol, 2,4-Dinitro-	6200U	ug/kg
Anthracene, Dibenzo[a,h	1300U	ug/kg
Anthracene, Benzo[a]-	72000	ug/kg
M-Cresol, P-Chloro-	1300U	ug/kg
Benzoic Acid	6200U	ug/kg
Ethane, Hexachloro-	1300U	ug/kg
Cyclopentadiene, Hexach	1300U	ug/kg
Isophorone	1300U	ug/kg
Acenaphthene	360J	ug/kg
Phthalate, Diethyl-	1300U	ug/kg
Phthalate, Di-n-Butyl-	1300BU	ug/kg
Phenanthrene	57000	ug/kg
Phthalate, n-Butyl Benz	1300U	ug/kg
Nitrosamine, Diphenyl-	1300BU	ug/kg
Fluorene	260J	ug/kg
Butadiene, Hexachloro-	1300U	ug/kg
Pentachlorophenol	6200U	ug/kg
Phenol, 2,4,6-Trichloro	1300U	ug/kg
2-Nitroaniline	6200U	ug/kg
Phenol, 2-Nitro-	1300U	ug/kg
Napthalene	580J	ug/kg
Naphthalene, 2-Methyl-	720J	ug/kg
Napthalene, 2-Chloro-	1300U	ug/kg
Benzidine, 3,3'-Dichlor	2600U	ug/kg
o-Cresol	1300U	ug/kg
Benzene, 1,2-Dichloro-	1300U	ug/kg
Phenol, 2-Chloro-	1300U	ug/kg
Phenol, 2,4,5-Trichloro	6200U	ug/kg
Benzene, Nitro-	1300U	ug/kg
3-Nitroaniline	6200U	ug/kg
4-Nitroaniline	6200U	ug/kg
Phenol, 4-Nitro-	6200U	ug/kg
Benzyl Alcohol	1300U	ug/kg
Ether, 4-Bromophenyl Ph	1300U	ug/kg
Phenol, 2,4-Dimethyl-	1300U	ug/kg
p-Cresol	1300U	ug/kg
Benzene, 1,4-Dichloro-	1300U	ug/kg
Aniline, p-Chlor-	1300U	ug/kg
Phenol	1300U	ug/kg
Ether, bis(2-Chloroethy	1300U	ug/kg
Methane, bis(2-Chloroet	1300U	ug/kg
Phthalate, bis(2-Ethyih	5006J	ug/kg
Phthalate, Di-n-Octyl	1300U	ug/kg
Benzene, Hexachloro-	1300U	ug/kg

B/N/Acid Scan *** Continued *** Parameter	Sediment Result	Units
Anthracene	3300	ug/kg
Benzene, 1,2,4-Trichlor	1300U	ug/kg
Phenol, 2,4-Dichloro-	1300U	ug/kg
Toluene, 2,4-Dinitro-	1300U	ug/kg
Pyrene	11000	ug/kg
Phthalate, Dimethyl	1300U	ug/kg
Dibenzofuran	1500	ug/kg
Perylene, Benzo[g,h,i]-	42000J	ug/kg
Pyrene, Indeno[1,2,3-c,	47000J	ug/kg
Fluoranthene, 3,4-Benzo	170000	ug/kg
Fluoranthene	13000	ug/kg
Fluoranthene, benzo[k]-	170000	ug/kg
Acenaphthylene	1300U	ug/kg
Chrysene	94000	ug/kg
o-Cresol, 4,6-Dinitro-	6200U	ug/kg
benzene, 1,3-Dichloro-	1300U	ug/kg
Toluene, 2,6-Dinitro-	1300U	ug/kg
Nitrosamine, Di-n-Propy	1300U	ug/kg
Ether, 4-Chlorophenyl P	1300U	ug/kg
Ether, bis(2-Chloroisop	1300U	ug/kg

Table A-II-4. Results of analysis for base/neutral acid extractables in a sediment sample - LFDS - analysis performed by MMES

	1	5
SAMPLE DATE:	5-10-86	5-10-86
ANALYSIS DATE:	5-15-86	5-15-86
MMES SAMPLE ID:	3297	3298
CLIENT SAMPLE ID:	LLFBS	LFDS
NOTE:		
COMPOUNDS	FINAL CONCENTRATION = ppm (mg/kg)	
N-nitroso-dimethylamine	<8.2	<8.2
bis (2-chloroethyl) ether	<8.2	<8.2
1,3-dichlorobenzene	<8.2	<8.2
1,4-dichlorobenzene	<8.2	<8.2
1,2-dichlorobenzene	<8.2	<8.2
bis(2-chloroisopropyl) ether	<8.2	<8.2
N-nitroso-di-N-propylamine	<8.2	<8.2
hexachloroethane	<8.4	<8.4
nitrobenzene	<8.4	<8.4
isophorone	<8.2	<8.2
bis (2-chloroethoxy) methane	<8.2	<8.2
1,2,4-trichlorobenzene	<8.2	<8.2
naphthalene	<8.2	<8.2
hexachlorobutadiene	<8.2	<8.2
hexachlorocyclopentadiene	<8.4	<8.4
2-chloronaphthalene	<8.2	<8.2
dimethylphthalate	<8.2	<8.2
acenaphthalene	<8.2	<8.2
2,6-dinitrotoluene	<8.4	<8.4
acenaphthene	<8.2	11
2,4-dinitrotoluene	<8.4	<8.4
diethylphthalate	<8.4	<8.4
fluorene	<8.2	9
4-chlorophenylphenyl ether	<8.2	<8.2
N-nitrosodiphenylamine	<8.4	<8.4
4-bromophenylphenyl ether	<8.2	<8.2
hexachlorobenzene	<8.2	<8.2
phenanthrene	<8.2	82
anthracene	<8.2	11

*Aqueous field blank

Table A-II-4. Continued

	1	5	
SAMPLE DATE:	5-10-86	5-10-86	
ANALYSIS DATE:	5-15-86	5-15-86	
MMES SAMPLE ID:	3297	3298	
CLIENT SAMPLE ID:	LLFBS	LFDS	
NOTE:	*		
COMPOUNDS	FINAL CONCENTRATION = ppm (mg/kg)		
di-N-butylphthalate	<8.4	<8.4	
fluoranthene	5.0	150	
benzidine	<168*	<168	
pyrene	5.3	120	
butylbenzylphthalate	<8.4	<8.4	
3,3'-dichlorobenzidine	<8.4	<8.4	
benzo (a) anthracene	<4.2	100	
chrysene	<4.2	110	
bis (2-ethylhexyl) phthalate	<8.4	<8.4	
di-N-octylphthalate	<8.4	<8.4	
benzo (b & k) fluoranthenes	<4.2	210	
benzo (a) pyrene	<4.2	110	
indeno-1,2,3 (c,d) pyrene	<8.4	100	FDS
dibenzo (a,h) anthracene	<8.4	36	
benzo (g,h,i) perylene	<8.4	91	
phenol	<4.2	<4.2	
2-chlorophenol	<4.2	<4.2	
2-nitrophenol	<4.2	<4.2	
2,3-dimethylphenol	<4.2	<4.2	
2,4-dichlorophenol	<4.2	<4.2	
4-chloro-3-methylphenol	<4.2	<4.2	
2,4,6-trichlorophenol	<4.2	<4.2	
2,4-dinitrophenol	<12.6	<12.6	
4-nitrophenol	<8.4	<8.4	
4,6-dinitro-o-cresol	<12.6	<12.6	
pentachlorophenol	<8.4	<8.4	

*Aqueous field blank

Table A-III-1. Results of analysis for volatile organic compounds in a sludge sample - SSP2ES - analysis performed by Region X Lab.

(Sample Complete)

11-AUG-86 EPA Region X Lab Management System Page 2
16:10:44 Sample/Project Analysis Results

Project: TEC-264A MARTIN MARIETTA Officer: BCZ Account: GB1DP647

Station No: SSP2ES

Sample No: 86 134581 Begin Sample Date: 86/03/28 12:38 Source: Sludge (Waste Pond) Depth: V QA Code:

Laboratory: RX Description: SLUDGE STORAGE POND #2,STATION E,SLUDGE

End Sample Date: 86/03/28 12:38 Comp: S Freq: G

Comment: AUGERED IN NE CORNER POND 2

VOA - PP Scan (GCMS) Parameter	Sediment Result	Units
Methane, Tetrachloro-	20U	ug/kg
Acetone	158UJ	ug/kg
Methane, Trichloro-	20U	ug/kg
Benzene	20U	ug/kg
Ethane, 1,1,1-Trichloro	20U	ug/kg
Methane, Bromo-	40U	ug/kg
Methane, Chloro-	40U	ug/kg
Ethane, Chloro-	40U	ug/kg
Ethylene, Chloro-	40U	ug/kg
Methane, Dichloro-	19UJ	ug/kg
Carbon Disulfide	20U	ug/kg
Methane, Tribromo-	20U	ug/kg
Methane, Dichlorobromo-	20U	ug/kg
Ethane, 1,1-Dichloro-	20U	ug/kg
Ethylene, 1,1-Dichloro-	20U	ug/kg
Propane, 1,2-Dichloro-	20U	ug/kg
Methyl Ethyl Ketone (ME	140UJ	ug/kg
Ethane, 1,1,2-Trichloro	20U	ug/kg
Ethylene, 1,1,2-Trichlo	20U	ug/kg
Ethane, 1,1,2,2-Tetrach	20U	ug/kg
o-Xylene	20U	ug/kg
Benzene, Ethyl-	20U	ug/kg
Styrene	20U	ug/kg
Ethane, 1,2-Dichloro-	20U	ug/kg
Vinyl Acetate	40U	ug/kg
Ketone, Methyl Isobutyl	40U	ug/kg
Toluene	20U	ug/kg
Benzene, Chloro-	20U	ug/kg
Ether, Chloroethyl Viny	40U	ug/kg
Methane, Chlorodibromo-	20U	ug/kg
Ethylene, Tetrachloro-	20U	ug/kg
Cis-1,2-Dichloroethene	20U	ug/kg
Ethylene, 1,2-Trans-Dic	20U	ug/kg
2-Hexanone	40U	ug/kg
Propene, cis-1,3-Dichlo	20U	ug/kg
Propene, trans-1,3-Dich	20U	ug/kg

Table A-III-2. Results of analysis for volatile organic compounds in a sludge sample - SSP2ES - analysis performed by Martin Marietta Environmental Systems

	1	6
SAMPLE DATE:	3/28/86	3/28/86
ANALYSIS DATE:	4/9/86	4/11/86
MMES SAMPLE ID:	2804	2796
CLIENT SAMPLE ID:	SSPFBS	SSP2ES
NOTE:	(a)	(b)
COMPOUNDS	FINAL CONCENTRATION = ppb (ng/gm)	
acrolein	<10	<90
acrylonitrile	<10	<90
benzene	<5	<45
bromodichloromethane	<5	<45
bromoform	<5	<45
bromomethane	<5	<45
carbon tetrachloride	<5	<45
chlorobenzene	<5	<45
chloroethane	<5	<45
chloroform	<5	<45
chloromethane	<5	<45
2-chloroethylvinyl ether	<10	<90
cis-1,3-dichloropropene	<5	<45
dibromochloromethane	<5	<45
1,1-dichloroethane	<5	<45
1,2-dichloroethane	<5	<45
1,1-dichloroethylene	<5	<45
1,2-dichloropropane	<5	<45
ethylbenzene	<5	<45
methylene chloride	<10	<90
1,1,2,2-tetrachloroethane	<5	<45
tetrachloroethylene	<5	<45
toluene	<5	<45
trans-1,2-dichloroethylene	<5	<45
trans-1,3-dichloropropene	<5	<45
1,1,1-trichloroethane	<5	<45
1,1,2-trichloroethane	<5	<45
trichloroethylene	<5	<45
vinyl chloride	<5	<45
cis-1,2-dichloroethylene	<5	<45

(a)Aqueous field blank; concentration units = ppb (ng/ml).
(b)Sample diluted 1:9 for analysis.

D-821

Table A-III-3. Results of analysis for base/neutral acid extractable in a sludge sample - SSP2ES - analysis by Region X Lab.

(Sample Complete)
11-AUG-86 EPA Region X Lab Management System Page 3
16:10:44 Sample/Project Analysis Results

Project: TEC-286A MARTIN MARIETTA Officer: BCZ Account: GM10P647

Station No: SSP2ES

Sample No: 86 134562 Begin Sample Date: 86/03/28 12:38 Source: Sludge (Waste Pond) Depth: 0 UA Code:

Laboratory: RX Description: SLUDGE STORAGE POND #2,STATION E,SLUDGE

End Sample Date: 86/03/28 12:38 Comp: S Freq: G

Comment: AUGEREL IN NE CORNER POND 2

B/N/Acid Scan Parameter	Sediment Result	Units
Pyrene, Benzo[a]-	110000	ug/kg
Phenol, 2,4-Dinitro-	1200000	ug/kg
Anthracene, Dibenzo[a,h	240000U	ug/kg
Anthracene, Benzo[a]-	860000	ug/kg
M-Cresol, P-Chloro-	240000U	ug/kg
Benzoic Acid	1200000U	ug/kg
Ethane, Hexachloro-	240000U	ug/kg
Cyclopentadiene, Hexach	240000U	ug/kg
Isophorone	240000U	ug/kg
Acenaphthene	240000U	ug/kg
Phthalate, Diethyl-	240000U	ug/kg
Phthalate, Di-n-Butyl-	240000U	ug/kg
Phenanthrene	340000	ug/kg
Phthalate, n-Butyl Benz	240000U	ug/kg
Nitrosamine, Diphenyl-	240000U	ug/kg
Fluorene	7500J	ug/kg
Butadiene, Hexachloro-	240000U	ug/kg
Pentachlorophenol	1200000U	ug/kg
Phenol, 2,4,6-Trichloro	240000U	ug/kg
2-Nitroaniline	1200000U	ug/kg
Phenol, 2-Nitro-	240000U	ug/kg
Naphthalene	240000U	ug/kg
Naphthalene, 2-Methyl-	240000U	ug/kg
Naphthalene, 2-Chloro-	240000U	ug/kg
Benzidine, 3,3'-Dichlor	490000U	ug/kg
O-Cresol	240000U	ug/kg
Benzene, 1,2-Dichloro-	240000U	ug/kg
Phenol, 2-Chloro-	240000U	ug/kg
Phenol, 2,4,5-Trichloro	1200000U	ug/kg
Benzene, Nitro-	240000U	ug/kg
3-Nitroaniline	1200000U	ug/kg
4-Nitroaniline	1200000U	ug/kg
Phenol, 4-Nitro-	1200000U	ug/kg
Benzyl Alcohol	240000U	ug/kg
Ether, 4-Bromophenyl Ph	240000U	ug/kg
Phenol, 2,4-Dimethyl-	240000U	ug/kg
P-Cresol	240000U	ug/kg
Benzene, 1,4-Dichloro-	240000U	ug/kg
Aniline, N-Chlor-	240000U	ug/kg
Phenol	240000U	ug/kg
Ether, bis[2-Chloroethy	240000U	ug/kg
Methane, bis[2-Chloroet	240000U	ug/kg
Phthalate, bis[2-Ethylh	240000U	ug/kg
Phthalate, Di-n-Octyl	240000U	ug/kg
Benzene, Hexachloro-	240000U	ug/kg

B/N/Acid Scan Parameter (*** Continued ***)	Sediment Result	Units
Anthracene	17000J	ug/kg
Benzene, 1,2,4-Trichlor	240000U	ug/kg
Phenol, 2,4-Dichloro-	240000U	ug/kg
Toluene, 2,4-Dinitro-	240000U	ug/kg
Pyrene	680000	ug/kg
Phthalate, Dimethyl	240000U	ug/kg
Dibenzofuran	240000U	ug/kg
Perylene, Benzo[g,h,i]-	130000	ug/kg
Pyrene, Indeno[1,2,3-c,	200000	ug/kg
Fluoranthene, 3,4-Benzo	510000	ug/kg
Fluoranthene	1.6E6	ug/kg
Fluoranthene, benzo[k]-	510000	ug/kg
Acenaphthylene	3300J	ug/kg
Chrysene	670000	ug/kg
O-Cresol, 4,6-Dinitro-	1200000U	ug/kg
Benzene, 1,3-Dichloro-	240000U	ug/kg
Toluene, 2,6-Dinitro-	240000U	ug/kg
Nitrosamine, Di-n-Propy	240000U	ug/kg
Ether, 4-Chlorophenyl P	240000U	ug/kg
Ether, bis[2-Chloroisop	240000U	ug/kg

Table A-III-4. Results of analysis for base/neutral acid extractables in a sludge sample - SSP2ES - analysis performed by Martin Marietta Environmental Systems

	1	6
SAMPLE DATE:	3/28/86	3/28/86
ANALYSIS DATE:	4/18/86	4/22/86
MMES SAMPLE ID:	2304	2796
CLIENT SAMPLE ID:	SSPFBS	SSP2ES
NOTE:	(a)	4 5 9
COMPOUNDS		
N-nitroso-dimethylamine	<5	<62.5
bis (2-chloroethyl) ether	<5	<62.5
1,3-dichlorobenzene	<5	<62.5
1,4-dichlorobenzene	<5	<62.5
1,2-dichlorobenzene	<5	<62.5
bis(2-chloroisopropyl) ether	<5	<62.5
N-nitroso-di-N-propylamine	<5	<62.5
hexachloroethane	<10	<125
nitrobenzene	<10	<125
isophorone	<5	<62.5
bis (2-chloroethoxy) methane	<5	<62.5
1,2,4-trichlorobenzene	<5	<62.5
naphthalene	<5	<62.5
hexachlorobutadiene	<5	<62.5
hexachlorocyclopentadiene	<10	<125
2-chloronaphthalene	<5	<62.5
dimethylphthalate	<5	<62.5
acenaphthalene	<5	<62.5
2,6-dinitrotoluene	<10	<125
acenaphthene	<5	<62.5
2,4-dinitrotoluene	<10	<62.5
diethylphthalate	<10	<125
fluorene	<5	<62.5
4-chlorophenylphenyl ether	<5	<62.5
N-nitrosodiphenylamine	<10	<125
4-bromophenylphenyl ether	<5	<62.5
hexachlorobenzene	<5	<62.5
phenanthrene	<5	<62.5
anthracene	<5	<62.5

(a)Aqueous field blank; concentration units = ppb (ng/ml).

Table A-III-4. Continued

	1	6
SAMPLE DATE:	3/28/86	3/28/86
ANALYSIS DATE:	4/18/86	4/22/86
MMES SAMPLE ID:	2804	2796
CLIENT SAMPLE ID:	SSPFBS	SSP2ES
NOTE:		
COMPOUNDS	FINAL CONCENTRATION = ppm (ug/g)	
di-N-butylphthalate	<10	<125
fluoranthene	<5	1780
benzidine	<200	<2500
pyrene	<5	1220
butylbenzylphthalate	<10	<125
3,3'-dichlorobenzidine	<10	<125
benzo (a) anthracene	<5	340
chrysene	<5	1280
bis (2-ethylhexyl) phthalate	<10	<125
di-N-octylphthalate	<10	<125
benzo (b & k) fluoranthenes	<5	1430
benzo (a) pyrene	<5	330
indeno-1,2,3 (c,d) pyrene	<10	370
dibenzo (a,h) anthracene	<10	<125
benzo (g,h,i) perylene	<10	470
phenol	<10	<62.5
2-chlorophenol	<5	<62.5
2-nitrophenol	<5	<62.5
2,3-dimethylphenol	<5	<62.5
2,4-dichlorophenol	<5	<62.5
4-chloro-3-methylphenol	<5	<62.5
2,4,6-trichlorophenol	<5	<62.5
2,4-dinitrophenol	<15	<187.5
4-nitrophenol	<10	<125
4,6-dinitro-o-cresol	<15	<187.5
pentachlorophenol	<10	<125

(a)Aqueous field blank; concentration units = ng/ml.

LAUCKS FIELD SPLIT SAMPLE COMPARISON

LABORATORY DATA VALIDATION
MARTIN MARIETTA - THE DALLES
FIELD SPLITS COMPARISON

GROUND WATER SAMPLES COLLECTED
AUGUST - SEPTEMBER 1986

A summary of the results of split samples collected during 26 August to 4 September 1986 at Martin Marietta Reduction Facility (MMRF), The Dalles, Oregon, and analyzed by MMES and Laucks Testing Labs is presented.

A majority of the Laucks data is invalid because of holding time violations. These violations affected total cyanides, free cyanides, fluorides, sulfates, PCBs, BNAs, and VOCs. A table summarizing the holding time violations is provided.

The data is presented, compared to the MMES data merely for qualitative evaluation and comparison. Free cyanide was analyzed by Laucks by the ASTM microdiffusion method as opposed to the Standard Methods 412.14 Weak and Dissociable Cyanide Method specified by the QAPP and in the laboratory contract. This may explain why Laucks results are much lower than MMES for "Free Cyanides."

Thirteen samples collected at MMRF, were split and analyzed by Martin Marietta Environmental Systems and Laucks Testing Labs. A list of samples collected, laboratory tracking numbers, and parameters requested can be found in Table 1.

Results from the analyses for inorganic parameters are summarized in Table I-1 through I-12 in Section I (Inorganics). Results from the analyses for organic parameters are summarized in Tables II-1 through II-3 in Section II (Organics).

Additional organic compounds (volatiles, base-neutral acid) from EPA Contract Lab Program's Hazardous Substance List (HSL) were analyzed by Laucks Testing Labs. No compounds were reported above detectable levels. Sample MW-1B was analyzed for PCBs by both labs. No PCB compounds were reported above detectable levels.

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Martin Marietta - The Dalles
Ground Water Samples
Collected September 1986

Field Split Samples
Holding Time Evaluation
Laucks Testing Laboratory

Field ID	Laucks	T. CN	F. CN	Na	F	SO_4	Metals	PCBs	BNA	VOC	Trip Blk VOC
MW-15B	98545	(x)	(x)	x	(x)	(x)	x				
MW-1B	98552	(x)	(x)	x	x	x	x	(x)	(x)	x	x
MW-3A	98565	(x)	(x)	x	x	x	x				x
MW-16-D	98565	(x)	(x)	x	x	x	x		(x)	x	x
Recycle Pond	98566	(x)	(x)								
MW-7B	78566	(x)	(x)	x	x	x	x			ND	
PW-4	98566	(x)	(x)	x	x	x	x			ND	x
MW-8B	98668	(x)	(x)	x	(x)	(x)	x				
MW-6A	98668	(x)	(x)	x	x	x	x				
MW-9B	98668	(x)	(x)	x	(x)	(x)	x				
Chenowith	98668	(x)	(x)	x	x	x	x				
DCEG										x	
LLDW	98953	x	(x)								
TOTAL:											
13		12	12	10	10	10	10	1	2	5	
Number exceeding holding time:		11	12	0	3	3	0	1	2	1	
Number of valid samples:		1	0	10	7	7	10	0	0	4	
Number not analyzed:		0	0	0	0	0	0	0	0	2	
Valid samples:		1		10	7	7	10			2	

Note:
Valid samples are: (x) = exceeded holding times
Total Cyanide - LLDW
Free Cyanide - No samples
Sodium - All samples
Fluoride - MW1B, 3A, 16D, 7B, PW-4, 6A, Chenowith 3
Sulfate - MW-B, 3A, 16D, 7B, PN-4, 6A, Chenowith 3
Metals - all samples
PCBs - no samples
B/N/A - no samples
VOC - MW1B, MW-16D

Table 1. List of split samples collected at MMRF and analyzed by Martin Marietta Environmental Systems and Laucks Testing Labs with corresponding lab tracking numbers and parameters requested

Client Sample ID	MMES ID	Sampling Date	Laucks ID	Parameter(s) Requested
MW-1B	797	8/28/86	98552	1, PCB's
MW-3A	777	8/27/86	98565-1	1
MW-6A	895	9/3/86	98668-1	3
MW-7B	826	9/1/86	98566-2	2
MW-8B	899	9/3/86	98668-2	3
MW-9B	891	9/4/86	98668-3	3
MW-15B	752	8/26/86	98545	3
MW-16D	779	8/27/86	98565-2	1
PW-4	817	9/2/86	98566-1	2
LLDW	983	9/18/86	98953	Total and free cyanide
Recycle Pond	822	8/30/86	98566-3	Total and free cyanide
Chenowith #3	889	9/4/86	98668-4	3
DCEG	892	9/4/86	98668-5	Volatile organics

1. Total and free cyanide, sodium, EP toxicity test metals, fluoride, sulfate, volatile organics, base/neutral acid extractables.
2. Total and free cyanide, sodium, EP toxicity test metals, fluoride and sulfate, volatile organics.
3. Total, free cyanide, sodium, EP toxicity test metal, fluoride, sulfate.

SECTION I

ANALYSES FOR INORGANIC PARAMETERS

Table I-1. Summary of inorganic results for client sample ID: MW-1B

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	1.3	0.8
Sulfate	22	17
Sodium	30	38
Free cyanide	<0.010	<0.005
Total cyanide	<0.010	0.008

Table I-2. Summary of inorganic results for client sample ID: MW-3A

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	0.97	0.4
Sulfate	30	26
Sodium	24	25
Free cyanide	<0.010	<0.005
Total cyanide	<0.010	0.035

Table I-3. Summary of inorganic results for client sample ID: MW-6A

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	1.1	0.7
Sulfate	9.1	8
Sodium	23	32
Free cyanide	0.230	0.012
Total cyanide	0.38	0.37

Table I-4. Summary of inorganic results for client sample ID: MW-7B

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	0.71	0.30
Sulfate	78	72
Sodium	22	21
Free cyanide	0.042	0.017
Total cyanide	0.77	0.74

Table I-5. Summary of inorganic results for client sample ID: MW-8B

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	1.8	0.30
Sulfate	67	70
Sodium	25	22
Free cyanide	0.190	0.006
Total cyanide	0.48	0.49

Table I-6. Summary of inorganic results for client sample ID: MW-9B

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	1.4	0.80
Sulfate	50	48
Sodium	32	36
Free cyanide	0.54	0.023
Total cyanide	1.0	1.1

Table I-7. Summary of inorganic results for client sample ID: MW-15B

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	1.1	0.30
Sulfate	97	77
Sodium	22	21
Free cyanide	0.052	0.012
Total cyanide	1.5	0.74
EP Tox Metals (µg/L)		
Arsenic	<10	<5
Barium	<200	40
Cadmium	<10	<2
Chromium	<20	<5
Lead	<10	<10
Mercury	<0.30	<1
Selenium	<5	<5
Silver	<50	<2

Table I-8. Summary of inorganic results for client sample ID: PW-4

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	0.72	0.50
Sulfate	21	17
Sodium	23	22
Free cyanide	<0.010	<0.005
Total cyanide	0.010	0.005
EP Tox Metals (µg/L)		
Arsenic	<10	<5
Barium	<200	<20
Cadmium	<10	<2
Chromium	<20	<5
Lead	<10	<10
Mercury	<0.3	<1
Selenium	<5	<5
Silver	<50	<2

Table I-9. Summary of inorganic results for client sample ID: Recycle Pond

Parameter (mg/L)	MMES Result	Laucks Result
Free cyanide	<0.010	0.025
Total cyanide	0.015	0.055

Table I-10. Summary of inorganic results for client sample ID: LLDW

Free cyanide	1.5	0.44
Total cyanide	14	12

Table I-11. Summary of inorganic results for client sample ID: MW-16D

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	0.68	0.50
Sulfate	24	20
Sodium	17	17
Free cyanide	<0.010	<0.005
Total cyanide	<0.010	0.010
EP Tox Metals (ug/L)		
Arsenic	<10	<5
Barium	<200	<20
Cadmium	<10	<2
Chromium	<20	<5
Lead	<10	<10
Mercury	<0.3	<1
Selenium	<5	<5
Silver	<50	<2

Table I-12. Summary of inorganic results for client sample ID: Chenowith #3

Parameter (mg/L)	MMES Result	Laucks Result
Fluoride	1.0	0.70
Sulfate	32	32
Sodium	39	43
Free cyanide	<0.010	<0.005
Total cyanide	<0.010	0.020
EP Tox Metals (µg/L)		
Arsenic	<50	<5
Barium	<200	<20
Cadmium	<10	<2
Chromium	<20	<5
Lead	<10	<10
Mercury	<0.30	<1
Selenium	<5	<5
Silver	<50	<2

SECTION II

ANALYSES FOR ORGANIC PARAMETERS

Table II-1. Results of analysis for volatile organic compounds in an aqueous sample collected at the Martin Marietta Reduction Facility, The Dalles, Oregon and analyzed by Martin Marietta Environmental Systems and Laucks Testing Labs

CLIENT SAMPLE ID: MW-1B

COMPOUND (ug/L	MMES Result	Laucks Result
acrolein	<10	<5
acrylonitrile	<10	<5
benzene	<5	<1
bromodichloromethane	<5	<1
bromomethane	<5	<1
bromoform	<5	<1
carbon tetrachloride	<5	<1
chlorobenzene	<5	<1
chloroethane	<5	<1
chloroform	<5	<1
chloromethane	<5	<1
2-chloroethylvinyl ether	<5	<1
cis-1,3-dichloropropene	<5	<1
dibromochloromethane	<5	<1
1,1-dichloroethane	<5	<1
1,2-dichloroethane	<5	<1
1,1-dichloroethylene	<5	<1
1,2-dichloropropane	<5	<1
ethylbenzene	<5	<1
methylene chloride	<5	<1
1,1,2,2-tetrachloroethane	<5	<1
tetrachloroethylene	<5	<1
toluene	<5	<1
trans-1,2-dichloroethylene	<5	<1
trans-1,3-dichloroethane	<5	<1
1,1,1-trichloroethane	<5	<1
1,1,2-trichloroethane	<5	<1
trichloroethylene	<5	<1
vinyl chloride	<1	<1
cis-1,2-dichloroethylene	<5	NA

NA = Not analyzed

D-837

Table II-1. Results of analysis for base/neutral acid extractable compounds in aqueous sample (client ID: MW-1B) collected at Martin Marietta Reduction Facility, The Dalles, Oregon and analyzed by Martin Marietta Environmental Systems and Laucks Testing Labs

	CLIENT SAMPLE ID: MW-1B	
COMPOUNDS (µg/L)	MMES Result	Laucks Result
Acenaphthalene	< 10	<1
Acenaphthene	< 10	<1
Anthracene	< 10	<1
Benzidine	< 80	<1
Benzo(a)Anthracene	< 10	<1
Benzo(a)Pyrene	< 10	<1
Benzo(b+k)fluoranthenes	< 10	<1
Benzo(g,h,i)Perylene	< 10	<1
Benzoic Acid	< 50	<1
Benzyl Alcohol	< 10	<1
4-Bromophenyl-phenylether	< 10	<1
Butylbenzylphthalate	< 10	<1
4-Chloro-3-Methylphenol	< 10	<1
4-Chloroaniline	< 10	<1
bis(2-Chloroethoxy)Methane	< 10	<1
bis(2-Chloroethyl)Ether	< 10	<1
bis(2-Chloroisopropyl)Ether	< 10	<1
2-Chloronaphthalene	< 10	<1
2-Chlorophenol	< 10	<1
4-Chlorophenyl-phenylether	< 10	<1
Chrysene	< 10	<1
Di-n-Butylphthalate	< 10	<1
Di-n-Octyl Phthalate	< 10	<1
Dibenz(a,h)Anthracene	< 10	<1
Dibenzofuran	< 10	<1
1,2-Dichlorobenzene	< 10	<1
1,3-Dichlorobenzene	< 10	<1
1,4-Dichlorobenzene	< 10	<1
3,3'-Dichlorobenzidine	< 20	<1
2,4-Dichlorophenol	< 10	<1
Diethylphthalate	< 10	<1
Dimethyl Phthalate	< 10	<1
2,4-Dimethylphenol	< 10	<1
4,6-Dinitro-2-Methylphenol	50	<1
2,4-Dinitrophenol	50	<1
2,6-Dinitrotoluene	< 10	<1

Table II-1. Continued

CLIENT SAMPLE ID: MW-1B

COMPOUNDS (µg/L)	MMES Result	Laucks Result
2,4-Dinitrotoluene	< 10	<1
1,2-Diphenylhydrazine	< 10	<1
bis(2-Ethylhexyl)Phthalate	< 10	<1
Fluoranthene	< 10	<1
Fluorene	< 10	<1
Hexachlorobenzene	< 10	<1
Hexachlorobutadiene	< 10	<1
Hexachlorocyclopentadiene	< 10	<1
Hexachloroethane	< 10	<1
Indeno(1,2,3-cd)Pyrene	< 10	<1
Isophorone	< 10	<1
2-Methylnaphthalene	< 10	<1
4-Methylphenol	< 10	<1
2-Methylphenol	< 10	<1
N-Nitroso-Di-n-Propylamine	< 10	<1
N-Nitrosodimethylamine	< 5	<1
N-Nitrosodiphenylamine	< 10	<1
Naphthalene	< 10	<1
2-Nitroaniline	< 50	<1
4-Nitroaniline	< 50	<1
3-Nitroaniline	< 50	<1
Nitrobenzene	< 10	<1
4-Nitrophenol	< 50	<1
2-Nitrophenol	< 10	<1
Pentachlorophenol	< 50	<1
Phenanthrene	< 10	<1
Phenol	< 10	<1
Pyrene	< 10	<1
1,2,4-Trichlorobenzene	< 10	<1
2,4,5-Trichlorophenol	< 50	<1
2,4,6-Trichlorophenol	< 10	<1

Table II-2. Results of analysis for volatile organic compounds in an aqueous sample collected at the Martin Marietta Reduction Facility, The Dalles, Oregon and analyzed by Laucks Testing Labs.

CLIENT SAMPLE ID: MW-16D

COMPOUND (µg/L	MMES Result	Laucks Result
acrolein	<10	<5
acrylonitrile	<10	<5
benzene	<5	<1
bromodichloromethane	<5	<1
bromomethane	<5	<1
bromoform	<5	<1
carbon tetrachloride	<5	<1
chlorobenzene	<5	<1
chloroethane	<5	<1
chloroform	<5	<1
chloromethane	<5	<1
2-chloroethylvinyl ether	<5	<1
cis-1,3-dichloropropene	<5	<1
dibromochloromethane	<5	<1
1,1-dichloroethane	<5	<1
1,2-dichloroethane	<5	<1
1,1-dichloroethylene	<5	<1
1,2-dichloropropane	<5	<1
ethylbenzene	<5	<1
methylene chloride	<5	<1
1,1,2,2-tetrachloroethane	<5	<1
tetrachloroethylene	<5	<1
toluene	<5	<1
trans-1,2-dichloroethylene	<5	<1
trans-1,3-dichloroethane	<5	<1
1,1,1-trichloroethane	<5	<1
1,1,2-trichloroethane	<5	<1
trichloroethylene	<5	<1
vinyl chloride	<1	<1
cis-1,2-dichloroethylene	<5	NA

NA - Not analyzed

Table II-2. Results of analysis for base/neutral acid extractable compounds in an aqueous sample collected at Martin Marietta Reduction Facility, The Dalles, Oregon and analyzed by Martin Marietta Environmental Systems and Laucks Testing Labs

CLIENT SAMPLE ID: MW-16D

COMPOUNDS (µg/L)	MMES Result	Laucks Result
Acenaphthalene	< 10	<1
Acenaphthene	< 10	<1
Anthracene	< 10	<1
Benzidine	< 80	<1
Benzo(a)Anthracene	< 10	<1
Benzo(a)Pyrene	< 10	<1
Benzo(b+k)fluoranthenes	< 10	<1
Benzo(g,h,i)Perylene	< 10	<1
Benzoic Acid	< 50	<1
Benzyl Alcohol	< 10	<1
4-Bromophenyl-phenylether	< 10	<1
Butylbenzylphthalate	< 10	<1
4-Chloro-3-Methylphenol	< 10	<1
4-Chloroaniline	< 10	<1
bis(2-Chloroethoxy)Methane	< 10	<1
bis(2-Chloroethyl)Ether	< 10	<1
bis(2-Chloroisopropyl)Ether	< 10	<1
2-Chloronaphthalene	< 10	<1
2-Chlorophenol	< 10	<1
4-Chlorophenyl-phenylether	< 10	<1
Chrysene	< 10	<1
Di-n-Butylphthalate	< 10	<1
Di-n-Octyl Phthalate	< 10	<1
Dibenz(a,h)Anthracene	< 10	<1
Dibenzofuran	< 10	<1
1,2-Dichlorobenzene	< 10	<1
1,3-Dichlorobenzene	< 10	<1
1,4-Dichlorobenzene	< 10	<1
3,3'-Dichlorobenzidine	< 20	<1
2,4-Dichlorophenol	< 10	<1
Diethylphthalate	< 10	<1
Dimethyl Phthalate	< 10	<1
2,4-Dimethylphenol	< 10	<1
4,6-Dinitro-2-Methylphenol	< 50	<1
2,4-Dinitrophenol	< 50	<1
2,6-Dinitrotoluene	< 10	<1

Table II-2. Continued

CLIENT SAMPLE ID: MW-1B
16D

COMPOUNDS (µg/L)	MMES Result	Laucks Result
2,4-Dinitrotoluene	< 10	<1
1,2-Diphenylhydrazine	< 10	<1
bis(2-Ethylhexyl)Phthalate	< 10	<1
Fluoranthene	< 10	<1
Fluorene	< 10	<1
Hexachlorobenzene	< 10	<1
Hexachlorobutadiene	< 10	<1
Hexachlorocyclopentadiene	< 10	<1
Hexachloroethane	< 10	<1
Indeno(1,2,3-cd)Pyrene	< 10	<1
Isophorone	< 10	<1
2-Methylnaphthalene	< 10	<1
4-Methylphenol	< 10	<1
2-Methylphenol	< 10	<1
N-Nitroso-Di-n-Propylamine	< 10	<1
N-Nitrosodimethylamine	< 5	<1
N-Nitrosodiphenylamine	< 10	<1
Naphthalene	< 10	<1
2-Nitroaniline	< 50	<1
4-Nitroaniline	< 50	<1
3-Nitroaniline	< 50	<1
Nitrobenzene	< 10	<1
4-Nitrophenol	< 50	<1
2-Nitrophenol	< 10	<1
Pentachlorophenol	< 50	<1
Phenanthrene	< 10	<1
Phenol	< 10	<1
Pyrene	< 10	<1
1,2,4-Trichlorobenzene	< 10	<1
2,4,5-Trichlorophenol	< 50	<1
2,4,6-Trichlorophenol	< 10	<1

Table II-3. Results of analysis for volatile organic compounds in a sediment sample collected at the Martin Marietta Reduction Facility, The Dalles, Oregon and analyzed by Laucks Testing Labs.

CLIENT SAMPLE ID: DCEG

COMPOUND (µg/kg	MMES Result	Laucks Result
acrolein	<50	<25
acrylonitrile	<50	<25
benzene	<25	<5
bromodichloromethane	<25	<5
bromomethane	<25	<5
bromoform	<25	<5
carbon tetrachloride	<25	<5
chlorobenzene	<25	<5
chloroethane	<25	<5
chloroform	<25	<5
chloromethane	<25	<5
2-chloroethylvinyl ether	<50	<5
cis-1,3-dichloropropene	<25	<5
dibromochloromethane	<25	<5
1,1-dichloroethane	<25	<5
1,2-dichloroethane	<25	<5
1,1-dichloroethylene	<25	<5
1,2-dichloropropane	<25	<5
ethylbenzene	<25	<5
methylene chloride	<25	<5
1,1,2,2-tetrachloroethane	<25	<5
tetrachloroethylene	<25	<5
toluene	<25	100
trans-1,2-dichloroethylene	<25	<5
trans-1,3-dichloroethane	<25	<5
1,1,1-trichloroethane	<25	<5
1,1,2-trichloroethane	<25	<5
trichloroethylene	<25	<5
vinyl chloride	<10	<5
cis-1,2-dichloroethylene	<25	NA[1]

[1] NA - Not analyzed

COMPUCHEM FIELD SPLIT SAMPLE COMPARISON

558/8a

FIELD SPLITS COMPARISON

Martin Marietta - The Dalles
Quality Assurance Review
Soil and Surface Water
Samples Collected June-August 1987

Samples: LRASC Matrix: Soil

Parameter units	Compuchem mg/kg	Versar mg/kg	RPD
T. Cyanide	6.9	<10	NC
F. Cyanide	0.85	0.66	25.2
Fluoride	2080	2300	10.0
Sulfate	650	<510	24.1
Sodium	11,700	10,500	10.8
Arsenic	4.4	<10	NC
EP Tox. Metals: Units	ug/L	ug/L	
Arsenic	58	<200	NC
Barium	112	<200	NC
Cadmium	BDL	<50	NC
Chromium	32	<50	NC
Lead	BDL	<200	NC
Mercury	.29	<0.30	NC
Selenium	BDL	<200	NC
Silver	BDL	<50	NC

Conclusion: RPD's are consistant with the QAPP. The data is acceptable for classification to any level.

558/8b

FIELD SPLITS COMPARISON

Sample: CWASGS Matrix: Soil (Grab)

Parameter	units:	Compuchem mg/kg	Versar mg/kg	RPD
T. Cyanide		18	20	10.5
F. Cyanide		4.8	9.6	66.6
Fluoride		650	1,170	57.1
Sodium		5,740	6,630	14.4

Sample: OCWPSC-C Matrix: soil (composite)

	units:	mg/kg	mg/kg	Versar Lab Duplicate	
T. Cyanide		16	19	17.1	18.9
F. Cyanide		8.6	J 5.2*	NC	J 4.9*
Sodium		14,800	10,900		

* Matrix spikes were low.

558/8c

FIELD SPLITS COMPARISON

Organics Analyses
Base/Neutral Extractables

Matrix: Soil Units: mg/kg

Sample ID:	Phasc 2916	Soil Rep. 2 2917	Phasc 138511
Laboratory	Versar	Versar	Compuchem
Compounds:			
Acenaphthene	114,000	91,300	34,000 J
Benzo(a) Anthracene	989,000	820,000	290,000
Benzo(a) Pyrene	778,000	585,000	290,000
Benzo (6 + k) Fluoranthene	1.8 E + 06	1.5 E + 06	J90,000
Benzo (g,h) Perylene	466,000	700,000	220,000
Chrysene	872,000	815,000	360,000
Dibenzene (a,h,) Anthracene	274,000	451,000	100,000
Fluoroanthene	1.6 E + 06	1.2 E + 06	340,000
Indeno (1,2,3-cd) Pyrene	559,000	444,000	200,000
Phenanthrene	696,000	553,000	220,000
Pyrene	893,000	783,000	440,000

BDL All Others at 50,000 + Detection Limit

Naphthalene	6,000
2 Methyl Naphthalene	6,500 J
Dibenzofuran	14,000 J
Fluorene	24,000 J
Pentachlorophenol	21,000 J
Anthracene	26,000 J

558/8d

FIELD SPLITS COMPARISON

Sample: LDAWGS

Units: ug/L

Parameter	Sample		Resampling	
	Compuchem	Versar	Compuchem	Versar
T. Cyanide	33,000	Not Tested [1/]		373,000
F. Cyanide	5,900	Not Tested [1/]		34,200
Fluoride	7,800	7,620		6,880

1/ Holding time, exceeded; sample recollected.

558/20a

VERSAR - COMPUCHEM
FIELD SPLIT COMPARISON
GROUND-WATER ANALYSIS
JULY - SEPTEMBER 1987

	Versar	Compuchem	RPD %	Versar	Compuchem	RPD %
Sample	**MWR-6B**			**MW-14B**		
ID No.	**3315**	**143703**		**3330**	**143903**	
Sodium (T)	25,100	22,000	13.1	24,800	21,000	16.6
Cyanide, F	51	79	43.0	41	44	7.0
Cyanide, T	1,120	830	29.7	641	670	4.4
Fluoride	<1.0	.38	NC	<1.0	.39	NC
Sulfate	73	83	12.8	72	79	9.3
Sample	**MW-17S**			**MW-19S**		
ID No.	**3331**	**143904**		**3332**	**143905**	
Sodium, (T)	31,400	26,000	18.8	246,000	200,000	20.6
Cyanide, F	27	18	40	<10	<10	0
Cyanide, T	549	530	3.5	<10	<10	0
Fluoride	<1.0	.46	NC	4.8	5.1	6.0
Sulfate	1,130*	110	NC	1,171	1,300	NC
Sample	**MW-23S**			**LDAWG - Repeat**		
ID No.	**3535**	**144114**			**144486**	
Sodium, (T)	18,800	15,000	22.4	-	73.5×10^6	
Cyanide, F	15	22	38.0	-	11,000	
Cyanide, T.	180	220	20.0	-	45,000	
Fluoride	<1.0	.28	NC	-	7,900	
Sulfate	16	25	43.9	-	120,000	
Sample	**MWR-7A**			**MWR-20A**		
ID. No.	**3484**	**145125**		**3486**	**145127**	
Sodium (T)	29,000	26,000	10.9	38,400	30,000	24.6
Cyanide, F	99	46	73.1	<10	<10	0
Cyanide, T	803	760	5.5	<10	<10	0
Fluoride	<1.0	.67	NC	<1.0	.64	NC
Sulfate	28	29	3.5	27	31	13.8

Table Continued.

	Versar	Compuchem	RPD %	Versar	Compuchem	RPD %
Sample	**Rec. Well**			**MW-26A**		
ID. No.	**3529**	**145129**		**3571**	**146308**	
Sodium (T)	40,000	31,000	25.3	61,200	64,000	4.5
Cyanide, F	<10	<10	0	25	15	50
Cyanide, T	10	10	0	312	300	3.9
Fluoride	<1.0	.84	NC	<1.0	.62	NC
Sulfate	33	22		75	75	0
Sample	**MW-15B**			**Chenowith #1**		
ID. No.	**3587**	**146310**		**3620**	**147111**	
Sodium	23,800	21,000	12.5	47,400	41,000	14.5
Cyanide, F	95	17	139.2	<10	<10	0
Cyanide, T	802	900	11.5	<10	<10	0
Fluoride	<1.0	.38	NC	<1.0	.93	NC
Sulfate	88	92	4.4	40	52	26.0
Sample	**MW-4B**			**MWR-2A**		
ID. No.	**3623**	**147112**		**3632**	**147190**	
Sodium	33,900	19,000	56.3	31,700	32,000	0.9
Cyanide, F	<10	<10	0	38	26	37.5
Cyanide, T	<10	20	NC	608	650	6.7
Fluoride	<1.0	.74	NC	<10	.61	NC
Sulfate	54	53	0	91	54	51.0
Sample	**MW-16B**			**MW-33B**		
ID. No.	**3673**	**149036**		**3687**	**149033**	
Sodium	25,100	26,000	3.5	43,200	22,000	65.0
Cyanide, F	15	21	33	85	85	0
Cyanide, T	260	280	7.4	1,500	2,200	37.8
Fluoride	1.4	1.8	25	<1.0	.20	NC
Sulfate	21	21	0	71	146	69.1

558/21

AVERAGE RPD FOR EACH METHOD

BETWEEN VERSAR AND COMPUCHEM

Parameter	Method	Average RPD
Sodium	200.7	20.6
Cyanide, Free	412.H	30.7
Cyanide, Total	335.2 Mod CLP	8.7
Fluoride	340.2	NC all BDL
Sulfate	375.3 Turbidimetric	19.5

Conclusion: The Field Split data supports the Data Validation of the primary laboratory.

SECTION FOUR

SUPPORT DOCUMENTATION FOR THE REMEDIAL INVESTIGATION REPORT FOR THE MARTIN MARIETTA REDUCTION FACILITY, THE DALLES, OREGON

GERAGHTY & MILLER, INC.
Ground-Water Consultants
Our 30th year

536/40

February 9, 1988

Mr. Raleigh Farlow
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue
Seattle, WA 98101

RE: Support Documentation for the Remedial Investigation Report for the Martin Marietta Reduction Facility, The Dalles, Oregon.

Dear Mr. Farlow:

Enclosed please find the support documentation you requested for the Remedial Investigation at the Martin Marietta Reduction Facility, The Dalles, Oregon. This information is contained within three document packages identified as Items I, II, and III. A table itemizing the material contained in each is also provided for your information.

If you have any questions, please feel free to call me at my office at (813) 961-1921. I look forward to receiving your approval of the information so that I may finalize the Quality Assurance Summary (Appendix D) of the Final Remedial Investigation Report.

Sincerely,

GERAGHTY & MILLER, INC.

Charles W. Ankerberg
Senior Scientist

CWA:lt
enc.

Northdale Executive Center • 3820 Northdale Blvd., Suite 200B • Post Office Box 273630 • Tampa, FL 33688-3630 • (813) 961-1921

MARTIN MARIETTA ALUMINUM - THE DALLES

Item I — Letter from Douglas J. McInnes, Project Manager (Versar) January 18, 1988 to C. Warren Ankerberg, Containing the Following:

- o Discussion of Quantitation Limmit Determination (Organic and Inorganic)
- o Table 1 - Volatile Organic Compound Limit Data
- o Table 2 - Base, Neutral, and Acid Extractable Compound Quantitation Limit Data
- o Table 3 - Metals and Inorganic Compounds Quantitation Limit Data

Item II — Letter from Joe Arlauskas, Manager Analytical Chemistry Services (Versar) January 15, 1988 to C. Warren Ankerberg, Containing the Following:

- o Section I: Summary of Detection Limit Determination (Organics and Inorganics)
- o Section II: Revised Report Tables B-54 and B-55 showing ICVS and CCVS for Total and Free Cyanide.
- o Section III: Copies of Detection Limit Tables for Organics without the "less than" sign.
- o Section IV: Source of Independent QC Samples.
- o Section V: Source of Independent QC Standard.
- o Section VI: Iron results for Cyanide Matrix Interference Study.

Item III — Letter from Douglas J. McInnes, Project Manager and Joe Arlauskas (Versar) October 22, 1987 to C. Warren Ankerberg, Containing the Following:

- o Report entitled "Matrix Interference Study for Free Cyanide Spike Recoveries"

ITEM I

Versar INC.
ESM Operations

January 18, 1988

C.W. Ankerberg
Geraghty & Miller Inc.
3820 Northdale Boulevard
Suite 200-B
Tampa, FL 33624

Dear Mr. Ankerberg,

Enclosed is the information you requested for the Martin Marietta Aluminum, The Dalles project.

Please call me if there are any questions or further need of information.

Sincerely,

Douglas J. McInnes
Project Manager

DJM/

cc: J. Arlauskas
File (The Dalles Project)

9200 RUMSEY ROAD • COLUMBIA, MARYLAND 21045-1934 • TELEPHONE: (301) 964-9200 • FAX: (301) 964-9200, EXT. 350

Contents of Information Request Package
for Geraghty and Miller, Inc., Tampa FL

Project: Martin Marietta Aluminum
The Dalles

Discussion of Quantitation Limit Determination
(Organic and Inorganic)

Table 1 - Volatile Organic Compound
Quantitation Limit Data

Table 2 - Base, Neutral, and Acid Extractable
Compound Quantitation Limit Data

Table 3 - Metals and Inorganic Compounds
Quantitation Limit Data

Discussion of Quantitation Limit Determination

A. Volatile Organic Compounds
(see Table 1)

The data in Table 1 come from Section I, Table 1 (cont) as presented in the Information Request Package set by Joe Arlauskas to C.W. Ankerberg on 15 January 1988, with the addition of the level of quantitation (LOQ) data presented in the report entitled "Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon, Task Order for Laboratory Services (No. 87-ETMF-00210: Analytical Data for Soil and Aqueous Samples Collected Between 22 and 26 June and on 2 August 1987."

For all compounds for which there is a Contract Laboratory Program Contract Required Quantitation Limit (CLP-CRQL) our reported Level of Quantitation (LOQ) is equal to or less than the CLP-CRQL.

There are several compounds that have no CLP-CRQL that were analytes of interest for this program. The LOQ for these compounds have been set between 3 to 10 times the average standard deviation determined by the detection level study, with the exception of Trichlorofluoromethane. For this compound 10 times the average standard deviation is 3 whereas the reported LOQ is 5. This number has been rounded up to allow easier preparation of standards.

For the isomers of 1,2-Dichloroethene the LOQ has been set at the CLP-CRQL for total-1,2-Dichloroethene.

B. Base Neutral and Acid Extractable Compounds
(see Table 2)

The data in Table 2 come from Section I, Tables 2 and 3 as presented in the Information Request Package set by Joe Arlauskas to C.W. Ankerberg on 15 January 1988, with the addition of the level of quantitation (LOQ) data presented in the report entitled "Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon, Task Order for Laboratory Services (No. 87-ETMF-00210: Analytical Data for Soil and Aqueous Samples Collected Between 22 and 26 June and on 2 August 1987."

For all compounds for which there is a Contract Laboratory Program Contract Required Quantitation Limit (CLP-CRQL) our reported Level of Quantitation (LOQ) is the same.

Base Neutral and Acid Extractable Compounds (cont)
(see Table 2)

There are several compounds that have no CLP-CRQL that were analytes of interest for this program. The LOQ for these compounds have been set between 3 to 10 times the average standard deviation determined by the detection level study.

For Benzidine there is no current CLP-CRQL. We have reported a quantitation limit of 80 μg/L based on the CLP-CRDL (Contract Required Detection Limit) for Benzidine from pre-1985 revisions of CLP.

C. Metals and Inorganic Compounds
(see Table 3)

The data in Table 3 come from Section I; Table 4, Attachment 1, and Attachment 2 as presented in the Information Request Package set by Joe Arlauskas to C.W. Ankerberg on 15 January 1988, with the addition of the level of quantitation (LOQ) data presented in the report entitled "Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon, Task Order for Laboratory Services (No. 87-ETMF-00210: Analytical Data for Soil and Aqueous Samples Collected Between 22 and 26 June and on 2 August 1987."

For all compounds for which there is a Contract Laboratory Program Contract Required Quantitation Limit (CLP-CRQL) our reported Level of Quantitation (LOQ) is equal to or less than the CLP-CRQL.

There are several compounds that have no CLP-CRQL that were analytes of interest for this program. The LOQ for these compounds have been set below the USEPA drinking water standards when available. In particular Fluoride, Sulfate, Chloride, Carbonate, and Bicarbonate have no CLP-CRQL available.

1 - Fluoride

The detection limit study performed for fluoride shows an average standard deviation of 0.05 mg/L. If the LOQ were to be 3 to 10 times the average standard deviation then the LOQ would be set at 0.5 mg/L. The reported LOQ for fluoride of 1.0 mg/L has been set based on the lowest standard prepared for the analysis. The value of 1.0 mg/L was chosen for a lower standard based on routine calibrations in the past and as a convenient whole number.

Metals and Inorganic Compounds (cont)
(see Table 3)

Fluoride (cont)

The reported LOQ of 1.0 mg/L is lower than the USEPA Drinking Water Standard of 4 mg/L. In order to exceed this more stringent regulatory limit a sample would have been measured quantitatively in the report of analytical results mentioned in this section.

2 - Sulfate

The detection limit study performed for sulfate shows an average standard deviation of 0.07 mg/L. If the LOQ were to be 3 to 10 times the average standard deviation then the LOQ would be set at 0.7 mg/L. The reported LOQ for sulfate of 5 mg/L has been set based on the lowest standard prepared for the analysis. The value of 5 mg/L was chosen for a lower standard based on method 375.4 6.3.2 (EPA-600/4-79-020).

The reported LOQ of 5 mg/L is lower than the USEPA Drinking Water Standard of 250 mg/L. In order to exceed this more stringent regulatory limit a sample would have been measured quantitatively in the report of analytical results mentioned in this section.

3 - Chloride

Chloride was determined by method 325.3 (EPA-600/4-79-020), a titrimetric method. The limit of quantitation for such an analysis is based on the titration of a laboratory blank, and can vary with titrant concentration and size of sample aliquot titrated.

The reported LOQ of 1.1 mg/L is lower than the USEPA Drinking Water Standard of 250 mg/L. In order to exceed this more stringent regulatory limit a sample would have been measured quantitatively in the report of analytical results mentioned in this section.

4 - Carbonate and Bicarbonate

Carbonate and bicarbonate were determined by method 403 (Standard Methods, 16th Ed.), a titrimetric method. The limit of quantitation for such an analysis is based on the titration of a laboratory blank, and can vary with titrant concentration and size of sample aliquot titrated.

There is no USEPA Drinking Water Standard to compare with the LOQ reported in the report of analytical results mentioned in this section.

TABLE 1
VOLATILE ORGANIC COMPOUND
QUANTITATION LEVEL DATA

Compound	s(a)	LOD 3s(b)	LCL (c)	UCL (d)	LOQ Rep.(e)	CLP CRQL(f)
Acrolein	3.33	9.99	6.7	23	10	(g)
Acrylonitrile	2.38	7.14	4.8	16	10	(g)
Benzene	0.13	0.40	0.26	0.28	5	5
Bromodichloromethane	0.20	0.59	0.39	1.3	5	5
Bromoform	0.20	0.59	0.40	1.4	5	5
Bromomethane	0.44	1.39	0.89	3.1	5	10
Carbon Tetrachloride	0.21	0.62	0.42	1.4	5	5
Chlorobenzene	0.08	0.23	0.16	0.54	5	5
Chloroethane	0.49	1.46	0.97	3.3	5	10
2-Chloroethylvinyl-ether	0.29	0.87	0.58	2.0	10	(g)
Chloroform	0.10	0.29	0.20	0.67	5	5
Chloromethane	0.25	0.75	0.50	1.7	5	10
Diboromochloro-methane	0.11	0.33	0.22	0.77	5	5
1,2-Dichloroethane	0.13	0.40	0.27	0.93	5	5
1,1-Dichloroethane	0.13	0.38	0.26	0.83	5	5
1,1-Dichloroethene	0.21	0.62	0.42	1.4	5	5
1,2-Dichloropropane	0.19	0.56	0.37	1.3	5	5
trans-1,3-Dichloro-propene	0.22	0.67	0.45	1.5	5	5
cis-1,3-Dichoro-propene	0.16	0.47	0.32	1.1	5	5
Ethylbenzene	0.16	0.48	0.32	1.1	5	5
Methylene Chloride	0.14	0.42	0.28	0.98	5	5
1,1,2,2-Tetrachloro-ethane	0.23	0.74	0.50	1.7	5	5
Tetrachloroethene	0.24	0.72	0.48	1.7	5	5
Toluene	0.19	0.57	0.38	1.3	5	5
1,1,1-Trichloro-ethane	0.22	0.65	0.44	1.5	5	5
1,1,2-Trichloro-ethane	0.15	0.45	0.30	1.0	5	5
Trichloroethene	0.26	0.77	0.52	1.8	5	5
Trichlorofluoro-methane	0.30	0.89	0.19	0.66	5	(g)
Vinyl Chloride	0.31	0.94	0.63	2.2	1	10

TABLE 1
VOLATILE ORGANIC COMPOUND
QUANTITATION LEVEL DATA
(continued)

Compound	s(a)	LOD 3s(b)	LCL (c)	UCL (d)	LOQ Rep.(e)	CLP CRQL(f)
total-1.2-Dichloro-ethene	0.21	0.63	0.42	1.5	(h)	5
cis-1,2-Dichloro-ethene					5	(i)
trans-1,2-Dichloro-ethene					5	(i)

(a) s - average standard deviation from detection level study
(b) LOD - level of detection = 3s
(c) LCL - lower confidence limit from Section I Table 1(cont.) as included in an Information Request Package sent by Joe Arlauskas to C.W. Ankerberg on 15 January 1988.
(d) UCL - upper confidence limit from the same document noted in footnote (c).
(e) LOQ Rep. - level of quantitation presented in the report entitled "Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon , Task Order for Laboratory Services (No. 901-999-701) (Contract No. 87-ETMF-0021): Analytical Data for Soil and Aqueous Samples Collected Between 22 and 26 June and on 2 August 1987."
(f) CLP CRQL - Contract Laboratory Program, contract required quantitation limits from USEPA SOW 10/86, Rev. 7/87.
(g) CLP CRQL's are not available for these compounds
(h) Analysis for this parameter was not requested for this project
(i) Since the quantitation level for total-1,2-Dichloroethene has been set at 5μg/L, matching the CLP-CRQL we have set the quantitation level for each of the isomers (cis-1,2-Dichloroethene and trans-1,2-Dichloroethene) at 5 μg/L. If a sample should be measured positive for total-1,2-Dichloroethene another portion of the sample is determined by capillary GC with a Hall detector. The results of this determination are reported with the GC/MS data.

TABLE 2
BASE, NEUTRAL, AND ACID EXTRACTABLE COMPOUND
QUANTITATION LEVEL DATA
(continued)

BN/A COMPOUND (a)	IDL (b)	SD (c)	CLP CRQL (d)	REPT LOQ WATER (e) (ug/L)	CALC LOQ SOIL (h) (ug/Kg)	REPT LOQ SOIL (j) (ug/Kg)
3,3'-Dichlorobenzidine	5.9	1.95	20	20	1967	3330
2,4-Dichlorophenol	4.5	1.52	10	10	1500	1670
Diethylphthalate	5.6	1.86	10	10	1867	1670
Dimethylphthalate	3.39	1.13	10	10	1130	1670
2,4-Dimethylphenol	1.9	0.64	10	10	633	1670
4,6-Dinitro-2-methylphenol	22	7.26	50	50	7333	8080
2,4-Dinitrophenol	39	13.1	50	50	13,000	8080
2,4-Dinitrotoluene	15	4.93	10	15(i)	5000	1670
2,6-Dinitrotoluene	10	3.48	10	10	3333	1670
1,2-Diphenylhydrazine			NA	10	—	1670
bis(2-Ethylhexyl)Phthalate	3.0	1.00	10	10	1000	1670
Fluoranthene	2.3	0.78	10	10	767	1670
Fluorene	3.8	1.26	10	10	1267	1670
Hexachlorobenzene	3.3	1.09	10	10	1100	1670
Hexachlorobutadiene	0.75	0.25	10	10	250	1670
Hexachlorocyclopentadiene	17	5.66	10	17(i)	5667	1670
Hexachloroethane	3.6	1.21	10	10	1200	1670
Indeno(1,2,3-cd)Pyrene	8.1	2.71	NA(g)	10	2700	1670
Isophorone	4.3	1.42	10	10	1433	1670
N-Nitroso-Di-n-Propylamine	5.0	1.67	10	10	1667	1670
N-Nitrosodimethylamine	2.4	0.81	NA	5.0	800	1670
N-Nitrosodiphenylamine	19	6.23	10	19 (i)	6333	1670

TABLE 2
BASE, NEUTRAL, AND ACIDE EXTREACTABLE COMPOUND
QUANTITATION LEVEL DATA

BN/A COMPOUND (a)	IDL (b)	SD (c)	CLP CRQL (d)	REPT LOQ WATER (e) (ug/L)	CALC LOQ SOIL (h) (ug/Kg)	REPT LOQ SOIL (j) (ug/Kg)
Acenaphthalene	1.18	0.40	10	10	393	1670
Acenaphthene	0.51	0.17	10	10	170	1670
Anthracene	0.71	0.24	10	10	237	1670
Benzidine	50.	16.7	(f)	80	16,666	3030
Benzo(a)Anthracene	2.8	0.92	10	10	933	1670
Benzo(a)Pyrene	1.2	0.41	10	10	400	1670
Benzo(b)fluoranthenes	3.4	1.14	10	10	1133	1670
Benzo(k)fluoranthenes	8.6	2.88	10	10	2867	1670
Benzo(g,h,i)Perylene	7.1	2.36	NA(g)	10	2367	1670
4-Bromophenyl-phenylether	3.3	1.10	10	10	1100	1670
Butylbenzylphthalate	4.4	1.4	10	10	1467	1670
4-Chloro-3-methylphenol	17	1.94	10	17(i)	5667	1670
bis(2-Chloroethoxy)Methane	2.5	0.82	10	10	833	1670
bis(2-Chloroethyl)Ether	2.0	0.68	10	10	667	1670
bis(2-Chloroisopropyl)Ether	1.1	0.36	10	10	367	1670
2-Chloronaphthalene	0.77	0.26	10	10	257	1670
2-Chlorophenol	3.0	0.99	10	10	1000	1670
4-Chlorophenyl-phenylether	3.0	1.00	10	10	1000	1670
Chrysene	3.4	1.12	10	10	1133	1670
Di-N-Butlyphthalate	1.5	0.49	10	10	500	1670
Di-N-Octylphthalate	1.8	0.61	10	10	600	1670
Dibenz(a,h)Anthracene	9.6	3.21	10	10	3200	1670
1,2-Dichlorobenzene	0.54	0.18	10	10	180	1670
1,4-Dichlorobenzene	0.88	0.29	10	10	293	1670
1,3-Dichlorobenzene	0.55	0.18	10	10	183	1670

TABLE 2
BASE, NEUTRAL, AND ACID EXTRACTABLE COMPOUND
QUANTITATION LEVEL DATA
(continued)

BN/A COMPOUND (a)	IDL (b)	SD (c)	CLP CRQL (d)	REPT LOQ WATER (e) (ug/L)	CALC LOQ SOIL (h) (ug/Kg)	REPT LOQ SOIL (j) (ug/Kg)
Naphthalene	1.6	0.54	10	10	533	1670
Nitrobenzene	2.8	0.92	10	10	933	1670
4-Nitrophenol	26	8.81	50	50	8666	8080
2-Nitrophenol	5.2	1.73	10	10	1733	1670
Pentachlorophenol	17	5.63	50	50	5667	8080
Phenanthrene	0.91	0.30	10	10	303	1670
Phenol	4.9	1.62	10	10	1633	1670
Pyrene	1.8	0.60	10	10	600	1670
1,2,4-Trichlorobenzene	0.81	0.27	10	10	270	1670
2,4,6-Trichlorophenol	2.2	0.74	10	10	733	1670

TABLE 2. BASE, NEUTRAL, AND ACID EXTRACTABLE COMPOUND QUANTITATION LEVEL DATA (FOOTNOTES)

(a) BN/A - Base Neutral and Acid extractable compounds.

(b) IDL - Instrument Detection Limit = 3 x average standard deviation.

(c) SD - Average standard deviation of three analyses as presented in Section I, Table 2 of an Information Request Package sent by Joe Arlauskas to C.W. Ankerberg on 15 January 1988.

(d) CLP CRQL - Contract Laboratory Program Contract Required Quantitation Limit.

(e) Reported LOQ - Level of quantitation presented in the report entitled "Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon, Task Order for Laboratory Services (No. 901-999-701) (Contract No. 87-ETMF-0021): Analytical Data for Soil and Aqueous Samples Collected Between 22 and 26 June and on 2 August 1987."

(f) Benzidine is no longer a CLP analyte of interest. The 80 ug/L quantitation limit is from pre-1985 revisions of the CLP-SOW.

(g) NA - Not Available, there is no CLP CRQL available for this compound.

(h) As calculated using LOD formula in Item 2, letter dated January 15, 1988, from J. Arlauskas (Versar, Inc.), to C. Ankerberg (Geraghty & Miller, Inc.).

(i) Reported as the respective CLP CRQL value, 10 ug/L, for all samples.

(j) Represent the lowest values reported for any of the soil samples. Note: Many samples were reported at higher values due to matrix interferences and as a result of sample dilution. These values are derived from the current EPA CLP CRQLs. The Instrument Detection Limit (IDL) is obtained by multiplying the CLP water CRQL by 500 because the CLP water analysis takes 1 liter to a 2.0 ml final volume which is a 500 fold concentration. For most compounds, this would result in an IDL of 5 ug/ml (PPM). These IDLs were converted to soil sample LOQs by dividing the IDL by the concentration factor. In this case, the concentration factor is 3 since 3 grams of soil was extracted and concentrated to 1.0 ml. Therefore, using 5 ug/ml (ppm) as the IDL for calculating soil LOQs would result in an LOQ of 1670 ug/kg. Note: The previous CLP requirement for each laboratory to determine CRDLs has been deleted from the most recent (1/87 revision) Statement of Work (SOW).

TABLE 2
BASE, NEUTRAL, AND ACID EXTRACTABLE COMPOUND
QUANTITATION LEVEL DATA
(continued)

(f) Benzidine is no longer a CLP analyte of interest. The 80 µg/L quantitation limit is from pre-1985 revisions of the CLP-SOW.

(g) NA - Not Available, there is no CLP CRQL available for this compound

TABLE 3
METALS AND INORGANIC COMPOUNDS
QUANTITATION LEVEL DATA

COMPOUND NAME	SD (a)	IDL (b)	CLP CRQL (c)	REPORTED LOQ (d)
Total Cyanide	0.00086	0.00258	0.010	0.010 mg/L
Free Cyanide	0.00086(e)	0.00258	0.010	0.010 mg/L
Fluoride	0.05	0.15	4.0(f)	1 mg/L
Sulfate	0.07	0.21	250 (f)	5 mg/L
Chloride	(g)		250 (f)	1.1 mg/L
Carbonate	(g)		NA (h)	10 mg/L
Bicarbonate	(g)		NA	10 mg/L
Sodium	0.073	0.219	5.000	1.0 mg/L
Calcium	0.0077	0.023	5.000	0.50 mg/L
Magnesium	0.01541	0.046	5.000	0.50 mg/L
Potassium	0.00676	0.203	5.000	1.0 mg/L

(a) SD - Average standard deviation of three analyses as presented in Section I, Table 2 of an Information Request Package sent by Joe Arlauskas to C.W. Ankerberg on 15 January 1988

(b) IDL - Instrument Detection Limit = 3 x average standard deviation

(c) CLP CRQL - Contract Laboratory Program Contract Required Quantitation Limit

(d) Reported LOQ - Level of quantitation presented in the report entitled "Martin Marietta Aluminum Reduction Plant, The Dalles, Oregon, Task Order for Laboratory Services (No. 901-999-701) (Contract No. 87-ETMF-0021): Analytical Data for Soil and Aqueous Samples Collected Between 22 and 26 June and on 2 August 1987."

(e) Total and Free Cyanide are determined by the same technique (335.2 CLP-M, Manual Spectrophotometric Determination-Option B), so the same determination for quantitation level has been reported for both Total and Free Cyanide

(f) Since there is no CLP CRQL for this compound the USEPA Drinking Water Standard has been listed. These standards can be found in 40 CFR Ch. I (7-1-87 Edition) page 530.

(g) This parameter is determined by titration, and the quantitation limit is set by titration of a laboratory blank. The quantitation limit can vary depending on the molarity of the titrant used and the amount of sample titrated.

(h) NA - Not Available, there is no CLP CRQL available for this compound

ITEM II

Versar INC.
ESM Operations

15 January 1988

Mr. Charles Ankerberg
Geraghty & Miller, Inc.
Northdale Executive Center
3820 Northdale Blvd., Suite 200
Tampa, FL 33624

Dear Mr. Ankerberg,

Enclosed is the information you requested for the Martin Marietta Aluminum, The Dalles project.

Please call Doug Mc Innes or Sam Hamner should you have any questions since I will be on vacation from January 18 thru 26.

Sincerely,

Joe Arlauskas
Manager
Analytical Chemistry Services

JA/lm

cc: file

9200 RUMSEY ROAD • COLUMBIA, MARYLAND 21045-1934 • TELEPHONE: (301) 964-9200 • FAX: (301) 964-9200, EXT. 350

SECTION I

SUMMARY OF DETECTION LIMIT DETERMINATION

(ORGANICS AND INORGANICS)

Contents of Information Request Package
for Geraghty & Miller, Inc., Tampa, FL

Project: Martin Marietta Aluminum
The Dalles

Section I: Summary of Detection Limit Determination (Organics and Inorganics)
Table 1 - Volatile Organics Study
Table 2 - Semivolatiles (BNS's) Study
Table 3 - EPA-CLP CRDL for Semivolatiles
Table 4 - Cyanide Study
Table 5 - PCB Aqueous
Table 6 - PCB Soil
Table 7 - Volatile Soil
Attachment 1 - Magnesium, Potassium, Calcium, and Sodium Study
Attachment 2 - Fluoride and Sulfate Study

Section II: Copies of Detection Limit Tables for Organics without the "less than" sign.

Section III: Source of independent QC samples
* EPA CLP Performance Evaluation sample results for full organics, volatiles organics, and two inorganic samples. Note: Versar, Inc., ESM was formerly (before April 1, 1987) called Martin Marietta Environmental Systems.
* State of Florida results for volatiles, cyanide, and metals.
* State of Florida Certification.

Section IV: Source of Independent QC Standard
Table 1 - Source for BNA Std and spiking levels for data shown in Appendix C, pages C-16 and 17 and C-26 and 27 in the 29 September 87 report.

Table 2 - Source for alkalinity and chloride shown in Table B-52 and B-53 in Appendix B of same report listed for Table 1 above.

Section V: Iron results for Cyanide Matrix Interference Study.

VERSAR, INC., ESM OPERATIONS

Summary of Detection Limit Determinations

A. Organics

1. Volatiles (see Table 1)

A. Water

Reagent water spiked and seven replicate measurements performed on each GC/MS instrument (i.e. instruments B & C). Standard deviation(S) calculated and level of detection (LOD) were determined as 3 x S (see Table 1). Method detection limit (MDL) shown was calculated according to EPA procedures in the Federal Register, Vol 49, No 209, 26 October 1984 - "Appendix B to Part 136 - Definition and Procedure for the Determination of the Method Detection Limit".

B. Soils

Soil detection limits were calculated using the water IDL values (which are the same as the LOD since this method does not use an extraction and concentration step), and are presented in Table 7. Since the determined IDL values (Table 7) are the same or lower than the EPA CLP CRQL's, these IDL values were used in the following expression to calculated soil LOD values:

LOD, soil in $\mu g/kg$ =

$$\frac{\text{IDL } \mu g/L \text{(Table 7)} \times (45ml/5g)(1g/1ml) \times \text{std. purge vol.(ml)}}{\text{sample purge volume (ml)}} \times \frac{1.0\ L}{1000\ gm} \times \frac{1000\ gm}{1.0\ kg}$$

Volatile analyses of soil samples were performed by placing 45 ml in a clean VOA bottle and filling with water to a total volume of 45 ml (i.e., a dilution factor of 45 ml/5 gm or 9.) Filling the vial to eliminate headspace prevents loss of soil volatiles that would normally occur if stored in the original sample bottles. The subsample is then shaken for one hour and 5 ml's withdrawn for purgeable analysis. The standard calibration curve is generated using 5 ml of water as the std. purge volume and is analogous to the final extract volume in the semivolatile equation. Results are reported as wet weight.

For example, for ethylbenzene:

LOD, soil in $\mu g/kg$ =

$$\frac{0.48\ \mu g/L\ \text{(Table 7)} \times (45ml/5g)(1g/1ml) \times 5\ ml}{} \times \frac{1.0\ L}{1000\ gm} \times \frac{1000}{1.0\ kg}$$

$$= 4.32\ \mu g/kg$$

2. Semivolatiles (BNA's see Table 2)

A. Water - The instrument detection limits (which correspond to our level of detection) were performed according to the EPA CLP Statement of Work for Organic Analysis 7/85 (Page A-4, Task VI,C). Using standard reference materials, three analyses of standards for all components were measured at 3-5 times the Contract Required Detection Limit concentration (see Table 3). These analyses were performed using the CLP contract instrumental conditions on standards in solvent. The instrument detection limits ,or LOD (i.e., what are now called "Contract Required Quantitation Limits" in the 1987 EPA CLP SOW) were calculated as 3 x SD.

Assuming that a one liter sample volume was extracted and concentrated to one milliliter (ml), the IDL's reported in Table 2 correspond to ESM laboratory's LOD's according to the equation below.

LOD, aqueous in $\mu g/L$ =

$$\frac{\text{IDL}\ (\mu g/ml) \times \text{Final extr. vol (ml)} \times \text{DF}}{\text{sample vol (L)}}$$

The LOD for any sample volume or extract can therefore be determined using this equation.

B. Solids (soils) - Soil detection limits were calculated using the water IDL (i.e. 3S) values from Table 2 and are method specific. For the Dalles project 3 grams of soil were extracted and concentrated to 1 ml for analyses. Therefore, to calculate soil detection levels:

LOD, soil in µg/kg =

$$\frac{(\text{IDL } (\mu g/ml, \text{ from Table 2}) \times \text{Final extr vol(ml)} \times DF}{\text{sample weight (gm)3}} \times 1000 gm/kg$$

For example, for n - Nitrosodimethylamine:

$$= \frac{2.4\ \mu g/ml \quad 1\ ml}{3\ gm} \times 1000\ gm/kg$$

LOD soil = 800 µg/kg

NOTE: For semivolatile compound detection limits the term level of quantitation corresponds to the EPA-CLP Contract Required Quantitation Limits used in the 7/87 SOW

3. PCBs

a. Water (see Table 5)

The instrument detection limits (which correspond to our level of detection) were performed according to the EPA CLP Statement of Work for Organic Analysis 7/85 (Page A-4, Task VI,C). Using standard reference materials, seven replicate measurements were performed on three non consecutive days for all components at 1-5 times the Contract Required Detection Limit concentration (see Table 5). These analyses were performed using the CLP contract instrumental conditions on standards in solvent. The instrument detection limits ,or LOD (i.e., what are now called "Contract Required Quantitation Limits" in the 1987 EPA CLP SOW) were calculated as 3 x SD.

For The Dalles project, a one liter sample volume was extracted and concentrated to two milliliters (ml). Using the IDL's reported in Table 5 the LOD's were calculated according to the equation below.

LOD, aqueous in µg/L =

$$\frac{\text{IDL } (\mu g/ml \quad \text{Table 5}) \times \text{Final extr. vol (ml)} \times DF}{\text{sample vol (L)}}$$

The LOD for any sample volume or extract can therefore be determined using this equation.

For example, for PCB 1254:

$$\text{LOD } (\mu g/L) = \frac{(0.0094\ \mu g/ml)(2\ ml)}{1.0\ L}$$

$$= 0.0188\ \mu g/L$$

b. Soils (see Table 6.)

Soil detection limits were calculated using the water IDL (i.e. 3s) values. For The Dalles project 2 grams of soil were extracted and concentrated in 2 ml of solvent. The LOD values were calculated according to the equation;

LOD, soil in $\mu g/kg$ =

$$\frac{(\text{IDL } (\mu g/ml, \text{ from Table 6}) \times \text{Final extr vol(ml)} \times DF}{\text{sample weight (gm)}} \times 1000 gm/kg$$

For example, for PCB 1254;

$$\text{LOD, soil in } \mu g/kg = \frac{(0.0094\ \mu g/ml)(2\ ml)}{2.0\ gm} \times 1000\ mg/kg$$

$$= 9.4\ \mu g/kg$$

NOTE: Since the Versar ESMO laboratory PCB detection levels were the same or lower than EPA CLP values, the latter were employed for this project.

B. Inorganics

1. Metals

A. Water

Detection limit calculation were performed according to the EPA-CLP SOW 7/85 for Inorganics. Briefly, 7 replicate measurements were performed on three non-consecutive days and the LOD or IDL calculated as 3 times the average standard deviation. See attachment 1 for magnesium, calcium, potassium and sodium.

The general equation for determining a given elements detection limit in water for a given method then is:

LOD, water, $\mu g/L$ =

$$\frac{\text{calculated IDL } (\mu g/L) \times \text{final digestate vol (L)}}{\text{Sample vol (L)}} \times \text{Diln.factor}$$

The final digestate volume and sample volume are both 0.1 liter. The calculated IDL's are taken from the detection limit determination data (attachment 1).

B. Soils

Soil detection limits were calculated using the water IDL values shown below:

LOD, soil, mg/kg =

$$\frac{\text{water IDL } (\mu g/L) \times \text{Final digestate vol (L)}}{\text{Sample wt (gm)} \times \frac{\%\ \text{solid}}{100}} \times \text{Diln. factor}$$

The final digestate volume and sample weight were 0.1 L and 1.0 gm, respectively and assumes a % solid of 100. The LOD, however, would vary according to changes in % solid content.

2. Non-metals

A. Cyanide - total and free

Cyanide detection limits for water and soils were determined using the procedures in the EPA-CLP SOW 7/85 for Inorganics. Briefly, 7 replicate measurements were performed on three non-consecutive days and the LOD calculated as 3 times the average standard deviation (see Table 4).

The general equation for calculating detection limits are:

For water samples:

CN, $\mu g/L$ =

[Lowest CN calibration std,10 $\mu g/L$ x Diln. factor x final distillate vol, 250 ml]

-- [Sample vol. distilled, 250 ml]

= 10 $\mu g/L$

Dilution of the distillate for colorization (if performed) corresponds to the diln. factor

For soil samples:

CN, $\mu g/kg$ =

[Lowest CN calibration std, 10 $\mu g/L$ x Diln. factor x Final distillate vol, 250 ml]

$$-- \quad [\text{Sample wt (gm)} \times \frac{\%\ \text{solids}}{100} \times 1000\ ml/L]$$

The sample weight is 10 grams and the dilution factor corresponds to dilution of the distillate for colorization, if performed.

B. Miscellaneous parameters
Detection limit data for the following parameters are included in attachment 2:

Parameter	Method
Fluoride	300.0
Fluoride	340.2
Sulfate	300.0

As described previously for soil samples, detection limits were calculated using water LOD's and correcting for the sample weight as specified by the method.

Summary discussion

The detection limits reported by Versar ESM Operation Laboratory were determined and calculated in accordance with EPA-CLP protocols except for volatile organics where the MDL protocol was employed (see section A. Organics). For the non-metal (i.e fluoride and sulfate), non- CLP parameters, CLP detection limit procedures were used as guidelines to determine detection limits.

For reporting purposes, the EPA-CLP detection limits were used providing that the calculated detection limit values were lower.

TABLE 5
PCB (AQUEOUS)
QUANTITATION LEVEL DATA

PCB COMPOUND (a)	SD (µg/ml) (b)	IDL (µg/ml) (c)	LOD (µg/l) (d)	CLP CRDL (µg/L) (e)	REPORTED (µg/L) LOQ (f)
PCB 1016	0.0135	0.0405	0.081	0.50	0.50
PCB 1221	0.0044	0.0131	0.0262	0.50	0.50
PCB 1232	0.0084	0.0252	0.0502	0.50	0.50
PCB 1242	0.0032	0.0096	0.0192	0.50	0.50
PCB 1248	0.0042	0.0126	0.025	0.50	0.50
PCB 1254	0.0031	0.0093	0.0188	1.0	1.0
PCB 1260	0.0148	0.0444	0.0888	1.0	1.0

(a) PCB'S - Polychlorinated Biphenyl compounds
(b) SD - Average standard deviation of three analyses, seven replicates/analysis.
(c) IDL - Instrument detection level, calculated as 3xSD
(d) LOD - Level of Detection as calculated in Section I,A.3.a
(e) CLP CRDL - Contract Laboratory Program Contract Required Detection Limit
(f) Reported LOQ - Level of quantitation presented in the report entitled "RESULTS OF CHEMICAL ANALYSIS OF SAMPLES COLLECTED DURING 19-28 MARCH 1986 ACCORDING TO THE WORK PLAN OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY AT THE MARTIN MARIETTA REDUCTION FACILITY, THE DALLES, OREGON" 5 JUNE 1986, REVISED 3 DECEMBER 1986.

TABLE 6
PCB (SOIL)
QUANTITATION LEVEL DATA

PCB COMPOUND (a)	SD (µg/ml) (b)	IDL (µg/ml) (c)	LOD (mg/kg) (d)	CLP CRDL (mg/kg) (e)	REPORTED (mg/kg) LOQ (f)
PCB 1016	0.0135	0.0405	0.0405	0.08	1.2
PCB 1221	0.0044	0.0131	0.0131	0.08	1.2
PCB 1232	0.0084	0.0252	0.0252	0.08	1.2
PCB 1242	0.0032	0.0096	0.0096	0.08	1.2
PCB 1248	0.0042	0.0126	0.0126	0.08	1.2
PCB 1254	0.0031	0.0093	0.0093	0.16	2.4
PCB 1260	0.0148	0.0444	0.0444	0.16	2.4

(a) PCB'S - Polychlorinated Biphenyl compounds
(b) SD - Average standard deviation of three analyses, seven replicates/analysis.
(c) IDL - Instrument Detection Limit = 3 x average standard deviation, based on aqueous detection limit study
(d) LOD - Level of Detection as calculated in Section I,A.3.b
(e) CLP CRDL - Contract Laboratory Program Contract Required Detection Limit (SOW 7/85) for low soils.
(f) Reported LOQ - Level of quantitation presented in the report entitled "RESULTS OF CHEMICAL ANALYSIS OF SAMPLES COLLECTED DURING 19-28 MARCH 1986 ACCORDING TO THE WORK PLAN OF THE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY AT THE MARTIN MARIETTA REDUCTION FACILITY, THE DALLES, OREGON" 5 JUNE 1986, REVISED 3 DECEMBER 1986. Values are 15 times the respective CLP values since the sample was screened according to CLP as a medium level soil

TABLE 7
VOLATILE ORGANIC COMPOUND
QUANTITATION LEVEL DATA
(SOIL)

Compound	s(a)	IDL (b) µg/L	LOD (c) µg/kg	LOQ Rep.(d) µg/kg	CLP CRDL(e) µg/kg
Acrolein	3.33	9.99	89.9	90	(f)
Acrylonitrile	2.38	7.14	64.3	90	(f)
Benzene	0.13	0.40	3.6	45	5
Bromodichloromethane	0.20	0.59	5.3	45	5
Bromoform	0.20	0.59	5.3	45	5
Bromomethane	0.44	1.39	12.5	45	10
Carbon Tetrachloride	0.21	0.62	5.6	45	5
Chlorobenzene	0.08	0.23	2.0	45	5
Chloroethane	0.49	1.46	13.1	45	10
2-Chloroethylvinyl-ether	0.29	0.87	7.8	90	(f)
Chloroform	0.10	0.29	2.6	45	5
Chloromethane	0.25	0.75	6.8	45	10
Diboromochloro-methane	0.11	0.33	3.0	45	5
1,2-Dichloroethane	0.13	0.40	3.6	45	5
1,1-Dichloroethane	0.13	0.38	3.4	45	5
1,1-Dichloroethene	0.21	0.62	5.6	45	5
1,2-Dichloropropane	0.19	0.56	5.0	45	5
trans-1,3-Dichloro-propene	0.22	0.67	6.0	45	5
cis-1,3-Dichoro-propene	0.16	0.47	4.2	45	5
Ethylbenzene	0.16	0.48	4.3	45	5
Methylene Chloride	0.14	0.42	3.7	90	5
1,1,2,2-Tetrachloro-ethane	0.23	0.74	6.7	45	5
Tetrachloroethene	0.24	0.72	6.5	45	5
Toluene	0.19	0.57	5.1	45	5
1,1,1-Trichloro-ethane	0.22	0.65	5.9	45	5
1,1,2-Trichloro-ethane	0.15	0.45	4.1	45	5
Trichloroethene	0.26	0.77	6.9	45	5
Trichlorofluoro-methane	0.30	0.89	8.0	45	(f)
Vinyl Chloride	0.31	0.94	8.5	45	10

TABLE 7
VOLATILE ORGANIC COMPOUND
QUANTITATION LEVEL DATA
(continued)

Compound	s(a)	IDL (b) µg/L	LOD (c) µg/kg	LOQ Rep.(d) µg/kg	CLP CRDL (e) µg/kg
cis-1,2-Dichloro-ethene				45	5(g)
trans-1,2-Dichloro-ethene	0.21	0.63	5.7	45	5

(a) s - average standard deviation from detection level study
(b) IDL - instrument detection levewl or CRDL as determined in the lab
(c) LOD - level of detection as calculated in Section A.1.b
(d) LOQ Rep. - level of quantitation presented in the report issued 5 June, 1986 revised 3 December, 1986
(e) CLP CRDL - Contract Laboratory Program, contract required detection limits from USEPA SOW 7/85
(f) CLP CRDL's are not available for these compounds
(g) Since the CLP CRDL for trans-1,2-Dichloroethene has been set at 5µg/L, we have set the quantitation level for cis-1,2-Dichloroethene at 5 µg/L. If a sample should be measured positive for trans-1,2-Dichloroethene another portion of the sample is analyzed for cis-1,2 by capillary GC with a Hall detector. The results of this determination are reported with the GC/MS data.

Sect I
Table 1- Volatiles Study

ORGANICS ANALYSIS DATA SHEETS
Martin Marietta Environmental Systems

Volatile Compounds

CLIENT SAMPLE ID:		MS-0	MS-0	MS-0	MS-0	MS-0	MS-0	MS-0		
MMES SAMPLE ID:		DETLIM1	DETLIM2	DETLIM3	DETLIM4	DETLIM5	DETLIM6	DETLIM7		
SAMPLE DATE:										
ANALYSIS DATE:		02/06/87	02/06/87	02/06/87	02/06/87	02/06/87	02/06/87	02/06/87		
FILE NAME:		VOET1B	VOET2B	VOET3B	VOET4B	VOET5B	VOET6B	VOET7B		
INSTRUMENT ID:		MS-0	MS-0	MS-0	MS-0	MS-0	MS-0	MS-0		
MATRIX:		WATER	WATER	WATER	WATER	WATER	WATER	WATER		
UNITS:		ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l		
DILUTION FACTOR:		1	1	1	1	1	1	1		
COMPOUNDS	Spike conc.								(S) ↓ MDL	LCL	UC
Acetone	20 ppb	21	22	33	30	21	25	28	2.79 8.37 9.79	5.6	19
Acrolein	50	32	32	34	24	22	22	26	1.61 4.83 5.68	3.3	11
Acrylonitrile	50	33	40	39	39	29	29	28	1.61 4.83 5.64	3.3	11
Benzene	25	1.8	2.3	2.3	2.4	2.3	2.3	2.1	.229 .687 .722	.46	1.5
Bromodichloromethane		1.6	1.3	1.4	1.5	1.5	1.3	1.4	.069 .207 .216	.14	.45
Bromoform		1.2	1.1	1.0	1.2	0.9	1.2	1.2	.127 .381 .400	.26	.85
Bromomethane		1.8	1.9	1.7	1.9	1.6	1.7	1.4	.177 .531 .557	.36	1.1
2-Butanone	20	9.1	13	13	13	12	10	11	2.01 6.03 6.32	4.0	13
Carbon Disulfide	2.5	2.0	1.9	1.9	1.8	1.6	1.6	1.3	.190 .57 .597	.37	1.2
Carbon Tetrachloride		1.6	1.6	1.5	1.4	1.4	1.4	1.1	.170 .51 .535	.34	1.1
Chlorobenzene		2.1	2.1	2.0	2.2	2.1	1.9	2.0	.097 .29 .306	.19	.64
Chloroethane		1.7	1.8	1.8	1.6	1.7	1.8	1.6	.089 .267 .297	.17	.56
2-Chloroethylvinylether		15	16	17	15	15	15	16	.786 2.359 2.47	1.6	5.2
Chloroform		2.0	1.9	1.8	1.9	1.5	1.8	1.7	.163 .489 .513	.33	1.1
Chloromethane		2.1	2.0	1.8	1.8	1.7	1.8	1.6	.236 .708 .741	.47	1.5
Dibromochloromethane		1.4	1.2	1.3	1.3	1.2	1.2	1.0	.137 .411 .493	.32	1.0
1,2-Dichloroethane		2.0	2.0	2.1	2.2	2.1	1.8	2.0	.125 .375 .393	.25	.83
1,1-Dichloroethane		1.7	1.8	1.6	1.7	1.7	1.6	1.5	.017 .231 .326	.20	.68
1,1-Dichloroethene		2.1	2.2	1.9	1.9	1.6	1.9	1.5	.249 .747 .755	.45	1.5
1,2-Dichloropropane		1.4	1.5	1.6	1.5	1.6	1.2	1.4	.139 .417 .437	.29	.91
trans-1,3-Dichloropropene		0.9	1.0	0.9	0.5	0.4	1.0	0.9	.249 .747 .787	.50	1.7
cis-1,3-Dichloropropene		1.4	1.1	0.9	1.1	1.0	0.9	1.0	.155 .465 .487	.31	1.0
Ethylbenzene		1.3	1.4	1.3	1.1	1.5	1.3	0.9	.187 .561 .587	.39	1.2
2-Hexanone		24	26	24	26	22	25	26	.919 2.757 2.89	1.9	6.0
4-Methyl-2-pentanone		1.8	7.3	4.5	2.3	2.0	2.7	2.0	1.90 5.7 5.97	3.8	12
Methylene Chloride		2.3	2.9	2.8	2.0	2.8	2.0	1.9	.415 1.245 1.30	.93	2.9
Styrene		0.8	1.2	1.4	1.3	1.5	1.0	1.3	.269 .807 .847	.54	1.7
1,1,2,2-Tetrachloroethane		1.4	1.9	1.3	1.1	1.3	1.6	1.5	.299 .897 .939	.60	1.9
Tetrachloroethene		2.0	1.8	1.7	1.7	1.8	1.6	1.6	.139 .417 .437	.28	.87
Toluene		2.3	2.6	2.1	2.4	2.4	2.3	2.3	.115 .345 .362	.23	.72
1,1,1-Trichloroethane		1.9	1.9	1.8	1.8	1.8	2.8	1.8	.369 1.104 1.15	.74	2.4
1,1,2-Trichloroethane		1.6	1.6	1.6	1.8	1.3	1.5	1.5	.106 .318 .336	.22	.71
Trichloroethene		2.0	2.1	1.6	2.4	2.3	1.8	1.8	.259 .864 .907	.55	1.8
Trichlorofluoromethane		1.7	1.9	1.3	1.6	1.4	1.2	1.4	.207 .621 .650	.42	1.4
Vinyl Acetate	20	8.9	9.1	10	10	9.8	10	10	.975 1.454 1.452	.96	3.1
Vinyl Chloride	2.5	2.1	1.8	1.9	1.8	1.6	1.6	1.4	.209 .687 .722	.46	1.5
o-XYLENE		1.9	2.1	1.5	2.1	2.1	2.1	1.6	.260 .78 .825	.52	1.7
m&p-XYLENES		4.1	4.5	2.0	1.9	4.4	4.3	4.0	.293 2.97 .979	1.7	5.7
Total-1,2-Dichloroethene		1.8	1.7	1.4	1.9	1.2	1.3	1.3	.262 .786 .825	.53	1.7

Sect I
Table 1 (cont)

ORGANICS ANALYSIS DATA SHEETS
Martin Marietta Environmental Systems

Volatile Compounds

CLIENT SAMPLE ID:	MS-C	MS-C	MS-C	MS-C	MS-C	MS-C	MS-C
MMES SAMPLE ID:	DETLIM1	DETLIM2	DETLIM3	DETLIM4	DETLIM5	DETLIM6	DETLIM7
SAMPLE DATE:							
ANALYSIS DATE:	02/06/87	02/06/87	02/06/87	02/06/87	02/06/87	02/06/87	02/06/87
FILE NAME:	VDETIC	VDET2C	VDET3C	VDET4C	VDET5C	VDET6C	VDET7C
INSTRUMENT ID:	MS-C	MS-C	MS-C	MS-C	MS-C	MS-C	MS-C
MATRIX:	WATER	WATER	WATER	WATER	WATER	WATER	WATER
UNITS:	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l	ug/l
DILUTION FACTOR:	1	1	1	1	1	1	1

COMPOUNDS	Spike Conc.								LOD (3xS) (J)	MDL	LCL	UC
Acetone	20	ppb	14	19	19	18	18	20	17	1.95 5.85 6.10	3.9	13
Acrolein	50		58	58	52	57	59	60	62	3.33 9.99 10.49	6.7	23
Acrylonitrile	50		38	44	44	45	44	44	42	2.38 7.14 7.49	4.2	16
Benzene	2.5		2.4	2.2	2.2	2.0	2.1	2.1	2.1	.127 .381 .400	.26	.91
Bromodichloromethane			2.1	1.8	2.1	1.6	2.0	1.9	1.7	.195 .585 .613	.39	1.3
Bromoform			1.7	1.6	1.7	1.3	1.3	1.3	1.2	.198 .594 .624	.40	1.4
Bromomethane			2.4	1.6	1.6	1.7	1.3	1.4	1.0	.443 1.329 1.39	.89	3.1
2-Butanone	20		19	17	13	17	14	17	14	1.86 5.58 5.85	3.7	13
Carbon Disulfide	2.5		2.4	1.9	2.3	1.9	1.9	1.6	2.0	.270 .81 .850	.54	1.9
Carbon Tetrachloride			2.1	1.6	1.9	1.7	1.9	1.7	1.3	.205 .615 .651	.42	1.4
Chlorobenzene			2.4	2.3	2.3	2.2	2.2	2.2	2.2	.076 .228 .247	.16	.54
Chloroethane			2.8	2.0	1.6	1.8	1.3	1.3	1.9	.495 1.485 1.52	.77	2.3
2-Chloroethylvinylether			1.0	1.2	1.4	1.0	0.6	1.3	1.0	.289 .867 .900	.59	2.0
Chloroform			2.2	2.1	2.2	2.1	2.1	2.0	1.9	.097 .291 .306	.20	.67
Chloromethane			2.3	1.9	1.6	2.0	1.9	1.7	1.6	.258 .75 .798	.50	1.7
Dibromochloromethane			1.8	1.6	1.3	1.5	1.5	1.6	1.3	.111 .333 .349	.22	.77
1,2-Dichloroethane			2.3	2.1	2.4	2.2	2.2	2.2	2.0	.134 .402 .422	.27	.93
1,1-Dichloroethane			2.1	2.0	1.8	2.0	2.0	1.8	1.8	.125 .375 .399	.26	.91
1,1-Dichloroethene			2.3	2.1	2.3	2.0	1.8	1.8	2.0	.207 .621 .653	.42	1.4
1,2-Dichloropropane			1.8	2.0	2.3	1.8	1.8	1.9	1.8	.196 .588 .595	.37	1.3
trans-1,3-Dichloropropene			1.7	1.2	1.3	1.1	1.2	1.4	1.6	.232 .696 .699	.45	1.5
cis-1,3-Dichloropropene			1.7	1.7	1.8	1.4	1.3	1.6	1.6	.157 .471 .494	.32	1.1
Ethylbenzene			2.0	1.9	1.8	1.3	1.7	1.7	1.8	.160 .49 .504	.32	1.1
2-Hexanone			1.7	2.4	1.9	2.4	2.0	2.1	1.7	.292 .876 .930	.59	2.0
4-Methyl-2-pentanone			1.9	2.3	2.3	2.3	2.6	2.4	2.4	.237 .711 .745	.49	1.6
Methylene Chloride			2.8	2.0	2.1	2.1	2.8	2.1	2.1	.141 .423 .449	.29	.97
Styrene			1.0	2.0	2.3	1.8	1.6	1.6	1.8	.390 1.14 1.19	.76	2.6
1,1,2,2-Tetrachloroethane			2.0	2.3	2.0	2.2	1.8	1.6	2.2	.267 .741 .775	.50	1.7
Tetrachloroethene			2.3	2.0	1.8	2.3	2.0	1.8	1.7	.241 .753 .759	.49	1.7
Toluene			2.8	2.7	2.7	2.9	2.4	2.4	2.7	.190 .57 .597	.39	1.3
1,1,1-Trichloroethane			2.3	1.9	2.4	1.9	2.0	1.9	2.0	.217 .651 .684	.44	1.5
1,1,2-Trichloroethane			2.1	1.9	1.9	1.6	1.6	1.8	1.9	.151 .453 .475	.30	1.0
Trichloroethene			2.3	2.3	2.0	1.9	2.6	2.3	1.9	.254 .762 .805	.52	1.8
Trichlorofluoromethane			1.7	1.6	1.3	1.6	1.6	1.4	1.6	.295 .885 .898	.19	.66
Vinyl Acetate	20		11	11	12	10	11	12	7.2	1.64 4.92 5.19	3.3	11
Vinyl Chloride	2.5		1.8	1.2	1.3	2.0	1.1	1.5	1.6	.314 .942 .989	.63	2.2
m-XYLENE			2.4	2.3	2.3	2.2	2.4	2.3	2.2	.127 .351 .399	.26	.99
o&p-XYLENES			4.5	4.6	5.0	4.4	4.2	4.4	4.4	.351 1.753 .790	.57	1.7
total-1,2-Dichloroethene			2.0	1.8	1.7	1.5	1.9	1.4	1.7	.211 .632 .664	.42	1.5

Sect I
Table 2. Semivolatile Study

INSTRUMENT DETECTION LIMIT DETERMINATION
AS PER CLP SOW 7/85 SOW
SEMI-VOLATILES

INSTRUMENT ID: MS-A
DATE: 7-2-87
UNITS: ~~PPM~~ (UG/ML)*
*FINAL EXTRACT VOLUME (1L SAMPLE CONCENTRATED TO 1ML)

	TEST LEVEL (PPM)	1	2	3	AVG	SD	3(SD)
N-NITROSODIMETHYLAMINE	30	31.19	32.77	31.67	31.88	0.81	2.4
PHENOL	30	30.57	30.82	33.49	31.62	1.62	4.9
BIS(2-CHLOROETHYL)ETHER	30	34.13	33.28	34.61	34.01	0.68	2.0
2-CHLOROPHENOL	30	31.56	31.08	32.99	31.88	0.99	3.0
1,3-DICHLOROBENZENE	30	31.12	31.41	31.46	31.33	0.18	0.55
1,4-DICHLOROBENZENE	30	32.38	32.08	32.67	32.38	0.29	0.88
BENZYL ALCOHOL	30	41.01	51.74	49.64	47.46	5.69	17.
1,2-DICHLOROBENZENE	30	31.74	32.97	31.78	31.87	0.18	0.54
2-METHYLPHENOL	30	35.18	33.93	35.79	34.97	0.95	2.8
BIS(2-CHLOROISOPROPYL)ETHER	30	32.27	32.18	32.84	32.43	0.36	1.1
4-METHYLPHENOL	30	34.58	32.12	37.37	34.69	2.62	7.9
N-NITROSO-DI-N-PROPYLAMINE	30	32.28	35.28	35.06	34.21	1.67	5.0
HEXACHLOROETHANE	30	30.24	32.65	31.60	31.50	1.21	3.6
NITROBENZENE	30	27.05	27.75	28.88	27.90	0.92	2.8
ISOPHORONE	30	30.42	32.17	33.24	31.94	1.42	4.3
2-NITROPHENOL	30	25.69	28.01	29.08	27.59	1.73	5.2
2,4-DIMETHYLPHENOL	30	27.66	26.91	28.19	27.59	0.64	1.9
BENZOIC ACID	150	135.3	151.9	148.4	145.2	8.75	26.
BIS(2-CHLOROETHOXY)METHANE	30	30.00	30.88	31.64	30.84	0.82	2.5
2,4-DICHLOROPHENOL	30	27.94	28.16	30.67	28.92	1.52	4.5
1,2,4-TRICHLOROBENZENE	30	30.06	29.61	29.57	29.75	0.27	0.81
NAPHTHALENE	30	30.56	29.52	30.34	30.14	0.54	1.6
4-CHLOROANILINE	30	109.8	102.4	73.25	95.16	19.34	58.
HEXACHLOROBUTADIENE	30	31.48	30.98	31.23	31.23	0.25	0.75
4-CHLORO-3-METHYLPHENOL	30	26.59	29.47	30.26	28.77	1.94	17.
2-METHYLNAPHTHALENE	30	29.39	30.26	30.50	30.05	0.59	1.8
HEXACHLOROCYCLOPENTADIENE	30	18.99	30.05	22.45	23.83	5.66	17.
2,4,6-TRICHLOROPHENOL	30	30.28	30.04	31.42	30.58	0.74	2.2
2,4,5-TRICHLOROPHENOL	150	166.1	175.3	173.2	171.5	4.83	14.
2-CHLORONAPHTHALENE	30	31.24	31.67	31.22	31.38	0.26	0.77
2-NITROANILINE	150	175.7	189.6	186.8	184.0	7.36	22.
DIMETHYL PHTHALATE	30	29.39	31.54	31.06	30.66	1.13	3.39
ACENAPHTHYLENE	30	35.64	36.40	35.83	35.96	0.40	1.18
3-NITROANILINE	150	64.55	42.89	61.07	56.17	11.6	35.
ACENAPHTHENE	30	31.05	31.37	31.31	31.25	0.17	0.51
2,4-DINITROPHENOL	150	138.1	164.2	152.8	151.7	13.1	39.
4-NITROPHENOL	150	159.66	177.1	166.2	167.7	8.81	26.
DIBENZOFURAN	30	28.77	30.74	29.73	29.75	0.99	3.0
2,4-DINITROTOLUENE	30	21.28	31.14	26.34	26.25	4.93	15.
2,6-DINITROTOLUENE	30	25.50	32.04	30.87	29.47	3.48	10.
DIETHYLPHTHALATE	30	30.17	33.81	32.63	32.20	1.86	5.6

Sect I
Table 2 (cont)

	TEST LEVEL (PPM)	1	2	3	AVG	SD	IDL 3(SD)
4-CHLOROPHENYL-PHENYLETHER	30	29.59	31.43	31.18	30.73	1.00	3.0
FLUORENE	30	27.24	29.75	28.40	28.46	1.26	3.8
4-NITROANILINE	150	106.0	92.56	107.9	102.1	8.35	25.
4,6-DINITRO-2-METHYLPHENOL	150	177.2	191.4	181.6	183.4	7.26	22.
N-NITROSODIPHENYLAMINE	30	70.26	57.98	62.35	63.53	6.23	19.
4-BROMOPHENYL-PHENYLETHER	30	33.32	32.41	34.60	33.45	1.10	3.3
HEXACHLOROBENZENE	30	35.64	34.04	36.13	35.27	1.09	3.3
PENTACHLOROPHENOL	150	177.6	188.6	180.8	182.3	5.63	17.
PHENANTHRENE	30	31.75	31.97	31.38	31.70	0.30	0.91
ANTHRACENE	30	32.90	32.46	32.54	32.63	0.24	0.71
DI-N-BUTYLPHTHALATE	30	32.26	31.91	32.89	32.35	0.49	1.5
FLUORANTHENE	30	31.59	31.97	30.47	31.34	0.78	2.3
BENZIDINE	80	81.38	111.9	84.92	92.72	16.7	50
PYRENE	30	27.93	28.95	27.88	28.25	0.60	1.8
BUTYLBENZYLPHTHALATE	30	26.05	28.94	27.63	27.54	1.45	4.4
3,3'-DICHLOROBENZIDINE	80	74.04	74.72	71.05	73.27	1.95	5.9
BENZO(A)ANTHRACENE	30	26.83	28.34	28.51	27.89	0.92	2.8
BIS(2-ETHYLHEXYL)PHTHALATE	30	27.84	29.80	28.44	28.69	1.00	3.0
CHRYSENE	30	30.53	30.48	32.45	31.15	1.12	3.4
DI-N-OCTYL PHTHALATE	30	27.25	28.39	27.746	27.70	0.61	1.8
BENZO(B)FLUORANTHENE	30	27.25	28.58	29.51	28.40	1.14	3.4
BENZO(K)FLUORANTHENE	30	32.51	26.78	29.21	29.50	2.88	8.6
BENZO(A)PYRENE	30	26.70	25.96	26.02	26.20	0.41	1.2
INDENO(1,2,3-CD)PYRENE	30	21.60	26.23	21.49	23.10	2.71	8.1
DIBENZ(A,H)ANTHRACENE	30	21.22	26.76	21.19	23.10	3.21	9.6
BENZO(G,H,I)PERYLENE	30	24.40	28.15	23.79	25.45	2.36	7.1

Semi-Volatiles	CAS Number	Detection Limits* Low Water[c] ug/L	Low Soil/Sediment[d] ug/Kg
36. Phenol	108-95-2	10	330
37. bis(2-Chloroethyl) ether	111-44-4	10	330
38. 2-Chlorophenol	95-57-8	10	330
39. 1,3-Dichlorobenzene	541-73-1	10	330
40. 1,4-Dichlorobenzene	106-46-7	10	330
41. Benzyl Alcohol	100-51-6	10	330
42. 1,2-Dichlorobenzene	95-50-1	10	330
43. 2-Methylphenol	95-48-7	10	330
44. bis(2-Chloroisopropyl) ether	39638-32-9	10	330
45. 4-Methylphenol	106-44-5	10	330
46. N-Nitroso-Dipropylamine	621-64-7	10	330
47. Hexachloroethane	67-72-1	10	330
48. Nitrobenzene	98-95-3	10	330
49. Isophorone	78-59-1	10	330
50. 2-Nitrophenol	88-75-5	10	330
51. 2,4-Dimethylphenol	105-67-9	10	330
52. Benzoic Acid	65-85-0	50	1600
53. bis(2-Chloroethoxy) methane	111-91-1	10	330
54 2,4-Dichlorophenol	120-83-2	10	330
55. 1,2,4-Trichlorobenzene	120-82-1	10	330
56. Naphthalene	91-20-3	10	330
57. 4-Chloroaniline	106-47-8	10	330
58. Hexachlorobutadiene	87-68-3	10	330
59. 4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
60. 2-Methylnaphthalene	91-57-6	10	330
61. Hexachlorocyclopentadiene	77-47-4	10	330
62. 2,4,6-Trichlorophenol	88-06-2	10	330
63. 2,4,5-Trichlorophenol	95-95-4	50	1600

SECTION I
Table 3- EPA-CLP CROL (7/85)

(continued)

Section I
Table 3 (cont)

Semi-Volatiles	CAS Number	Detection Limits* Low Water[c] ug/L	Low Soil/Sediment[c] ug/Kg
64. 2-Chloronaphthalene	91-58-7	10	330
65. 2-Nitroaniline	88-74-4	50	1600
66. Dimethyl Phthalate	131-11-3	10	330
67. Acenaphthylene	208-96-8	10	330
68. 3-Nitroaniline	99-09-2	50	1600
69. Acenaphthene	83-32-9	10	330
70. 2,4-Dinitrophenol	51-28-5	50	1600
71. 4-Nitrophenol	100-02-7	50	1600
72. Dibenzofuran	132-64-9	10	330
73. 2,4-Dinitrotoluene	121-14-2	10	330
74. 2,6-Dinitrotoluene	606-20-2	10	330
75. Diethylphthalate	84-66-2	10	330
76. 4-Chlorophenyl Phenyl ether	7005-72-3	10	330
77. Fluorene	86-73-7	10	330
78. 4-Nitroaniline	100-01-6	50	1600
79. 4,6-Dinitro-2-methylphenol	534-52-1	50	1600
80. N-nitrosodiphenylamine	86-30-6	10	330
81. 4-Bromophenyl Phenyl ether	101-55-3	10	330
82. Hexachlorobenzene	118-74-1	10	330
83. Pentachlorophenol	87-86-5	50	1600
84. Phenanthrene	85-01-8	10	330
85. Anthracene	120-12-7	10	330
86. Di-n-butylphthalate	84-74-2	10	330
87. Fluoranthene	206-44-0	10	330
88. Pyrene	129-00-0	10	330
89. Butyl Benzyl Phthalate	85-68-7	10	330
90. 3,3'-Dichlorobenzidine	91-94-1	20	660
91. Benzo(a)anthracene	56-55-3	10	330
92. bis(2-ethylhexyl)phthalate	117-81-7	10	330
93. Chrysene	218-01-9	10	330
94. Di-n-octyl Phthalate	117-84-0	10	330
95. Benzo(b)fluoranthene	205-99-2	10	330
96. Benzo(k)fluoranthene	207-08-9	10	330
97. Benzo(a)pyrene	50-32-8	10	330

(continued)

SECTION I
Table 4- Cyanide Study

Detection Limit Study

Analysis: Total Cyanide
Method: 335.2
Analyst: James Murdock

Data Check: _____
Comments: _____

		Day One Date: 2/4/87	Day Two Date: 6/23/87	Day Three Date: 6/4/87
Conc. of std. used		50 ug/L	10 ug/L	10 ug/L
replicates:	1	49.227	12.867	11.936
	2	49.227	12.609	11.936
	3	49.227	13.381	11.936
	4	51.922	13.895	11.652
	5	49.766	13.124	11.652
	6	54.617	13.124	11.652
	7	53.000	13.638	11.936
Mean		50.998	13.234	11.814
Std. deviation		2.03	0.409	0.1405

3 day average of Std. deviation: 0.8598 ug/L
3 x Std deviation: 2.58 = IDL

Detection Limit: 10.0 ug/L

SECTION I

ATTACHMENT 1

MAGNESIUM, CALCIUM, SODIUM, POTASSIUM STUDY

DETECTION LIMIT

Element: Magnesium (279.079 nm)
Matrix: Pure Water
Method: ICP
Analyst: MRT

Data Check/Initials: _____
Comment: Perkin-Elmer ICP 5500

	1st Day Date: 9/20/85	2nd Day Date: 9/26/85	3rd Day Date: 9/30/85
CALIBRATION STDS:	ABSORBANCE (AVE)	ABSORBANCE (AVE)	ABSORBANCE (AVE)
1. 1000 ppb			
2. ppb			
3. ppb			
4. ppb			
ANALYSIS OF STANDARD SOLUTION	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)
conc = 100 1	108.2	107.5	104.0
2	111.3	115.2	77.9
3	97.2	93.3	81.2
4	66.1	74.4	100.4
5	96.5	81.9	107.3
6	128.9	89.5	108.3
7	87.0	96.0	96.1
Mean:	99.2	93.1	96.5
Std. Dev.:	19.83	14.11	12.30

CRDL = 5000 ppb

3-day average of Std. deviations: 15.41

3 x SD 46.15

Detection Limit (ppb): _____

Element Name Mg279 Gain 767

Mg

Standard 1 Replicate 1

Mg279 EM 28033

Standard 1 Replicate 2

Mg279 EM 29128

Standard 1 Replicate 3

Mg279 EM 28528

Mg279 AV 28563 SD 548.3 CV 1.9 CONC 1000.0 ppb

Blank Replicate 1

Mg279 EM 1100

Blank Replicate 2

Mg279 EM 374

Blank Replicate 3

Mg279 EM 1239

Mg279 AV 904 SD 464.5 CV 51.3 CONC 0.0 ppb

.1ppm Mg Replicate 1

100 ppb Std

Mg279 108.2 ppb

.1ppm Mg Replicate 2

Mg279 111.3 ppb

.1ppm Mg Replicate 3

Mg279 97.2 ppb

.1ppm Mg Replicate 4

Mg279 66.1 ppb

.1ppm Mg Replicate 5

Mg279 96.5 ppb

.1ppm Mg Replicate 6

Mg279 128.9 ppb

.1ppm Mg Replicate 7

Mg279 87.0 ppb

Mg279 AV 99.3 ppb SD 19.83 CV 19.9

recorded

Mg279 66.1 ppb

1ppm Mg Replicate 5

Mg279 - 94.5 ppb

1ppm Mg Replicate 6

Mg279 128.9 ppb

1ppm Mg Replicate 7

Mg279 87.0 ppb recorded

Mg279 AV 99.3 ppb SD 19.83 CV 19.9

Mg - 2nd run
9/26/85

Run Manual Mode 85/09/26 14:28

Method Name: Mg279 Replicates: 7 Read Delay: 35
Print Format: All Data ID Name: Data Name:
Remarks: Mg DEtection limit W/Chimney

Mg279

Element Name Mg279 Gain 763

Standard 1 Replicate 1

Mg279 EM -3329 Peak Offset

Element Name Mg279 Gain 767

Standard 1 Replicate 1

Mg279 EM 28331

Standard 1 Replicate 2

Mg279 EM 25934

Standard 1 Replicate 3

Mg279 EM 26104

Mg279 AV 26789 SD 1337.4 CV 4.9 CONC 1000.0 ppb

Blank Replicate 1

Mg279 EM 1307

Blank Replicate 2

Mg279 EM 1422

Blank Replicate 3

Mg279 EM 192

Mg279 AV 973 SD 679.3 CV 69.7 CONC 0.0 ppb

Sample 1 Replicate 1

Mg279 95.2 ppb

Sample 1 Replicate 2

Mg279 110.1 ppb

Sample 1 Replicate 3

Sample 1 Replicate 3

Mg279 96.9 ppb

Mg279 AV 92.4 ppb SD 17.44 CV 18.8

100ppb Mg Replicate 1

Mg279 104.0 ppb

100ppb Mg Replicate 2

Mg279 77.9 ppb

100ppb Mg Replicate 3

Mg279 81.2 ppb

100ppb Mg Replicate 4

Mg279 100.4 ppb

100ppb Mg Replicate 5

Mg279 107.3 ppb

100ppb Mg Replicate 6

Mg279 108.3 ppb

100ppb Mg Replicate 7

Mg279 94.1 ppb

Mg279 AV 96.5 ppb SD 12.30 CV 12.7

recorded

Mg
3rd run

Run Manual Mode 85/09/30 15:31

Method Name: Mg279 Replicates: 3 Read Delay: 35
Print Format: All Data ID Name: Data Name:
Remarks: detection limit EPA-CLP with chimney

Mg279

Element Name Mg279 Gain 756

Standard 1 Replicate 1

Mg279 EM 31128

Standard 1 Replicate 2

Mg279 EM 30229

Standard 1 Replicate 3

Mg279 EM 31029

Mg279 AV 30795 SD 492.8 CV 1.6 CONC 1000.0 ppb

Blank Replicate 1

Mg279 EM 537

Blank Replicate 2

Mg279 EM 1523

Blank Replicate 3

Mg279 EM 3

Mg279 AV 688 SD 770.2 CV 111.8 CONC 0.0 ppb

Sample 1 Replicate 1

Mg279 73.1 ppb

Sample 1 Replicate 2

Mg279 107.2 ppb

Sample 1 Replicate 3

Mg279 96.9 ppb

DETECTION LIMIT

Element: Ca (317.93)
Matrix: Pure Water
Method: ICP
Analyst: Mila J

Data Check/Initials: _____
Comment: ICP instrument - Perkin Elmer 5700

	1st Day Date: 9/19/85	2nd Day Date: 9/21/85	3rd Day Date: 9/30/85
CALIBRATION STDS:	ABSORBANCE (AVE)	ABSORBANCE (AVE)	ABSORBANCE (AVE)
1. 1000 ppb			
2. ppb			
3. ppb			
4. ppb			
ANALYSIS OF STANDARD SOLUTION	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)
conc = 50 ppb 1	49.0	48.5	60.0
2	58.7	49.3	51.2
3	57.8	43.5	48.5
4	61.1	46.3	42.7
5	55.0	53.2	35.6
6	37.4	41.5	42.4
7	60.8	54.2	62.6
Mean:	54.5	48.1 ~~4.69~~ ppm	49.6
Std. Dev.:	8.70	4.69	9.76

CROL = 5000 ppm

3-day average of Std. deviations: ~~1.750~~ 7.7

3 x SD ~~23.0~~ 23

D-895

Detection Limit (ppb): ~~---~~ DL = .023 ppm

Ca. detection Limit

Run Manual Mode 85/09/19 17:07

Method Name: Ca317 Replicates: 3 Read Delay: 35
Print Format: All Data ID Name: Data Name:
Remarks: detection limit

Ca317

Element Name Ca317 Gain 646

Standard 1 Replicate 1

Ca317 EM 61721

Standard 1 Replicate 2

Ca317 EM 62396

Standard 1 Replicate 3

Ca317 EM 61507

Ca317 AV 61874 SD 463.4 CV 0.7 CONC 1000.0 ppb

Blank Replicate 1

Ca317 EM -346

Blank Replicate 2

Ca317 EM 790

Blank Replicate 3

Ca317 EM 373

Ca317 AV 272 SD 574.6 CV 211.0 CONC 0.0 ppb

ca 50ppb Replicate 1

Ca317 70.0 ppb

ca 50ppb Replicate 2

Ca317 D-896 49.7 ppb

ca 50ppb Replicate 3

... SD ... CV 211.0 CONC 0.0 ppb

ca 50ppb Replicate 1

Ca317 70.0 ppb

ca 50ppb Replicate 2

Ca317 49.9 ppb

ca 50ppb Replicate 3

Ca317 48.4 ppb

Ca317 AV 56.1 ppb SD 12.05 CV 21.4

Sample 2 Replicate 1

Ca317 49.0 ppb

Sample 2 Replicate 2

Ca317 58.7 ppb

Sample 2 Replicate 3

Ca317 59.8 ppb

Sample 2 Replicate 4

Ca317 61.1 ppb

Sample 2 Replicate 5

Ca317 55.0 ppb

Sample 2 Replicate 6

Ca317 37.4 ppb

Sample 2 Replicate 7

Ca317 60.8 ppb

Ca317 AV 54.5 ppb SD 8.70 CV 15.9

Run Manual Mode 85/09/21 13:55

Method Name: Ca317 Replicates: 3 Read Delay: 60
Print Format: All Data ID Name: Data Name:
Remarks: Detection limit for EPA CLP program - second day

Ca317

Element Name Ca317 Gain 697

Standard 1 Replicate 1

Ca317 EM -1815 Peak Offset

2nd day

Element Name Ca317 Gain 673

Standard 1 Replicate 1

Ca317 EM 69172

Standard 1 Replicate 2

Ca317 EM 69069

Standard 1 Replicate 3

Ca317 EM 68230

Ca317 AV 68823 SD 516.3 CV 0.7 CONC 1000.0 ppb

Blank Replicate 1

Ca317 EM 720

Blank Replicate 2

Ca317 EM 564

Blank Replicate 3

Ca317 EM 371

Ca317 AV 551 SD 174.8 CV 31.6 CONC 0.0 ppb

50ppb Ca	Replicate 1	
	Ca317	48.5 ppb
50ppb Ca	Replicate 2	
	Ca317	49.3 ppb
50ppb Ca	Replicate 3	
	Ca317	43.5 ppb
50ppb Ca	Replicate 4	
	Ca317	46.3 ppb
50ppb Ca	Replicate 5	
	Ca317	53.2 ppb
50ppb Ca	Replicate 6	
	Ca317	41.5 ppb
50ppb Ca	Replicate 7	
	Ca317	54.2 ppb

Ca317 AV 48.1 ppb SD 4.69 CV 9.7

recorded

Run Manual Mode 85/09/30 14:12

Method Name: Ca317 Replicates: 3 Read Delay: 3
Print Format: All Data ID Name: Data Name:
Remarks: detection limit for EPA CLP program

Ca317

Element Name Ca317 Gain 752

2nd day

Standard 1 Replicate 1

Ca317 EM -4209 Peak Offset

Element Name Ca317 Gain 689

Standard 1 Replicate 1

Ca317 EM 71240

Standard 1 Replicate 2

Ca317 EM 68935

Standard 1 Replicate 3

Ca317 EM 69206

Ca317 AV 69793 SD 1259.7 CV 1.8 CONC 1000.0 ppb

Blank Replicate 1

Ca317 EM 1415

Blank Replicate 2

Ca317 EM 106

ank Replicate 3

Ca317 EM 345

Ca317 AV 622 SD 697.0 CV 112.0 CONC 0.0 ppb

50ppb Ca	Replicate 1		
	Ca317	60.0 ppb	
50ppb Ca	Replicate 2		
	Ca317	51.2 ppb	
50ppb Ca	Replicate 3		
	Ca317	48.5 ppb	
50ppb Ca	Replicate 4		
	Ca317	42.7 ppb	
50ppb Ca	Replicate 5		
	Ca317	35.6 ppb	
50ppb Ca	Replicate 6		
	Ca317	42.4 ppb	
50ppb Ca	Replicate 7		
	Ca317	62.6 ppb	
Ca317	AV 49.0 ppb	SD 9.76	CV 19.9

recalculated

DETECTION LIMIT

Element: Potassium
Matrix: Pure Water
Method: ICP
Analyst: MRJ

Data Check/Initials: _____
Comment: _____

	1st Day Date: 9/21/85	2nd Day Date: 9/26/85	3rd Day Date: 9/30/87
CALIBRATION STDS:	ABSORBANCE (AVE)	ABSORBANCE (AVE)	ABSORBANCE (AVE)
1. 20,000 ppb			
2. ppb			
3. ppb			
4. ppb			
ANALYSIS OF STANDARD SOLUTION	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)
conc = ~~1000~~ 1	~~890~~	~~1020~~	1020
2	890	950	1050
3	~~1050~~	920	990
4	890	1110	1160
5	860	~~1100~~	1030
6	960	~~970~~	1020
7	~~900~~	~~970~~	1130
Mean:	920	~~1074~~ 1010	1050
Std. Dev.:	65	~~74~~	64

CROC = 5000 ppm

3-day average of Std. deviations: ~~46~~ 67.6

3 x SD 138

Detection Limit (ppb): ~~46~~ 205 ~~903~~

Element Name K766 Gain 948

Standard 1 Replicate 1

K766 EM 90852

Standard 1 Replicate 2

K766 EM 91928

Standard 1 Replicate 3

K766 EM 89831

K766 AV 90870 SD 1048.5 CV 1.1 CONC 20.00 ppm

Blank Replicate 1

K766 EM 1056

Blank Replicate 2

K766 EM 1369

Blank Replicate 3

K766 EM 569

K766 EM 1056

Blank Replicate 2

K766 EM 1369

Blank Replicate 3

K766 EM 569

K766 AV 998 SD 403.1 CV 40.3 CONC 0.00 ppm

1ppm K Replicate 1

K766 0.89 ppm

1ppm K Replicate 2

K766 0.89 ppm

1ppm K Replicate 3

K766 1.05 ppm

1ppm K Replicate 4

K766 0.89 ppm

1ppm K Replicate 5

K766 0.86 ppm

1ppm K Replicate 6

K766 0.96 ppm

1ppm K Replicate 7

K766 0.90 ppm

K766 AV 0.92 ppm SD 0.063 CV 7.0

K 9/26/95 2nd run

Run Manual Mode 85/09/26 15:53

Method Name: K766 Replicates: 3 Read Delay: 35
Print Format: All Data ID Name: Data Name:
Remarks: K Detection limit RF10XW

K766

Element Name K766 Gain 846

Standard 1 Replicate 1

K766 EM 84864

Standard 1 Replicate 2

K766 EM 80397

Standard 1 Replicate 3

K766 EM 78300

K766 AV 81187 SD 3352.5 CV 4.1 CONC 20.00 ppm

Blank Replicate 1

K766 EM -178

Blank Replicate 2

K766 EM 229

Blank Replicate 3

K766 EM 204

K766 AV 85 SD 228.1 CV 268.3 CONC 0.00 ppm

1000ppb K Replicate 1

K766 1.01 ppm

1000ppb K Replicate 2

K766 0.97 ppm

1000ppb K Replicate 2

K766 0.97 ppm

1000ppb K Replicate 3

K766 0.90 ppm

K766 AV 0.96 ppm SD 0.056 CV 5.8

Sample 2 Replicate 1

K766 1.02 ppm

Sample 2 Replicate 2

K766 0.95 ppm

Sample 2 Replicate 3

K766 0.92 ppm

Sample 2 Replicate 4

K766 1.11 ppm

Sample 2 Replicate 5

K766 1.11 ppm

Sample 2 Replicate 6

K766 0.98 ppm

Sample 2 Replicate 7

K766 0.97 ppm

K766 AV 1.01 ppm SD 0.074 CV 7.3

CLDL = 5 ppm

recorded

DETECTION LIMIT

Element: Sodium
Matrix: Pure Water
Method: ICP
Analyst: MRJ

Data Check/Initials:
Comment: PE ICP 5300
RF power = 1KW

	1st Day Date: 9/21/85	2nd Day Date: 9/26/85	3rd Day Date: 9/30/85
CALIBRATION STDS:	ABSORBANCE (AVE)	ABSORBANCE (AVE)	ABSORBANCE (AVE)
1. 10,000 ppb			
2. ppb			
3. ppb			
4. ppb			
ANALYSIS OF STANDARD SOLUTION	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)	7 REPLICATES (ABS/CONC)
conc = √000 1	√060	5120	5180
2	5110	4890	√060
3	5020	5010	√080
4	5110	4850	√160
5	5120	4900	√030
6	5050	4880	√040
7	4910	4920	√090
Mean:	5050	4950	5090
Std. Dev.:	72	93	55

CRDL = 5000 ppb 5000

3-day average of Std. deviations: 73

x SD 3

219 ppb

D-907

Detection Limit (ppb): ~~219~~ 73 ppb QX 3 = 219 ppb

214 ppb = .072 ~~.072~~ .219 ppm

Na

Run Manual Mode 85/09/21 15:16

Method Name: Na588 Replicates: 3 Read Delay: 35
Print Format: All Data ID Name: Data Name:
Remarks: Detection limit for EPA CLP program - second day

Na588

Element Name Na588 Gain 540

Standard 1 Replicate 1

Na588 EM 108368

Standard 1 Replicate 2

Na588 EM 107381

Standard 1 Replicate 3

Na588 EM 107884

Na588 AV 107878 SD 491.1 CV 0.4 CONC 10.00 ppm

Blank Replicate 1

Na588 EM 8113

Blank Replicate 2

Na588 EM 8331

Blank Replicate 3

Na588 EM 8571

Na588 AV 8338 SD 229.0 CV 2.7 CONC 0.00 ppm

1ppm Na Replicate 1

Na588 EM 8571

Na588 AV 8338 SD 229.0 CV 2.7 CONC 0.00 ppm

1ppm Na Replicate 1

Na588 1.00 ppm Peak Offset

1ppm Na Replicate 2

Na588 1.09 ppm Peak Offset

1ppm Na Replicate 3

Na588 1.08 ppm Peak Offset

Na588 AV 1.06 ppm SD 0.047 CV 4.4

Sample 2 Replicate 1

Na588 1.06 ppm Peak Offset

Sample 2 Replicate 2

Na588 1.08 ppm Peak Offset

Sample 2 Replicate 3

Na588 1.06 ppm Peak Offset

Sample 2 Replicate 4

Na588 1.02 ppm Peak Offset

Sample 2 Replicate 5

Na588 0.86 ppm Peak Offset

Sample 2 Replicate 6

Na588 0.01 ppm Peak Offset

Sample 2 Replicate 7

Na588 9.48 ppm

Na588 AV 2.08 ppm SD 3.286 CV 157.3

5ppm Na Replicate 1

Na588 4.91 ppm

Na588 9.48 ppm

Na588 AV 2.08 ppm SD 3.296 CV 157.3

Sppm Na Replicate 1

Na588 4.91 ppm

Sppm Na Replicate 2

Na588 5.06 ppm

Sppm Na Replicate 3

Na588 5.11 ppm

Sppm Na Replicate 4

Na588 5.02 ppm

Sppm Na Replicate 5

Na588 5.11 ppm

Sppm Na Replicate 6

Na588 5.12 ppm

Sppm Na Replicate 7

Na588 5.05 ppm recorded 1st d

Na588 AV 5.05 ppm SD 0.072 CV 1.4

Na 9/26/85
2nd run

Run Manual Mode 85/09/28 15:30

Method Name: Na588 Replicates: 3 Read Delay: 35
Print Format: All Data ID Name: Data Name:
Remarks: Na detection limit

Na588

Element Name Na588 Gain 474

Standard 1 Replicate 1

Na588 EM 103405

Standard 1 Replicate 2

Na588 EM 105459

Standard 1 Replicate 3

Na588 EM 105823

Na588 AV 104896 SD 1303.5 CV 1.2 CONC 10.00 ppm

Blank Replicate 1

Na588 EM 3221

Blank Replicate 2

Na588 EM 3179

Blank Replicate 3

Na588 EM 3327

Na588 AV 3242 SD 76.2 CV 2.3 CONC 0.00 ppm

5000ppb Na Replicate 1

Na588 0.01 ppm Peak Offset

Blank Replicate 3

Na588 EM 3327

Na588 AV 3242 SD 76.2 CV 2.3 CONC 0.00 ppm

5000ppb Na Replicate 1

Na588 0.01 ppm Peak Offset

5000ppb Na Replicate 2

Na588 0.01 ppm Peak Offset

5000ppb Na Replicate 3

Na588 0.01 ppm Peak Offset

Na588 AV 0.01 ppm SD 0.003 CV 21.2

Sample 2 Replicate 1

Na588 5.12 ppm

Sample 2 Replicate 2

Na588 4.89 ppm

Sample 2 Replicate 3

Na588 5.01 ppm

Sample 2 Replicate 4

Na588 4.85 ppm

Sample 2 Replicate 5

Na588 4.90 ppm

Sample 2 Replicate 6

Na588 4.88 ppm

Sample 2 Replicate 7

Na588 4.92 ppm

Na588 AV 4.94 ppm SD 0.093 CV 1.9

CROSS PPM

Element Name	Wavelength	Back. Corr.	Time	S1	S2	S3	S4	S5
Na588	588.995	Upper	2.0	10.00	0.00	0.00	0.00	0.00

Na 2nd run

Run Manual Mode 85/09/30 16:35

Method Name: Na588 Replicates: 3 Read Delay: 35
Print Format: All Data ID Name: Data Name:
Remarks:

Na588

Element Name Na588 Gain 521

D-914

Standard 1 Replicate 1

Na588 EM 117288

Element Name Na588 Gain 521

Standard 1 Replicate 1

Na588- EM 117288

Standard 1 Replicate 2

Na588 EM 118831

Standard 1 Replicate 3

Na588 EM 118834

Na588 AV 118318 SD 891.0 CV 0.7 CONC 10.00 ppm

Blank Replicate 1

Na588 EM 4185

Blank Replicate 2

Na588 EM 4208

Blank Replicate 3

Na588 EM 4249

Na588 AV 4214 SD 32.4 CV 0.7 CONC 0.00 ppm

5000ppb Na Replicate 1

Na588 5.07 ppm

5000ppb Na Replicate 2

Na588 5.13 ppm

5000ppb Na Replicate 3

Na588 5.09 ppm

Na588 AV 5.10 ppm SD 0.026 CV 0.5

Sample 2 Replicate 1

Na588 5.18 ppm

Sample 2 Replicate 2

Na588 5.06 ppm

Sample 2 Replicate 3

Na588 5.08 ppm

Sample 2 Replicate 4

Na588 5.16 ppm

Sample 2 Replicate 5

Sample 2 Replicate 4

Na588 5.16 ppm

Sample 2 Replicate 5

Na588 5.03 ppm

Sample 2 Replicate 6

Na588 5.04 ppm

Sample 2 Replicate 7

Na588 5.09 ppm

Na588 AV 5.09 ppm SD 0.055 CV 1.0

recorded

SECTION I

ATTACHMENT 2

FLUORIDE AND SULFATE STUDY

Attachment 2

Detection Limit Study

Analysis: F-
Method: 300 || instrument: Dionex
Analyst: UAL

Data Check: KST 6/2/87
Comments: _____

	Day One Date: 5-28-87 @ 300	Day Two Date: 5-29-87 @ 300	Day Three Date: 6-1-87 @ 300
Conc. of std. used	5ppm	5ppm	5ppm
replicates: 1	5.327	~~5.074~~ UAL 5.074	5.445
2	5.231	~~5.049~~ UAL 5.049	5.117
3	5.100	5.048	5.064
4	5.150	5.039	4.973
5	5.147	5.069	4.572
6	5.158	5.033	5.052
7	5.009	4.990	4.981
Mean	5.160	5.044	5.073
Std. deviation	0.09967	0.02587	0.1534

3 day average of Std. deviation: 0.1030
3 x Std deviation: 0.31 (LOD)

Detection Limit (LOQ): 0.93 mg/L

Detection Limit Study

Analysis: F⁻ Data Check: RST 6/16/87
Method: Ise - 340.2 Comments: _____
Analyst: MAL _____

	Day One Date: 10 June 87	Day Two Date: 11 June 87	Day Three Date: 15 June
Conc. of std. used	1.0 ppm	1.0 ppm	1.0 ppm
replicates: 1	0.94	0.92	0.95
2	0.95	0.925 = 0.92	0.97
3	0.97	0.95	0.97
4	0.97	0.97	0.97
5	0.95	0.98	0.97
6	0.94	0.98	0.97
7	0.93	0.95	0.97
Mean	0.95	0.95	0.967
Std. deviation	0.01528	0.02563	0.007559

3 day average of Std. deviation: 0.016616
3 x Std deviation: 0.048 = IDL

Detection Limit: 0.15 ppm = LOQ

Detection Limit Study

Analysis: $SO_4^{=}$
Method: 300
Analyst: NAL

Data Check: KST 6/2/87
Comments: _____

	Day One Date: 5-28-87 @300	Day Two Date: 5-29-87 @300	Day Three Date: 6-1-87 @300
Conc. of std. used	5ppm	5ppm	5ppm
replicates: 1	4.681	4.653	4.762
2	4.588	4.592	4.546
3	4.647	4.619	4.595
4	4.690	4.852	4.526
5	4.632	4.688	4.632
6	4.552	4.695	4.534
7	4.582	4.657	4.631
Mean	4.624	4.678	4.609
Std. deviation	0.05234	0.08455	0.07752

3 day average of Std. deviation: 0.07147
3 x Std deviation: 0.21

Detection Limit: 0.63
LOQ

SECTION II

COPIES OF DETECTION LIMIT TABLES

FOR ORGANICS WITHOUT THE "LESS THAN" SIGN

LEVELS OF QUANTITATION
FOR
ORGANIC ANALYSIS

The Levels of Quantitation (LOQ) for the organic analyses were determined using the procedure specified in the USEPA Contract Laboratory Program Statement of Work, 7/85 Revision Page A-4, paragraph c.

This method requires the analysis of each compound in triplicate at a level equivalent to 3 to 5 times the Contract Required Detection Limit (now called the Contract Required Quantitation Level). The actual LOQs for each sample may vary, however, dependent on how much sample was extracted or analyzed, required dilutions, sample matrix, etc.

Table D-1. Levels of quantitation for volatiles in an aqueous matrix

	MATRIX:	WATER
	UNITS:	UG/L
	DILUTION FACTOR:	1
COMPOUNDS		
Acrolein		10
Acrylonitrile		10
Benzene		5
Bromodichloromethane		5
Bromoform		5
Bromomethane		5
Carbon Tetrachloride		5
Chlorobenzene		5
Chloroethane		5
2-Chloroethylvinylether		10
Chloroform		5
Chloromethane		5
Dibromochloromethane		5
1,3-Dichlorobenzene		5
1,2-Dichlorobenzene		5
1,4-Dichlorobenzene		5
1,1-Dichloroethane		5
1,2-Dichloroethane		5
1,1-Dichloroethene		5
1,2-Dichloropropane		5
trans-1,3-Dichloropropene		5
cis-1,3-Dichloropropene		5
Ethylbenzene		5
Methylene Chloride		5
1,1,2,2-Tetrachloroethane		5
Tetrachloroethene		5
Toluene		5
1,1,1-Trichloroethane		5
1,1,2-Trichloroethane		5
Trichloroethene		5
Trichlorofluoromethane		5
Vinyl Chloride		1
cis-1,2-Dichloroethene		5
trans-1,2-Dichloroethene		5

Table D-2. Levels of quantitation for base/neutral acid extractables in an aqueous matrix

COMPOUNDS	MATRIX: WATER UNITS: UG/L
Acenaphthalene	10
Acenaphthene	10
Anthracene	10
Benzidine	80
Benzo(a)Anthracene	10
Benzo(a)Pyrene	10
Benzo(b+k)fluoranthenes	10
Benzo(g,h,i)Perylene	10
4-Bromophenyl-phenylether	10
Butylbenzylphthalate	10
4-Chloro-3-Methylphenol	10
bis(2-Chloroethoxy)Methane	10
bis(2-Chloroethyl)Ether	10
bis(2-Chloroisopropyl)Ether	10
2-Chloronaphthalene	10
2-Chlorophenol	10
4-Chlorophenyl-phenylether	10
Chrysene	10
Di-n-Butylphthalate	10
Di-n-Octyl Phthalate	10
Dibenz(a,h)Anthracene	10
1,2-Dichlorobenzene	10
1,4-Dichlorobenzene	10
1,3-Dichlorobenzene	10
3,3'-Dichlorobenzidine	20
2,4-Dichlorophenol	10
Diethylphthalate	10
Dimethyl Phthalate	10
2,4-Dimethylphenol	10
4,6-Dinitro-2-Methylphenol	50
2,4-Dinitrophenol	50
2,4-Dinitrotoluene	10
2,6-Dinitrotoluene	10
1,2-Diphenylhydrazine	10
bis(2-Ethylhexyl)Phthalate	10
Fluoranthene	10

Table D-2. Continued

COMPOUNDS	MATRIX: WATER UNITS: UG/L
Fluorene	10
Hexachlorobenzene	10
Hexachlorobutadiene	10
Hexachlorocyclopentadiene	10
Hexachloroethane	10
Indeno(1,2,3-cd)Pyrene	10
Isophorone	10
N-Nitroso-Di-n-Propylamine	10
N-Nitrosodimethylamine	5
N-Nitrosodiphenylamine	10
Naphthalene	10
Nitrobenzene	10
4-Nitrophenol	50
2-Nitrophenol	10
Pentachlorophenol	50
Phenanthrene	10
Phenol	10
Pyrene	10
1,2,4-Trichlorobenzene	10
2,4,6-Trichlorophenol	10

Table D-3. Levels of quantitation for base/neutral acid extractables in a soil matrix

COMPOUNDS	MATRIX: SOIL UNITS: UG/KG
Acenaphthalene	1670
Acenaphthene	1670
Anthracene	1670
Benzidine	3030
Benzo(a)Anthracene	1670
Benzo(a)Pyrene	1670
Benzo(b+k)fluoranthenes	1670
Benzo(g,h,i)Perylene	1670
4-Bromophenyl-phenylether	1670
Butylbenzylphthalate	1670
bis(2-Chloroethoxy)Methane	1670
bis(2-Chloroethyl)Ether	1670
bis(2-Chloroisopropyl)Ether	1670
2-Chloronaphthalene	1670
4-Chlorophenyl-phenylether	1670
Chrysene	1670
Di-n-Butylphthalate	1670
Di-n-Octyl Phthalate	1670
Dibenz(a,h)Anthracene	1670
1,3-Dichlorobenzene	1670
1,2-Dichlorobenzene	1670
1,4-Dichlorobenzene	1670
3,3'-Dichlorobenzidine	3330
Diethylphthalate	1670
Dimethyl Phthalate	1670
2,4-Dinitrotoluene	1670
2,6-Dinitrotoluene	1670
1,2-Diphenylhydrazine	1670
bis(2-Ethylhexyl)Phthalate	1670
Fluoranthene	1670
Fluorene	1670
Hexachlorobenzene	1670
Hexachlorobutadiene	1670
Hexachlorocyclopentadiene	1670
Hexachloroethane	1670
Indeno(1,2,3-cd)Pyrene	1670

Table D-3. Continued

COMPOUNDS	MATRIX: SOIL UNITS: UG/KG
Isophorone	1670
N-Nitroso-Di-n-Propylamine	1670
N-Nitrosodimethylamine	1670
N-Nitrosodiphenylamine	1670
Naphthalene	1670
Nitrobenzene	1670
Phenanthrene	1670
Pyrene	1670
1,2,4-Trichlorobenzene	1670

LEVELS OF QUANTITATION
FOR
INORGANIC ANALYSIS

The Levels of Quantitation (LOQ) for inorganic analyses were determined using the procedure specified in "Principles of Environmental Analysis" Analytical Chemistry, Volume 55, Pages 2210-2218, December 1983. The actual LOQs for each sample will vary depending on sample size, required dilutions, sample matrix, etc.

Table D-4. Levels of quantitation for chemical parameters in aqueous and soil matrices *

VERSAR INC., ESM OPERATIONS
LEVELS OF QUANTITATION

Parameter	Method	LEVEL OF QUANTITATION WATER (mg/L)	SOIL (mg/kg)
Total Cyanide	335.2	0.010	0.50
Free Cyanide	412H(1)	0.010	0.50
Fluoride	300.0	1.6	NA(2)
Fluoride	340.2	1.0	1.0
Sulfate	375.4	5.0	5.0
Sulfate	300.0	2.0	NA
Chloride	325.3	1.1	NA
Carbonate	403	10	NA
Bicarbonate	403	10	NA
Sodium	273.1	1.0	200
Sodium	200.7	1.0	NA
Calcium	200.7	0.50	NA
Magnesium	200.7	0.50	NA
Potassium	200.7	1.0	NA
Arsenic	206.2	0.01	2.0

(1) Standard Methods
(2) NA= Not Applicable

* The actual LOQs for each sample will vary depending on sample size, required dilutions, sample matrix, etc.

Table D-5. Levels of quantitation for metals in EP TOX extract matrix

LEVELS OF QUANTITATION		
Parameter (EP TOX METALS*)	Method	LEVEL OF QUANTITATION Units: ug/L
Arsenic	200.7	200
Barium	200.7	200
Cadmium	200.7	50
Chromium	200.7	50
Lead	200.7	200
Mercury	239.2	0.30
Selenium	200.7	200
Silver	200.7	50

* Samples prepared using method 1310 from SW-846 2nd Edition USEPA 1982

SECTION III

SOURCE OF INDEPENDENT QC SAMPLES

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 11 1987

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

To: Laboratories Participating in Pre-Award Performance Evaluation Samples for IFB's WA 87-J001, J002, and J003

Dear Participant:

Enclosed are copies of your score sheet for the pre-award "Performance Evaluation Samples" for IFB's WA 87-J001, WA 87-J002, and WA 87-J003 and the acceptance windows for each analyte.

The acceptable score for performance on those samples is 720 points.

If you wish to have a debriefing, please contact Larry Butler at EMSL-LV.

Sincerely,

/Joan F. Fisk

Joan F. Fisk
National Organics Program Manager

Enclosure

cc: Larry Butler, EMSL-LV

PREAWARD PERFORMANCE EVALUATION SAMPLE DATA SCORING

Laboratory Martin Marietta Environmental Systems (MMES) #18

IFB Full Organics Date 4-9-87

SUMMARY:

		150 points for water	150 points for soil	Water	Soil
I.	Identification				
a.	Total number of I pts. deducted	9.5	10		
b.	pts. awarded for I			140.5	140
II.	Quantification				
a.	Total number of II pts deducted	0	0		
b.	pts. awarded for II			150	150
	Total points awarded for I and II, water and soil			581	out of 600 pts.
III.	Quality Control	300 pts.			
a.	Total number of III pts. deducted	2.2			
b.	pts. awarded for III			298	out of 300 pts
IV.	Reporting/Deliverables	100 pts.			
a.	Total number of IV pts. deducted	0			
b.	pts. awarded for IV			100	out of 100 pts
V.	Score				
a.	Total number of I, II, III, and IV pts. awarded			979	out of 1000 pts.
b.	Total pts. awarded			979	out of 1000 pts
VI.	Number of days late			0	

IMPORTANT: 1) Points deducted will not exceed the maximum possible number of points.

I. Identification (150 points for water sample; 150 points for soil samples.

NOTE: If a Pest/PCBs compound is detected and not confirmed, the compound will be considered not identified and points will be deducted.

	Water	Soil
A. Target Compound List (TCL) identification (Water Sample = 100 pts. max.; Soil Sample = 100 pts. max.).		
Number of compounds not identified (0/0) X 100 pts. (Number of compounds in study (32/32)/10 = (0/0) pts. ded.	0	0
B. TCL false positives (Water Sample = 30 pts. max.; Soil Sample = 30 pts. max.)		
Number of TCL false positives (0/0) X 3 points = (0/0) points deducted	0	0
C. Tentatively Identified Compounds (TIC) identification (Water Sample = 10 pts. max.; Soil Sample = 10 pts. max.)		
Number of compounds not identified (9/7) X 10 pts. Number of compounds in study (20/14) = (4.5/5) pts. ded.	4.5	5
D. TIC false positives (Water Sample = 10 pts. max.; Soil Sample = 10 pts. max.)		
Number of TIC false positives (5/5) X 1 point = (5/5) points deducted	5	5
Total number of I pts. deducted	9.5	10

II. Quantification of the TCL (150 points for water sample; 150 points for soil sample)

A. TCL quantification include VOA, Semi-VOA, and Pesticides (Water Sample = 150 pts. max.; Soil Sample = 150 pts. max.)		
Number of compounds not within criteria (0/0) x 150 pts Number of compounds in study (32/32)/5 = (0/0) pts. ded.	0	0
Total number of II pts deducted	0	0

III. Quality Control (300 points)

A. Instrument Quality Control (150 points)

Number of pts deducted

1. Tuning (50 points)

a. DFTPP (25 pts. max.)

1. For any DFTPP performance tune analyzed separately or as part of the calibration standard with any critical ions abundance ratios outside criteria deduct a maximum of 25 points. (Critical key ions are: 68, 70, 197, 198, 199, 441, 442, 443, and 365). 0

2. For any DFTPP performance tune analyzed separately or as part of the calibration standard with any non-critical ions abundance ratios outside criteria deduct 2 pts. for each to a maximum of 25 pts. (Non-critical key ions are: 51, 127, and 275.) 0

3. Failure to perform a DFTPP tune at the required 12-hour frequency, deduct a maximum of 25 points. 0

b. BFB (25 pts. max.)

1. For any BFB performance tune analyzed separately or added to reagent water with any critical ions abundance ratios outside criteria deduct a maximum of 25 points. (Critical key ions are: 95, 96, 174, 175 176, 177.) 0

2. For any BFB performance tune analyzed separately or added to reagent water with any non-critical ions abundance ratios outside criteria deduct 2 points for each to a maximum of 25 points. (Non-critical key ions are: 50, 75, 173.) 0

3. Failure to perform a BFB tune at the 12-hour frequency, deduct a maximum of 25 pts. 0

2. Initial Calibration (50 points)

a. For initial calibration data for VOA or Semi-VOA with System Performance Check Compound (SPCC) average relative response factor (RRF) less than 0.300 for VOA fraction (less than 0.250 for Bromoform) or less than 0.050 for Semi-VOA fraction, (15 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (14)
X 15 pts = (0) pts. ded. 0

Number of
pts deducted

b. For initial calibration data for VOA or Semi-VOA with Calibration Check Compound (CCC) percent relative standard deviation greater than 30%, (20 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (25)
X 20 pts. = (0) pts. ded. — 0

c. 72-hour Calibration Requirements for GC/EC (15 pts. max.)

1. If the retention time of 4,4'-DDT is not ≥ 12 minutes on packed GC columns

Number of items not within criteria (0) x 15 pts.
Total number of items required (4)
= (0) pts ded. — 0

2. If the linearity of Aldrin, Endrin, or Dibuthylchlorendate in Evaluation Mixtures A, B, and C exceeds a 10% relative standard deviation (% RSD).

Number of items not within criteria (0) x 15 pts.
Total number of items required (6)
= (0) pts ded. — 0

3. If the percent breakdown for Endrin,4,4'-DDT or the combined peaks % breakdown exceeds 20% in Evaluation Mix B.

Number of items not within criteria (0) x 15 pts.
Total number of items required (3)
= (0) pts ded. — 0

4. If the retention time shift for Dibutylchlorendate exceeds a 2% difference for packed GC columns (0.3% difference for capillary column) between the initial standard (Evaluation Mix A) and Evaluation Mixtures B and C, individual standards Mixtures A and B and all multiresponse pesticide/PCBs analyzed during the 72-hour period.

Number of items not within criteria (0) x 15 pts.
Total number of items required (4)
= (0) pts ded. — 0

Number of Pts. Deducted

5. If the pesticide standards are not analyzed in the proper sequence, deduct 15 points. 0

d. Failure to perform initial calibration will result in the deduction of all the Quality Control points, which equals 300. 0

3. Continuing Calibration (50 points)

a. For continuing calibration data for VOA or Semi-VOA with System Performance Check Compound (SPCC) average relative response factor (RRF) less than 0.300 for VOA fraction (less than 0.250 for Bromoform) or less than 0.050 for Semi-VOA fraction, (15 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (18)
X 15 pts. = (0) pts. ded. 0

b. For continuing calibration data for VOA or Semi-VOA with Calibration Check Compound (CCC) percent relative standard deviation greater than 25% (20 pts. max.)

compounds not within criteria, both fractions (1)
Total number of compounds, include both fractions (38)
X 20 pts. = (0.53) pts. ded. 0.53

c. 72-hour Calibration Requirements for GC/EC (15 pts. max.)

1. If the retention time of 4,4'-DDT is not $\geq$ 12 minutes on packed GC columns

Number of items not within criteria (0)
Total number of items required (5)
X 15 pts. = (0) pts. deducted. 0

Number of Pts. Deducted

2. If the percent breakdown for Endrin, 4,4'-DDT or the combined peaks % breakdown exceeds 20% in Evaluation Mix B.

Number of items not within criteria (0) X 15 pts.
Total number of items required (3)
= (0) pts. ded. 0

d. Failure to perform continuing calibration will result in the deduction of all the continuing calibration points, which equals 50 points. 0

B. Sample/Method Quality Control (150 points)

1. Surrogate Spike recovery (60 points). NOTE: Do not include Method Blanks.

a. VOA (30 pts. max.)

Number of surrogate compounds not within criteria (0)
Total number of VOA surrogate compounds (12).
X 30 pts. = (0) pts. deducted 0

b. Semi-VOA (30 pts. max.)

Number of surrogate compounds not within criteria (2)
Total number of Semi-VOA surrogate compounds (36).
X 30 pts = (1.67) pts. deducted. 1.67

c. Points will not be evaluated for Pesticide/PCBs surrogate compound. NR

2. Method Blank Analyses (75 points)

Failure to perform the method blank analysis for any of the fractions will result in the deduction of 75 points.

a. VOA surrogate recovery (15 pts. max.)

Number of surrogate compounds not within criteria (0)
Total number of VOA surrogate compounds (6)
X 15 pts. = (0) pts. deducted. 0

b. VOA method blank contamination (15 pts. max.).

If one or more TCL compounds are detected in the method blank above the contract required quantitation limit (5X the CRQL for methylene chloride, acetone, toluene, and 2-butanone) deduct the maximum points, 15. 0

	Number of Pts. Deducted
c. Semi-VOA surrogate recovery (15 pts. max.) Number of surrogate compounds not within criteria (0) Total number of Semi-VOA surrogate compounds (12) X 15 pts. = (0) pts. deducted	0
d. Semi-VOA method blank contamination (15 pts. max.) If one or more TCL compounds are detected in the method blank above the contract quantitation limit (5 X the CRQL for phthalate esters) deduct the maximum points, 15.	0
e. Pesticide/PCBs method blank contamination (15 pts. max.) If one or more TCL compounds are detected in the method blank above the contract required quantitation limit deduct the maximum points, 15.	0
3. Matrix Spike/Matrix Spike Duplicate (15 points)	
a. Utilization of the wrong spiking concentration in one or more of the fractions will result in the deduction of 15 points.	NR
b. Failure to perform matrix spike or matrix spike duplicate analysis will result in the deduction of 15 points.	NR
Total number of III pts. deducted	2.2
IV. Reporting and Deliverables (100 points)	
A. BFB and DFTPP (12.5 points max for BFB and 12.5 points max for DFTPP)	
1. Mass listing and bar graph output submitted for each instrument and for every 12-hour period samples were analyzed. Deduct 12.5 points for any BFB violation and 12.5 pts for any DFTPP violation	0
B. RICs, Chromatograms, quantitation reports, and system print-outs (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the statement of work.	0
C. Mass spectra (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the Statement of Work.	0

	Number of Pts. Deducted
D. Contractual Forms (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the Statement of Work.	0
Total number of IV pts. deducted	0

PREAWARD SAMPLE RESULTS
IFB WA-87 J001, 002, 003
(3/24/87)

	ANALYTE	ug/L	LOWER	UPPER
VOA	1,1-DICHLOROETHANE	50	37.3 -	68.8
	CHLOROFORM	70	50.7 -	79.3
	TETRACHLOROETHENE	70	47.6 -	79.8
	ETHYLBENZENE	50	46.1 -	72.3
VOA-TIC	1-CHLOROPENTANE	72		
	ETHYLCYCLOHEXANE	81		
	HEPTALDEHYDE	62		
BNA	2-CHLOROPHENOL	200	81.3 -	238
	ISOPHORONE	120	51.8 -	158
	2,4-DIMETHYLPHENOL	250	80.3 -	242
	2,4-DICHLOROPHENOL	200	81.8 -	218
	ACENAPHTHENE	100	47.5 -	112
	N-NITROSODIPHENYLAMINE	150	64.6 -	254
	FLUORANTHENE	120	62.8 -	155
	BIS(2-ETHYLHEXYL)PHTHALATE	140	66.7 -	187
BNA-TIC	3-BROMOTOLUENE	140		
	M-IODOTOLUENE	140		
	ETHYL BENZOATE	140		
	1,3-DIBROMOBENZENE	140		
	2-CHLORO-6-NITROTOLUENE	140		
	CYCLODECANONE	140		
	BIPHENYL	140		
PEST	alpha-BHC	0.30	0.155 -	0.400
PCB	HEPTACHLOR EPOXIDE	0.35	0.222 -	0.428
	ENDRIN	0.45	0.237 -	0.589
	ENDOSULFAN II	0.50	0.266 -	0.576

PREAWARD SAMPLE RESULTS
IFB WA-87 J001, 002, 003
(3/24/87)

	SOLID MATRIX ANALYTE	THEO. CONC. ug/kg	ACCEPTANCE WINDOWS LOWER	UPPER
VOA	TRANS-1,2-DICHLOROETHENE	4428	2620 -	4590
	DIBROMOCHLOROMETHANE	1788	537 -	1780
	TOLUENE	3025	1260 -	4230
	O-XYLENE	1375	660 -	2220
VOA-TIC	FLUOROBENZENE	3285		
	CYCLOHEXYL CHLORIDE	3264		
BNA	1,4-DICHLOROBENZENE	2580	789 -	2560
	1,2,4-TRICHLOROBENZENE	2167	733 -	2410
	NAPHTHALENE	2000	712 -	2130
	2,4,6-TRICHLOROPHENOL	6667	2760 -	6540
	4-NITROPHENOL	5333	2220 -	11000
	FLUORENE	2167	1030 -	2250
	PYRENE	1933	797 -	2550
	DI-N-OCTYLPHTHALATE	2000	784 -	2510
BNA-TIC	BENZENE,1-ETHYL-4-NITRILE	2000		
	4-ETHYLNITROBENZENE	2000		
	BENZENE,(2-METHYLPROPOXY)	2000		
	4-BROMOPHENOL	2000		
	PHENOL,4-(1-METHYLPROPYL)	2000		
PEST	HEPTACHLOR	100	25.1 -	162
PCB	ALDRIN	83.3	27.2 -	124
	4,4'-DDD	250	74.9 -	364
	ENDOSULFAN SULFATE	167	40.2 -	211

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Distribution of Inorganic Pre-Award Performance Evaluation Scores

FROM: William D. Langley
Acting Inorganics CLP Program Manager

TO: All Laboratory Participants Under IFB WA87-K025/K026/K027

I have authorized the release and distribution of Laboratory scores for the Inorganic Pre-Award Performance Evaluation Samples as determined by the CLP Sample Management Office under Pre-Award Bid Confirmation scoring procedures. These score sheets for individual laboratories and accompanying information are being forwarded to you by Mr. Sa'ad Masri of the Sample Management Office.

Scores in this Pre-Award Performance Evaluation Study ranged from 0 to 99.1%. Of the seventy-five (75) laboratories participating, 38 (approximately 50%) scored at the 80% level or better. Twenty (20) laboratories scored in the range of 60 to 79 with the remaining 17 laboratories scoring at less than the 60% level. After full evaluation of the results submitted the 80% level was taken by the Program Office as the acceptable level warranting further consideration. The Contracting and Program Office, however, retain the right to consider other laboratories scoring near the 80% level if circumstances appear to warrant such consideration.

The Contracting Office (PCMD) has been provided with a list of all laboratories which participated in this Performance Evaluation Study and has been provided a copy of their score sheets. Technical questions relating to the study may be directed to me at (202-382-7906). Contractually related matters should be directed to Marian Bernd (202-382-3195).

Your interest in the EPA Contract Laboratory Program and analytical participation in this Performance Evaluation Study is sincerely appreciated.

cc: Marian Bernd,PCMD
Michael Hurd, AOB
Jim Vickery, AOB

SAMPLE MANAGEMENT OFFICE

MEMORANDUM

DATE: September 3, 1987

TO: All Laboratories that Submitted Performance Evaluation Data Packages for IFB WA87-K025, K026, and K027

FROM: Sa'ad Masri
QA Chemist

SUBJECT: Preaward Performance Evaluation Data Scoring for IFB WA87-K025, K026, and K027

At the request of the Inorganic Section Chief Bill Langley, the attached scoring data are being made available to you. The attached scoring sheets and associated data are the results of the data scoring which was performed by the Sample Management Office (SMO) during the first two weeks of August of 1987. Scoring was performed on all data packages that were received at SMO no later than five days after their due date.

- Scoring Sheet

  The scoring sheet is appendix A of attachment B of the IFB. It has been modified to include the laboratory name for identification. It contains the number of points deducted for each section and the total points deducted. In addition a score from zero to one hundred is indicated. You will receive your own scoring sheet only.

- Confidence Interval

  The confidence intervals are the windows used to determine identification, quantification and false positives for samples K025-W1 and K025-S. The actual numbers in the tables were used as upper and lower limits of the confidence interval for each element except those that were indicated undetected. For undetected elements all results that were reported or flagged for being below the Contract Required Detection Limit were considered in control. For Silver in K025-S a confidence interval was used for scoring. A false positive penalty was assessed for Silver values that were determined to be outliers. Elements that were analyzed by methods other than those specified in the Statement of Work (SOW 787) were considered out of control.

- Spread Sheet

  The spread sheets list K025-W1 and K025-S sample results for each laboratory. In addition the method of analysis and a penalty code for each element are provided. Laboratory names have been coded in order to preserve confidentiality. Each laboratory receiving these data will have their specific laboratory code listed in the title of the spread sheets between brackets << >>.

P.O. Box 818, Alexandria, Virginia 22313. Phone: (703) 557-2490/FTS-8-557-2490

This information is provided in order to assist you in better evaluating your performance. If you have any questions please call Bill Langley at (202) 382-7906.

Attachments

cc: Bill Langley, AOB
Mike Hurd, AOB
Marian Bernd, PCMD

Laboratory: VERSAR INC. (COLUMBIA, MD)

PREAWARD PERFORMANCE EVALUATION (PE)

DATA SCORING

Maximum Number of Points Possible = 100.

Scoring System Determines Points Deducted from 100.

I. Sample No. 1: Aqueous

A. Identification:

(-5 Points x Number of Missed Identifications) = - 0.00 Pts.

B. Quantitation:

$(1 - y^{1.5}) \times -50$ = - 0.00 Pts.

where $y = \frac{\text{Total Number of Elements - Number Missed}}{\text{Total Number of Elements}}$

C. False Positives:

(-2 Points x False Positives) = - 0.00 Pts.

II. Sample No. 2: Solid

A. Identification:

(-5 Points x Number of Missed Identifications) = - 0.00 Pts.

B. Quantitation:

$(1 - y^{1.5}) \times -50$ = - 0.00 Pts.

where $y = \frac{\text{Total Number of Elements - Number Missed}}{\text{Total Number of Elements}}$

C. False Positives:

(-2 Points x False Positives) = - 2.00 Pts.

III. Duplicate Precision (Maximum of 10 Points Deducted)

(-1 Point x Number of Duplicate Results Outside of Control Limits) = - 0.00 Pts.

Aqueous: 0

Solid: 0

IV. Matrix Spikes (Maximum of 10 Points Deducted)

(-0.5 Points x Number of Matrix Spikes Outside of Control Limits) = - 1.00 Pts.

Aqueous: 1

Solid: 1

V. Reporting and Deliverables

Failure to comply with the following requirements will result in points deducted from the total score.

A. Instrument detection limits determined and submitted, with all Contract Required Detection Limits met. (Maximum of 5 Points Deducted) = - 0.00 Pts.

B. All contractual forms (I-XIII) submitted in a substantially complete manner. (Maximum of 5 Points Deducted) = - 0.85 Pts.

C. Acceptable raw data submitted for the preaward analysis. (Maximum of 5 Points Deducted) = - 0.00 Pts.

VI. Timeliness

5 points per day will be deducted, up to 5 days, for data received beyond the due date. After 5 days, bidder will be judged to be non-responsive. = - 0.00 Pts.

VII. Summary Score

Total Number of Points Deducted = - 3.85 Pts.

Laboratory Point Score = 96.15 Pts.

SAMPLE MANAGEMENT OFFICE
PREAWARD PERFORMANCE EVALUATION SAMPLE
K025-W1

NO.	ELEMENT	CONFIDENCE INTERVAL UG/L UPPER LIMIT	LOWER LIMIT	NOTES
1	AL	871.4	602.4	
2	SB	160.6	27.95	
3	AS	27.93	12.25	
4	BA	418	335.5	
5	BE	17.35	10.49	
6	CD	18.8	7.45	
7	CA	3956.2	2920	
8	CR	49.93	24.51	
9	CO	107.6	77.23	
10	CU	117.6	78.02	
11	FE	858.9	608.6	
12	PB	42.59	8.53	
13	MG	3737.2	2762.5	
14	MN	107.5	78.88	
15	HG	3.82	2.31	
16	NI	221.24	153.5	
17	K	5314	664.9	
18	SE	20.41	10.39	
19	AG			UNDETECTED
20	NA	4426.5	2771.8	
21	TL	58.76	4.87	
22	V	129.8	70.82	
23	ZN	113.1	70.29	

SAMPLE MANAGEMENT OFFICE
PREAWARD PERFORMANCE EVALUATION SAMPLE
K025-S

NO.	ELEMENT	CONFIDENCE INTERVAL MG/KG-DRY UPPER LIMIT	LOWER LIMIT	NOTES
1	AL	25773.4	10401.5	
2	SB			UNDETECTED
3	AS	114.21	21.19	
4	BA	260.14	190.4	
5	BE			UNDETECTED
6	CD	15.98	1.62	
7	CA	6052.5	4429.7	
8	CR	56.55	29.53	
9	CO	17.39	7.94	
10	CU	201.43	157.2	
11	FE	27285.9	18848.9	
12	PB	732.6	491.6	
13	MG	4508	2504.6	
14	MN	11884.3	8807.1	
15	HG	0.526	0.026	
16	NI	39.18	15.91	
17	K	3277.8	827.1	
18	SE			UNDETECTED
19	AG	6.08	0	FALSE POS.
20	NA	842.5	108	
21	TL			UNDETECTED
22	V	50.97	15.1	
23	ZN	527.57	384.31	

PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-W1)

<< LABORATORY CODE = (F) >>

ELEMENT	A		AA		AB		AC		AD	
AL	790	P	714	P	748	P	741	P	672	P
SB	106	P	95	P	105	F	99.6	F	103	P
AS	17.9	F	23	F	25.8	F	18.1	F	20	F
BA	375	P	377	P	386	P	392	P	354	P
BE	14.3	P	14	P	12	P	12	P	15.8	P
CD	12.1	P	13	P	12	P	5 *	P	21 *	P
CA	3670B	P	3473B	P	3830B	P	3520B	P	3420B	P
CR	40.3	P	36	P	35	P	33	F	35.2	P
CO	93.9	P	91	P	98	P	94	P	94.1	P
CU	94.1	P	98	P	103	P	93	P	90	P
FE	741	P	720	P	816	P	741	P	289 *	P
PB	24	F	24	F	30.5	F	23.7	F	27.7	F
MG	3500B	P	3330B	P	3440B	P	3440B	P	3190	P
MN	87.8	P	91	P	92	P	96	P	93.5	P
HG	2.9	CV	3	CV	3 *	AV	2.79	CV	3.2	CV
NI	187	P	192	P	196	P	177	P	181	P
K	3660B	P	3350B	P	3980B	A	3770B	P	3310	P
SE	13.3	F	25 *	F	17.9	F	10.6	F	16	F
AG	4U	P	5U	P	5.1	F	6U	P	6.4U	P
NA	3880B	P	3470B	P	3730B	P	3630B	P	3760B	P
TL	42.6	F	32	F	30.9	F	24.4	F	49	F
V	92	P	92	P	100	P	98	P	96.8	P
ZN	90.3	P	98	P	102	P	96	P	93	P

ELEMENT	AE		AF		AG		AH		AI	
AL	620B	P	657	P	730	P	632	P	845	P
SB	52	P	104	F	70	P	117	P	142	P
AS	14	F	26	F	16	F	21.7	F	26	F
BA	371	P	397	P	370	P	347N	P	383	P
BE	12	P	14	P	12	P	10 *	P	16	P
CD	17	F	13.7	F	13	P	14.3	F	19 *	P
CA	3300B	P	3430B	P	3100B	P	3210B	P	3550B	P
CR	31	P	40	P	30	P	35.6	P	47	P
CO	79	P	94	P	89	P	94.9	P	98	P
CU	89	P	101	P	117	P	107	P	104	P
FE	686	P	722	P	560 *	P	701	P	767	P
PB	42	F	24	F	17	F	25.1	F	24	F
MG	3070B	P	3240	P	3400B	P	3370B	P	3480B	P
MN	91	P	96	P	74 *	P	90.8	P	100	P
HG	2.8	CV	2.2 *	CV	3.1	CV	3.5 *	C	3.8	CV
NI	160	P	202	P	189	P	172	P	213	F
K	3815B	A	3500B	A	3500B	P	3520B	P	4000B	P
SE	20	F	16.1	F	14	F	15.8	F	11	F
AG	5U	P	5U	P	10U	P	7.7U	P	10	P
NA	3420B	P	11800 *	A	3100B	P	3230B	P	3800B	P
TL	31	F	37	F	30	F	36.3	F	32	F
V	80	P	100	P	90	P	102	P	108	P
ZN	85	P	107	P	105	P	90	P	98	P

FLAG (@) = MISIDENTIFICATION
FLAG (*) = OUT OF CONTROL
FLAG (+) = FALSE POSITIVE

PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-W1)

<< LABORATORY CODE = (F) >>

ELEMENT	AJ			AK			AL			AM			AN		
AL	887.6	*	P	760		P	630		P	753		P	700		P
SB	103.4		P	79		P	139		P	121		P	118		F
AS	19.05		F	18.1		F	22.4		F	20.5		F	31	*	F
BA	382.4		P	391		P	374		P	352		P	393		P
BE	16.3		P	14		P	11		P	13.6		P	13.7		P
CD	10.3		P	13		P	7	*	P	15		P	15.3		P
CA	3517B		P	3970B	*	P	3300B		P	3730B		P	3700B		P
CR	37.8		P	41		P	42		P	46.3		P	37		P
CO	89.2		P	92		P	85		P	92		P	94		P
CU	98.5		P	111		P	127	*	P	94.8		P	111		P
FE	921.6	*	P	736		P	722		P	788		P	651		P
PB	19.5		F	25.7		F	18		F	21.7		F	30		F
MG	3208B		P	4010B	*	P	2600B	*	P	200U	#	P	3600B		P
MN	91.4		P	99		P	99		P	102		P	91		P
HG	3.3		CV	2.8		CV	2.6		CV	3.5		CV	3.2		CV
NI	185.2		P	211		P	164		P	186		P	190		P
K	2449B		P	3290B		A	3000U	#	P	2850B		P	3700B		A
SE	14.6		F	15		F	17.3		F	15.8		F	18		F
AG	4.9U		P	9U		P	10U		P	8U		P	4.2B		F
NA	3532B		P	4100U	#	P	3500B		P	4280B		P	3750B		P
TL	25.7		F	43.8		F	37.5		F	28.4		F	31		F
V	93.1		P	93		P	82		P	91.2		P	88		P
ZN	94.1		P	132	*	P	117	*	P	114	*	P	360	*	P

ELEMENT	AO			AP			AQ			AR			AS		
AL	842		P	714		P	795		P	837		P	699		P
SB	91		F	88.2		F	98		P	135U	#	P	106		F
AS	17.6		F	17.7		F	18		F	16.7		F	23		F
BA	421	*	P	350		P	396		P	380		P	362		P
BE	14		P	13.8		P	14		P	14.8		F	16		P
CD	13		F	12.4		P	16		P	12.4		P	15.4		P
CA	3330B		P	3150		P	36007B	*	P	3490B		P	3500B		P
CR	29		P	41.9		P	40		P	76	*	P	38.2		P
CO	76	*	P	76.9	*	P	97		P	95.6		P	125	*	F
CU	84		P	85.1		P	98		P	105		P	90.2		P
FE	744		P	625		P	783		P	705		P	702		P
PB	247	*	F	23.4		F	36		F	39.2		F	27.4		F
MG	3230B		P	2710	*	P	3430B		P	3340B		P	3210B		P
MN	91		P	81		P	94		P	94.1		P	93.6		P
HG	2.8		CV	3		CV	1.4	*	CV	3		CV	0.94	*	CV
NI	160		P	184		P	202		P	194		P	186		P
K	3250B		P	2600B		A	3060B		P	3570B		P	3400		A
SE	20.5	*	F	18.1		F	17		F	13		F	20.4		F
AG	13	+	P	1.4U		P	7U		P	9U		P	4.9B		F
NA	2910B		P	3300B		A	3900B		P	3680B		P	3530B		P
TL	44.4		F	31.5		F	58		F	26.8		F	39.4		F
V	79		P	87.2		P	94		P	94.9		P	90		P
ZN	85		P	124	*	P	146	*	P	107		P	97.1		P

FLAG (#) = MISIDENTIFICATION
FLAG (*) = OUT OF CONTROL
FLAG (+) = FALSE POSITIVE

PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-W1)

<< LABORATORY CODE = (F) >>

ELEMENT	AT			AU			AV			AW			AX		
AL	611		P	726		P	720		P	681		P	918	*	P
SB	84		P	97.5		F	102		P	98.6		F	128.5		F
AS	23.6		F	15.8		F	18		F	19		F	16.7		F
BA	341		P	366		P	350		P	355		P	370		P
BE	15.1		P	13.5		P	14		P	14		P	10	*	P
CD	12.7		P	13		P	16		P	18		P	12.5		P
CA	3060B		P	3340B		P	3860B		P	3380		P	4413	*	P
CR	30.9		P	20.1	*	P	41		P	79	*	P	39.2		P
CO	76	*	P	91		P	92		P	98		P	85		P
CU	93.5		P	82.7		P	84		P	124	*	P	103		P
FE	661		P	691		P	825		P	770		P	810		P
PB	33.3		F	27.7		F	26		F	21.8		F	28		F
MG	2720B	*	P	3070B		P	3500B		P	3290		P	3623		P
MN	84.9		P	87.4		P	88		P	104		P	90		P
HG	3.1		CV	2.9		CV	2.7		CV	2.6		CV	3.1		CV
NI	168		P	179		P	185		P	183		P	171		P
K	2860		P	3320B		A	4890B		P	3630		P	3178		P
SE	17.5		F	16.5		F	11		F	15.6		F	13.5		F
AG	4.8U		P	96.2	+	P	2.4B		P	10U	+	A	7.3U		P
NA	3370B		P	3506B		P	3520B		P	3510		P	3649		P
TL	342	*	F	14.8		F	47		F	32.8		F	36		F
V	78.3		P	90.1		P	89		P	59	*	P	90		P
ZN	104		P	91.8		P	103		P	126	*	P	112		P

ELEMENT	AY			AZ			B			BA			BB		
AL	751		P	716		P	677		P	766		P	741		P
SB	89		F	130		P	84		P	153		F	37B		F
AS	27.4		F	13.44	*	A	19		F	266	*	F	18.8		F
BA	392		P	371		P	364		P	368		P	376		P
BE	14.4		P	14.6		P	14		P	16		P	14.7		P
CD	14.7		P	12.9	*	A	12		P	12.6		F	13.6		F
CA	3920B		P	3580		P	3520B		P	3249		P	3690		P
CR	40.3		P	34.5		P	36		P	47		P	7.7B	*	F
CO	98.8		P	91.3		P	92		P	108	*	P	93.7		P
CU	101		P	112		P	95		P	111		P	92.8		P
FE	743		P	697		P	701		P	751		P	743		P
PB	7.8	*	F	23.7	*	A	23		F	36.6		F	26.8		F
MG	3290B		P	3210		P	3150B		P	3253		P	3430B		P
MN	98.8		P	88.5		P	88		P	113	*	P	92.4		P
HG	3		CV	2.4		CV	3.3		CV	3.76		CV	.	*	CV
NI	233	*	P	178		P	188		P	202		P	188		P
K	3450B		P	3330		P	3220B		P	5198		P	3500		A
SE	13		F	10.03	*	*H	15		F	14.2		F	5.4	*	F
AG	5U		P	7.5		P	7B		P	5		P	3U		F
NA	3700B		P	3810		P	3290B		P	2747	*	P	3740B		P
TL	33.7		F	36.58	*	A	32		F	13.7		F	14.4		F
V	98.8		P	99.1		P	90		P	116		P	94.6		P
ZN	110		P	101		P	109		P	97		P	101		P

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-WI)

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ELEMENT	BC			BD			BE			BF			BG		
AL	688		P	661		P	879	*	P	790		P	659		P
SB	117		P	132		P	95.8		F	104		F	96		F
AS	20		F	18.6		F	20.3		F	28.3	*	F	19.9		F
BA	2540	*	P	344		P	357		P	433	*	P	349		P
BE	18	*	F	38	*	P	12.1		P	16.5		P	14		P
CD	12		P	6	*	P	13.1		F	.U	#	P	14		P
CA	3120		P	3160B		P	3300B		P	3900B		P	3200B		P
CR	33		P	28		P	43		P	42.5		P	34		P
CO	79		P	81		P	80.3		P	94.9		P	97		P
CU	96		P	78	*	P	115		P	86.8		P	85		P
FE	590	*	P	749		P	473	*	P	812		P	739		P
PB	26		F	21.3		F	27.9		F	25.8		F	26.1		F
MG	2720	*	P	2870B		P	2890B		P	3200B		P	3172B		P
MN	96		P	78	*	P	102		P	105		P	94		P
HG	2.8		CV	3.2		CV	2.6		CV	3.7		CV	226	*	CV
NI	179		P	181		P	185		P	231	*	P	184		P
K	3320		P	2320U	#	P	3240B		P	3490B		A	2817B		P
SE	15		F	20.4		F	16.7		F	17.7		F	17.8		F
AG	10U		P	4U		P	16.3	+	P	0B		P	2.7B		F
NA	3570		P	4370B		P	3810B		P	3530		A	3426B		P
TL	28		F	13.9		F	31.4		F	33.4		F	29.7		F
V	93		P	89		P	61.2	*	P	109		P	91		P
ZN	94		P	75		P	99.7		P	92		P	103		P

ELEMENT	BH			BI			BJ			BK			BL		
AL	889	*	P	190U	#	P	823		P	751		P	808		P
SB	105		P	120		F	135		F	90		P	88.1		F
AS	25.6		F	21.1		F	27		F	35.2	*	F	24.9		F
BA	400		P	351		P	372		P	372		P	356		P
BE	14.6		P	9	*	P	15.7		F	27	*	P	10	*	P
CD	13.6		P	13		F	10.2		P	28	*	P	7	*	P
CA	3820B		P	3100		P	3780B		P	3800B		P	3470B		P
CR	34.7		P	39		P	41		F	42		P	29		P
CO	94.2		P	108	*	P	82.6		P	95		P	64	*	P
CU	113		P	63	*	P	87.3		P	94B		P	99		P
FE	638		P	710		P	911	*	P	725		P	736		P
PB	32.9		F	28		F	75.3	*	F	46	*	P	40.6		F
MG	3180B		P	3100		P	3420B		P	3370B		P	3230B		P
MN	90.8		P	95		P	94.6		P	115	*	P	770	*	P
HG	4.2	*	AV	2.8		CV	3.1		CV	3.26		CV	3.4		CV
NI	183		P	222	*	P	175		P	193		P	145	*	P
K	5000U	#	P	2500		P	1550B		P	3360B		P	1030U	#	P
SE	14.6		F	18.3		F	14.6		F	46	*	F	14.5		F
AG	8.9B		P	4.1		P	4U		F	2U		P	7.4U		P
NA	5250	*	P	2400	*	F	4210B		P	3830B		P	244B	*	P
TL	61.6	*	F	23.1		P	25.6		F	62	*	P	3.8B	*	F
V	95.6		P	91		P	84.9		P	117		P	84		P
ZN	117	*	P	100		P	112		P	182	*	P	158	*	P

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-W1)

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ELEMENT	BM			BN			BO			BP			BQ		
AL	656		P	803		P	819		P	780		P	98	*	A
SB	104		P	104		F	83		P	127		F	80	*	A
AS	22.1		F	21.1		F	20		F	21		F	15	*	A
BA	324	*	P	384		P	341		P	380		P	430	*	A
BE	10	*	P	21	*	F	12		P	13		F	16	*	A
CD	10.2		F	15.1		F	13		P	13.5		F	17	*	A
CA	3640B		P	3500B		P	2900	*	P	5000U	#	P	2630B	*	A
CR	46.8		F	35.3		F	42		P	35		F	53	*	A
CO	110	*	P	70	*	P	84		P	9	*	P	105	*	A
CU	85		P	83		P	89		P	82		P	94	*	A
FE	689		P	839		P	747		P	80	*	P	579	*	A
PB	21.4		F	18.7		F	22		F	23		F	41	*	A
MG	3400B		P	3540B		P	3000		P	5000U	#	P	2790		A
MN	92		P	78	*	P	93		P	100		P	82	*	A
HG	3.2		CV	5.7	*	CV	2.9		CV	0.85	*	CV	4	*	CV
NI	369	*	P	148	*	P	174		P	173		P	217	*	A
K	3350B		A	14900	*	P	3800		P	5000U	#	P	1976B		A
SE	17.2		F	13.6		F	15		F	17		F	12	*	A
AG	5.4B		F	4.4B		F	16	+	P	10U		F	5	+	A
NA	3670		A	3340B		P	3800		P	5000U	#	P	3380B		A
TL	65	*	F	20.2*		F	26		F	18		F	30	*	A
V	64	*	P	73		P	88		P	100		P	160	*	A
ZN	73		P	78		P	97		P	114	*	P	99	*	A

ELEMENT	BR			BS			BT			BU			BV		
AL	1080	*	P	828		P	237	*	F	690		P	740	*	A
SB	190	*	P	.	*	H	0	*	F	70	*		200U	#	A
AS	13		P	9.4	*	H	12	*	F	150U	#	P	43	*	F
BA	400		P	396		P	1660	*	A	386		P	400		F
BE	13		P	5.27	*	P	16		F	13		P	14.3	*	A
CD	15		P	10	*	A	18		F	13		P	17.8	*	A
CA	5000U	#	P	15700	*	A	2470	*	A	3350		P	3110		A
CR	38		P	47	*	A	18	*	F	47		P	45.9	*	A
CO	95		P	258	*	P	0	*	F	99		P	100	*	A
CU	99		P	43.4	*	P	170	*	A	94		P	100	*	A
FE	770		P	1090	*	P	709	*	A	722		P	650	*	A
PB	130	*	P	90	*	A	26		F	150U	#	P	17		F
MG	5000U	#	P	3310B		A	3520		A	3350		P	2660	*	A
MN	93		P	76.3	*	P	41	*	A	91		P	100	*	A
HG	3.4		CV	24	*	CV	5	*	CV	.	*	CV	2.96		CV
NI	730	*	P	160		P	455	*	A	190		P	210	*	A
K	5000U	#	P	.	*	A	3860		A	.	*		2940		A
SE	86	*	P	7.6	*	H	13		F	250U	#	P	14	*	A
AG	40	+	P	7	+	A	0		F	.	+		20U	+	A
NA	5000U	#	P	4160B		A	4730	*	A	.	*		2400	*	A
TL	170	*	P	10	*	A	24		F	250U	#	P	100U	#	A
V	160	*	P	168	*	P	109		F	92		P	200U	#	A
ZN	120	*	P	57.8	*	P	70	*	A	.	*	P	130	*	A

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-W1)

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ELEMENT	BW			C		D		E		F	
AL	51600	*	P	665	P	687	P	733	P	729	P
SB	3U	#	F	110	P	98	P	79	P	112	F
AS	19.3		F	18.6	F	23	F	22.7	F	23.2	F
BA	4U	#	P	398	P	375	P	377	P	369	P
BE	5U	#	P	15	P	15	P	13.9	P	14.4	P
CD	1U	#	F	14.8	P	14	P	10.4	P	13.2	P
CA	20U	#	P	3780B	P	3310B	P	3390	P	3620B	P
CR	10	*	F	35.4	P	39	P	34.3	P	40.8	P
CO	10U	#	F	94	P	95	P	88.8	P	93.7	P
CU	83.3		P	113	P	97	P	93.3	P	97.4	P
FE	78200	*	P	817	P	725	P	694	P	746	P
PB	1U	#	F	23.4	F	23	F	27.6	F	26.4	F
MG	100U	#	P	3560B	P	3300B	P	3210B	P	3480B	P
MN	9U	#	P	98.5	P	94	P	90.7	P	94.8	P
HG	0.2	*	CV	2.7	CV	2.9	CV	2.9	CV	3.1	CV
NI	30U	#	P	209	P	195	P	175	P	183	P
K	100U	#	P	4060B	P	3650B	P	3480B	P	3390B	P
SE	4B	*	F	14.8	F	17	F	15.2	F	13.7	F
AG	1U		F	10	P	10U	P	6U	P	7.8U	P
NA	100U	#	P	4100B	P	3820B	P	3450	P	3490B	P
TL	1U	#	F	39.8	F	27	P	42.5	F	45.1	F
V	40U	#	P	98.3	P	93	P	91.6	P	93	P
ZN	20	*	P	107	P	92	P	92	P	85	P

ELEMENT	G		H		I		J		K		
AL	719	P	720	P	835	P	648	P	716	P	
SB	97.6	P	114	P	91.8	F	95.4	P	89.3	P	
AS	17.1	F	19.1	F	20.4	F	18.2	F	21.4	F	
BA	376	P	336	P	402	P	384	P	389	P	
BE	16.4	P	13.6	P	14.3	P	14.4	P	13.7	P	
CD	13.4	P	8.1	P	13.9	P	20 *	P	13.3	P	
CA	3390B	P	3130B	P	3640B	P	3510B	P	3470B	P	
CR	37.4	P	28	P	36.4	P	33.4	P	37.5	P	
CO	89.5	P	103	P	97.4	P	90.4	P	93.6	P	
CU	98.9	P	86.6	P	99.4	P	100	P	101	P	
FE	751	P	666	P	735	P	746	P	736	P	
PB	22.6	F	24	F	27.3	F	28	F	27.6	F	
MG	3240B	P	2880B	P	3420B	P	3330B	P	3340B	P	
MN	90.3	P	86	P	97.3	P	93.3	P	90.5	P	
HG	3.3	CV	2.7	CV	2.8	CV	3.44	CV	4.1 *	CV	
NI	186	P	151 *	P	208	P	191	P	189	P	
K	3460B	P	3200	A	4300B	A	2530B	A	3770B	P	
SE	17.6	F	14.7	F	19.1	F	16.9	F	17.8	F	
AG	2.5B	P	10U	P	10U	P	7U	P	5U	P	
NA	3750B	P	4000B	A	4380B	A	3500B	P	3560B	P	
TL	29.3	F	35.9	F	34.4	F	38.6	F	29	F	
V	94	P	81.1	P	108	P	93.2	P	91.7	P	
ZN	105	P	93.2	P	109	P	101	P	99.5	P	

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-W1)

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ELEMENT	L		M		N		O		P	
AL	717	P	710	P	712	P	653	P	714	P
SB	90.9	F	99.5	F	96.7	P	90	F	99.6	P
AS	18.9	F	21.1	F	18.7	F	18	F	24.8	F
BA	380	P	412	P	375	P	387	P	390	P
BE	14.1	P	14	P	13.4	P	14 *	B	15.9	P
CD	11.3	P	13	P	13.9	P	13	P	12.9	P
CA	3280	P	3670B	P	3340B	P	3060B	P	3420B	P
CR	38	P	35	P	36.2	P	35	F	37.9	P
CO	95	P	95	P	89.8	P	95	P	97.1	P
CU	103	P	112	P	96.7	P	90	P	97	P
FE	780	P	815	P	717	P	768	P	729	P
PB	23.8	F	31	F	24.1	F	33	F	21.7	F
MG	3280	P	3290B	P	3340B	P	3210B	P	3230B	P
MN	105	P	88	P	88.8	P	93	P	92.7	P
HG	2.6	CV	3.3	CV	3	CV	3	CV	2.7	CV
NI	171	P	195	P	182	P	185	P	196	P
K	3090	P	3550B	P	3390B	P	3330B	A	3420B	P
SE	14.3	F	16.7	F	15.3	F	18	F	16.2	F
AG	11.1 +	P	9.4U	P	5U	P	1.3U	F	1.8U	P
NA	3470	P	4040B	P	3830B	P	3630B	A	3440B	P
TL	34.8	F	39.1	F	34.1	F	38	F	28.6	F
V	94	P	98	P	90.2	P	95	P	97.4	P
ZN	93	P	104	P	90.8	P	88	P	95	P

ELEMENT	Q		R		S		T		U	
AL	710	P	767	P	700	P	470 *	P	729	P
SB	80	P	102	F	108	F	69	P	97.2	P
AS	19.8	F	19.4	F	20.2	F	20.2S	F	21.3	F
BA	385	P	382	P	393	P	379	P	389	P
BE	14	P	12.4	P	14.1	P	13.6	P	15.2	P
CD	14	P	10.1	P	11.1	P	10.2	P	10.8	P
CA	3400B	P	3430B	P	3480B	P	3350B	P	3650B	P
CR	35	P	41.8	P	41.5	P	39	P	37.9	P
CO	95	P	99.3	P	98.2	P	90	P	98.3	P
CU	90	P	102	P	104	P	94.7	P	104	P
FE	720	P	763	P	702	P	700	P	726	P
PB	25.7	F	57.5 *	F	24.6	F	22.6	F	22.4	F
MG	3170B	P	3220B	P	3260B	P	3220B	P	3530B	P
MN	89	P	100	P	94.6	P	90	P	97.1	P
HG	3 *	C	2.6	CV	3	CV	3	CV	3.2	CV
NI	211	P	199	P	192	P	195	P	197	P
K	3230B	P	3400B	A	3310B	P	2700B	P	3660B	P
SE	14.3	F	13.8	F	12.7	F	14.9	F	17.6	F
AG	8U	P	6U	P	9U	P	10B	P	4U	P
NA	3440B	P	3600B	A	3640B	P	3400B	P	3860B	P
TL	24.4	F	39.2	F	51.8	F	37.2	F	34.3	F
V	90	P	88.3	P	83.9	P	72	P	100	P
ZN	87	P	105	P	120 *	P	98	P	104	P

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-W1)

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ELEMENT	V		W		X		Y		Z	
AL	759	P	737	P	682.8	P	730	P	613	P
SB	79	P	65.7	P	118.9	P	111	P	107	F
AS	20	F	21.8	F	24.1	F	21.1	F	14.9	F
BA	366	P	290 *	P	375.6	P	371	P	389	P
BE	17	P	13.5	P	14.4	P	13.4	P	14	P
CD	13	P	11.2	P	14	P	13.8	P	11	P
CA	3500	P	2980B	P	3344B	P	3640B	P	3140B	P
CR	48	P	31.3	P	24.7	P	37.4	P	43	P
CO	93	P	79.9	P	94.8	P	95.2	P	85	P
CU	101	P	97.9	P	98.4	P	103	P	103	P
FE	736	P	806	P	736.8	P	774	P	735	P
PB	24	F	22.6	F	33.8	F	48.6 *	F	32.4	F
MG	3290	P	2970B	P	3363B	P	3300B	P	2950B	P
MN	93	P	90.6	P	95.9	P	104	P	94	P
HG	3.2	CV	3.1	CV	2.83	CV	3	CV	2.72	CV
NI	195	P	181	P	182.8	P	192	P	178	P
K	3340	P	3090B	P	3428B	P	3110B	A	2390B	P
SE	12	F	15.7	F	13.9	F	41 *	F	20.2	F
AG	10	P	6.5U	P	0U	P	4B	F	8.3U	P
NA	3710	P	3100B	P	4131B	P	3400B	P	3390B	P
TL	36	F	29.6	F	48.4	F	47	F	35.2	F
V	93	P	81.2	P	112.7	P	89.6	P	105	P
ZN	87	P	87.8	P	124.4 *	P	85.4	P	96	P

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-S)

<< LABORATORY CODE = (F) >>

ELEMENT	A			AA			AB			AC			AD		
AL	17600		P	17500		P	15400		P	16400		P	15000		P
SB	12U		P	5.1U		P	5.7U		F	3.05B		F	8U		P
AS	72.2		F	59		F	46.9		F	44.4		F	80		F
BA	223		P	453	*	P	227		P	218		P	219		P
BE	0.79B		P	0.7B		P	1U		P	1	+	P	1.3B		P
CD	8.2		P	12		P	.	*	P	7.1		P	3.1		P
CA	5190		P	5340		P	5110		P	4940		P	5060		P
CR	40.6		P	40		P	44.4		P	38.4		P	42.4		P
CO	13.7		P	13		P	12.8		P	13.5		P	8.7		P
CU	180		P	182		P	182		P	170		P	174		P
FE	23600		P	22500		P	22700		P	22300		P	24700		P
PB	625		P	624		P	743	*	F	569		P	610		P
MG	3410		P	3530		P	3510		P	3240		P	3250		P
MN	9810		P	10600		P	10000		P	10200		P	10300		P
HG	0.23		CV	0.37		CV	0.17		CV	0.23		CV	3.5	*	CV
NI	25.1		P	27		P	23.7		P	22.2		P	18.6		P
K	1680		P	2110		P	2174		A	1750		P	1750		P
SE	0.6B		F	1.1	+	F	0.4U		F	35U		F	2U		F
AG	2.4		P	2.3		P	2.28		F	2.2		P	2		P
NA	461B		P	954B	*	P	705		P	469		P	436B		P
TL	0.6B		F	2U		F	0.94	+	F	0.39U		F	0.2	+	F
V	30.8		P	30		P	38.7		P	30.4		P	25.1		P
ZN	438		P	503		P	455		P	438		P	450		P

ELEMENT	AE			AF			AG			AH			AI		
AL	18709		P	20800		P	17500		P	17500		P	19800		P
SB	7.8	+	P	0.4U		F	12.1U		P	0.6U		F	26	+	P
AS	20	*	F	63.8		F	58.7		F	65.3		F	82		F
BA	228		P	225		P	221		P	224		P	228		P
BE	1.2	+	P	0.9B		P	0.61U		P	0.9B		P	1.6	+	P
CD	12.8		P	9		F	10.3		P	10.3	*		19	*	P
CA	5182		P	5250		P	5060		P	4580		P	5400		P
CR	51		P	43.3		P	43.5		P	44.5		P	48		P
CO	19.9	*	P	12.2		P	9.9		P	12		P	17		P
CU	176		P	174		P	178		P	172E		P	183		P
FE	23300		P	22500		P	24300		P	24200		P	23500		P
PB	599		P	287	*	F	591		F	591		F	675		F
MG	3554		P	3620		P	3600		P	3470		P	3890		P
MN	10908		P	10000		P	11300		P	10900		P	10000		P
HG	0.28		CV	0.2		CV	0.3		CV	0.1	*	C	0.32		CV
NI	36		P	29.3		P	23.7		P	29		P	30		F
K	437B	*	A	2140		A	1860		P	1830		P	2250		P
SE	0.5U		F	0.5B		F	0.61U		F	0.2B		F	0.43U		F
AG	5		P	1.1B		P	2U		P	4.9		P	5.1		P
NA	791		P	2160	*	A	304U	#	P	419B		P	470B		P
TL	1U		F	0.79B		F	8.1U		F	0.82U		F	0.81U		F
V	37		P	35		P	22.5		P	39.9		P	45		P
ZN	465		P	481		P	458		P	.	*	P	430		P

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ELEMENT	AJ			AK			AL			AM			AN		
AL	24116.3		P	15900		P	16320		P	20100		P	19300		P
SB	11.32B		P	9.5U		P	10U		P	8.1U		P	0.6U		F
AS	62.72		F	57.7		F	85		F	65.7		F	156	*	F
BA	247.2		P	203		P	215.2		P	244		P	221		P
BE	1.32	+	P	0.89U		P	0.4B		P	1.5	+	P	0.91B		P
CD	8.66		P	8.3		P	8.6		P	11.4		P	6.7		P
CA	5657.32		P	5260		P	4460		P	5260		P	5230		P
CR	46.99		P	45.6		P	39.2		P	46.9		P	39		P
CO	14.36		P	11.9		P	11.8		P	14.4		P	12		P
CU	186.78		P	165		P	170		P	184		P	168		P
FE	24116.3		P	22700		P	18940		P	27100		P	24400		P
PB	609.2		F	598		P	521		P	670		P	523		F
MG	4108.06		P	3350		P	3200		P	4100		P	3640		P
MN	10222		P	10100		P	10308		P	11000		P	10300		P
HG	0.65	*	CV	0.2		CV	0.1		CV	16.1	*	CV	0.29		CV
NI	33.59		P	27.6		P	24.2		P	37.8		P	24		P
K	2789.03		P	1560		A	1680		P	2190		P	2260		A
SE	0.08U		F	0.91U		F	10U		F	0.8U		F	0.6U		F
AG	4.23		P	1.8U		P	2U		P	4.6		P	1.9B		F
NA	628.19B		P	827U	#	P	420B		P	1250	*	P	523B		P
TL	0.55	+	F	0.69B		F	1U		F	1U		F	0.48B		F
V	34.99		P	27.2		P	27.8		P	36.9		P	29		P
ZN	464.78		P	434		P	444.4		P	505		P	466		P

ELEMENT	AO			AP			AQ			AR			AS		
AL	19400		P	16500		P	19200		P	18000		P	21700		P
SB	0.2U		F	0.3U		F	5.2	+	P	47.1	+	P	0.66U		F
AS	85.7		F	66.1		F	59		P	55.9		F	119	*	F
BA	246		F	209		P	230		P	225		P	239		P
BE	0.81B		P	1.1	+	P	0.72	+	P	0.62B		F	1.6	+	P
CD	7.6		P	8.7		P	8		P	0.97U	#	P	13.1		P
CA	5590		F	4000	*	P	5120		P	5240		P	5560		P
CR	43.8		P	36.8		P	41		P	48.2		P	47.8		P
CO	11.7		P	11.6		P	13		P	11.7		P	15.9		F
CU	188		P	196		P	168		P	186		P	162		P
FE	23800		P	20000		P	22000		P	22500		P	24600		P
PB	575		F	542		F	595		P	588		P	776	*	F
MG	3830		P	3090		P	3440		P	3500		P	4080		P
MN	10100		P	9340		P	10300		P	9410		P	10900		P
HG	0.272		CV	0.23		CV	0.182		CV	0.27		CV	0.94	*	CV
NI	23.8		P	22.5		P	26		P	27		P	28.5		P
K	1980		P	1500		A	2220		P	2170		P	2300		A
SE	0.4U		F	0.5B		F	0.6U		F	0.47U		F	12.7	+	F
AG	7.5	*	P	2.4		P	1.1		P	2.5		P	2.8		F
NA	394B		P	520		A	456		P	538B		P	551B		P
TL	0.2U		F	0.4B		F	16	+	F	0.65	+	F	6.9U		F
V	32.7		P	37.7		P	32		P	30.5		P	50.9		P
ZN	484		P	563	*	P	433		P	477		P	477		P

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ELEMENT	AT			AU			AV			AW			AX		
AL	10200	*	P	21200		P	9000	*	P	15900		P	10846		P
SB	9.6U		P	0.7U		F	6U		P	0.6U		F	0.6U		F
AS	73		F	63.2		F	65		P	58		F	50.3		F
BA	223		P	228		P	182	*	P	214		P	195		P
BE	2.2	+	P	1.2	+	P	0.2U		P	0.4U		P	0.7	+	P
CD	8.1		P	0.5U	#	P	7.8		P	11.2		P	8		P
CA	4970		P	4890		P	5370		P	5350B		P	5043		P
CR	36.8		P	44.1		P	33		P	44.9		P	34.3		P
CO	11.3		P	14.5		P	10		P	12.8		P	25.6	*	P
CU	178		P	168		P	141	*	P	193B		P	157	*	P
FE	18900		P	22400		P	18200	*	P	23800		P	19250		P
PB	566		P	571		P	548		P	577		F	566		P
MG	2480	*	P	3740		P	2220	*	P	3330		P	2736		P
MN	10800		P	9430		P	9440		P	11079		P	9234		P
HG	0.22		CV	0.06		CV	0.28		CV	0.1U	#	CV	0.23		CV
NI	22.8		P	27.6		P	14	*	P	26.5		P	39.8	*	P
K	1300		P	2520		A	1340		P	2040B		P	1220		P
SE	0.22U		F	0.5U		F	0.4U		F	0.4U		F	0.5U		F
AG	2.1		P	6.2	*	P	2.7		P	4	*	A	2.7		P
NA	1660	*	P	506		P	580		P	595B		P	412		P
TL	1.62B		F	1U		F	0.53B		F	0.62B		F	0.3B		F
V	23.5		P	41.6		P	20		P	18.6		P	21		P
ZN	405		P	440		P	376	*	P	471		P	416		P

ELEMENT	AY			AZ			B			BA			BB		
AL	23.1	*	P	20500		P	12800		P	17276.4		P	16200		P
SB	2U		F	4.5	+	P	2.4U		P	1U		F	6U		F
AS	126	*	F	66.2		P	55		F	49.5		F	61		F
BA	245		P	248		P	210		P	241.3		P	207		P
BE	1.3	+	P	1.3	+	P	0.86B		P	1.8B		P	1.2B		P
CD	13.8		P	18.8	*	P	8.6		P	4.455		F	0.85	*	F
CA	6500	*	P	5550		P	5260		P	6138.2	*	P	5190		P
CR	57.3	*	P	31.6		P	38		P	42.9		P	158	*	F
CO	13.7		P	14		P	12		P	23.2	*	P	12.1B		P
CU	185		P	194		P	170		P	191.5		P	180		P
FE	21.2	*	P	23700		P	21000		P	24085		P	21100		P
PB	612		P	626		P	595		P	720.6		F	350	*	F
MG	3870		P	4080		P	2870		P	4441.06		P	3290B		P
MN	10300		P	10300		P	9950		P	11097.6		P	8750	*	P
HG	0.55	*	CV	0.51		CV	0.32		CV	0.26		CV	.	*	CV
NI	36.7		P	28.7		P	25		P	33.1		P	23.7B		P
K	2960		P	2560		P	1480		P	3376.8	*	P	2140		A
SE	30.8	+	F	0.351	+	*H	0.5B		F	-3.6U		F	0.39U		F
AG	3.7		P	5.34		P	3.7		P	-4.5U	*	P	0.36		F
NA	483B		P	484		P	437		P	490.7		P	502B		P
TL	1U		F	.	+	A	0.53U		F	-1U		F	0.3U		F
V	48.6		P	47.2		P	27		P	39.6		P	29.9B		P
ZN	495		P	490		P	423		P	98.7	*	P	415		P

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ELEMENT	BC			BD			BE			BF			BG		
AL	19100		P	15300		P	13100		P	23200		P	14733		P
SB	12.1U		P	25	+	P	0.8U		F	.U		F	3.68U		F
AS	71		F	111		F	51.1		F	59.3		F	131.7	*	F
BA	235		P	200		P	205		P	242		P	219		P
BE	1	+	F	0.75B		P	0.54B		P	0.98B		P	0.51U		P
CD	11.5		P	6.9		P	8.5		F	5.3		P	13.9		P
CA	5590		P	5300		P	5090		P	4999B		P	4957		P
CR	41		P	37		P	41.7		P	46.9		P	36.8		P
CO	9.1		P	7.1B	*	P	11.3		P	11.9		P	17.8	*	P
CU	185		P	160		P	172		P	212	*	P	198		P
FE	21470		P	22100		P	14300	*	P	26600		P	23136		P
PB	730		F	566		P	503		P	32.6	*	F	601		P
MG	4010		P	3580		P	2560		P	3701B		P	3386		P
MN	11100		P	9550		P	9100		P	14000	*	P	5426	*	P
HG	0.57	*	CV	0.16		CV	0.078		CV	0.26		CV	223	*	CV
NI	31.7		P	23.7		P	22.3		P	53	*	P	71.3	*	P
K	2050		P	1590		P	1580B		P	2360B		A	1584		P
SE	0.6	+	F	0.95	+	F	0.2U		F	.U		F	1.05	+	F
AG	2		P	0.75U		P	2U		P	.U	*	P	0.44B		F
NA	99	*	P	532B		P	572B		P	512B		A	493		P
TL	0.81	+	F	0.68	+	F	0.1U		F	.U		F	0.505B		F
V	33.7		P	29.1		P	19		P	39		P	36.5		P
ZN	474		P	417		P	448		P	565	*	P	449		P

ELEMENT	BH			BI			BJ			BK			BL		
AL	24900		P	18800		P	14900		P	26.9	*	P	20400		P
SB	12U		P	17	+	F	3U		F	2.55	+	P	0.8B		F
AS	79.8		F	71		F	82.4		F	110		F	0.26U	@	F
BA	245		P	231		P	183	*	P	247		P	44900	*	P
BE	4.4	+	P	0.8	+	P	1.8	+	F	1.5	+	P	80.9	+	P
CD	7.3		P	9		F	9.8		P	9.02		P	0.96U	@	P
CA	5550		P	4950		P	5650		P	5.45	*	P	5631		P
CR	44.7		P	43		P	34.5		F	51.9		P	40.9		P
CO	13		P	15		P	14.4		P	15.9		P	8.3		P
CU	186		P	185		P	177		P	175		P	172		P
FE	21100		P	21600		P	21400		P	24300		P	23300		P
PB	600		P	536		F	671		P	638		P	605		P
MG	3990		P	3200		P	3200		P	4340		P	3740		P
MN	9400		P	14000	*	P	9960		P	10500		P	10600		P
HG	0.48	*	AV	0.31		CV	0.05U	@	CV	0.534	*	CV	0.26		CV
NI	29.7		P	34		P	35		P	32.1		P	24		P
K	2870		P	3100		P	1350		P	3340	*	P	2360		P
SE	1U		F	0.5U		F	0.6U		F	0.17U		F	0.6	+	F
AG	4.1		P	3.6		F	1.73B		F	0.17U		P	7.2U	*	P
NA	997U	@	P	1000	*	P	553B		P	507		P	299		P
TL	489	+	P	1U		F	1.6U		F	10200U		P	0.55U		F
V	44.1		P	25		P	30.5		P	53	*	P	18.1		P
ZN	439		P	540	*	P	462		P	511		P	465		P

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ELEMENT	BM			BN			BO			BP			BQ		
AL	20300		P	1420	*	P	12200		P	23550		P	25738.8	*	A
SB	1U		F	0.8B		F	0.82U		P	5U		F	12.97	+	A
AS	97.6		F	179	*	F	0.78	*	F	99		F	7.038	*	A
BA	230N		P	235		P	125	*	P	232		P	213.15	*	A
BE	1U		P	3.1B		F	2U		P	1.2	+	F	1.709B	+	A
CD	11.2		F	1B	*	A	5.3		P	1.5	*	P	9.753	*	A
CA	5430		P	5540		P	3000	*	P	4740		P	4896.41		A
CR	60.8	*	F	127	*	F	24	*	P	57.2	*	P	44.339	*	A
CO	10.1U	#	P	10.4B		P	6.8	*	P	10.4		P	15.886	*	A
CU	156	*	P	206	*	P	88	*	P	168		P	166.398	*	A
FE	28000	*	P	248	*	A	14500	*	P	25480		P	26613.6	*	A
PB	682		F	3840	*	A	334	*	F	672		P	600.238	*	A
MG	4380		P	3670B		P	2400	*	P	3890		P	3760.28		A
MN	10400		P	11900	*	P	177	*	P	10950		P	9068.92	*	A
HG	0.2		CV	0.38	*	P	2.9	*	CV	0.2		CV	1.053	*	CV
NI	13.2U	#	P	27B		P	15	*	P	27		P	39.01	*	A
K	2800		A	18300	*	A	1500		P	3080		P	2222.99		A
SE	19U		F	3B		F	0.1U		F	1U		F	0.241	+	A
AG	3.1		F	12.1	+	F	1.74		P	1.9		F	4.988	*	A
NA	496		A	574B		P	282		P	551		P	2272.26B	*	A
TL	1.2U		F	2.8B		F	4	+	F	1U		F	6.03B	+	A
V	28.8		P	41.2B		P	20		P	38.6		P	95.24	*	A
ZN	402		P	491	*	A	263	*	P	438		P	418.256	*	A

ELEMENT	BR			BS			BT			BU			BV		
AL	25600		P	16700		P	125277	*	A	.	*		19900	*	A
SB	140	+	P	.	+	H	0	+	F	.	+		480	+	A
AS	82		P	51300	*	H	404	*	F	.	*		53		F
BA	240		P	211		P	6223.45	*	A	.	*		258	*	A
BE	0.95	+	P	2.1	+	P	0	+	F	.	+		1U	+	A
CD	14		P	8.47	*	A	115	*	F	.	*		14	*	A
CA	5800		P	1420B	*	A	4182.6	*	A	.	*		33	*	A
CR	0.5U	#	P	37	*	A	387	*	F	.	*		60	*	A
CO	14		P	522	*	P	0	*	F	.	*		22	*	A
CU	170		P	103	*	P	2040.39	*	A	.	*		179	*	A
FE	25900		P	19300		P	181854	*	A	.	*		22300	*	A
PB	800	*	P	619	*	A	6142.62	*	A	.	*		644	*	A
MG	4880	*	P	3260B		A	27682.2	*	A	.	*		2U	#	A
MN	12000	*	P	10300		P	10507	*	A	.	*		10200	*	A
HG	3.2	*	CV	0.18		CV	2.27	*	CV	.	*		0.26		CV
NI	95	*	P	30.8B		P	1050.71	*	A	.	*		123	*	A
K	3600	*	P	.	*	A	17720.6	*	A	.	*		209	*	A
SE	28	+	P	980	+	H	0	+	F	.	+		0.6U		F
AG	3.7		P	2350	+	A	0		F	.	*		20	+	A
NA	450		P	548B		A	8284.46	*	A	.	*		429		A
TL	130	+	P	10	+	A	0	+	F	.	+		100U	+	A
V	59	*	P	52.3	*	P	20.2		F	.	*		250	*	A
ZN	730	*	P	473		P	5132	*	A	.	*		398	*	A

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-S)

<< LABORATORY CODE = (F) >>

ELEMENT	BW			C			D			E			F		
AL	18900		P	23700		P	12700		P	23000		P	15000		P
SB	0.75U		F	9.2U		P	11B		P	6.5U		P	0.96U	+	
AS	55		F	55		F	63		F	77.1		F	70.2		F
BA	199		P	242		P	212		P	242		P	222		P
BE	0.25U		P	1	+	P	1U		P	1.2	+	P	0.67B		P
CD	7.9		F	9.9		P	8		P	8.3		P	9.4E		P
CA	4310	*	P	5410		P	4910		P	5410		P	5240		P
CR	35		F	49		P	36		P	42.2		P	38.9		P
CO	7.5B	*	F	13.4		P	11		P	13.7		P	11.1		P
CU	163		P	183		P	179		P	181		P	191		P
FE	19100		P	24900		P	20600		P	24300		P	22700		P
PB	248	*	F	595		P	534		F	649		F	620		F
MG	3430		P	4310		P	3000		P	3870		P	3330		P
MN	8790	*	P	10000		P	10200		P	10000		P	10900		P
HG	0.33		CV	0.25		CV	0.3		CV	0.26		CV	0.3		CV
NI	20.8		P	32		P	24		P	26.9		P	23.9		P
K	2530		P	2920		P	1610		P	2490		P	1630		P
SE	1.5	+	F	0.5U		F	1U		F	0.61U		F	0.55U		F
AG	1.7		F	3.2		P	4		P	1.2U		P	2.63		P
NA	575		P	496B		P	447		P	468		P	429B		P
TL	0.25	+	F	0.7B		F	1U		F	0.67B		F	0.86B		F
V	26		P	40		P	27		P	37.6		P	28.9		P
ZN	399		P	475		P	402		P	465		P	424		P

ELEMENT	G			H			I			J			K		
AL	18600		P	24800		P	22600		P	24400		P	18400		P
SB	4.2U		P	12.5U		P	3.4U		F	6.66U		P	4.9U		P
AS	79.9		F	58.2		F	68.1		F	60.9		F	77.8		F
BA	247		P	239		P	243		P	252		P	234		P
BE	1.4	+	P	0.96B		P	1.1	+	P	1.23	+	P	1.2	+	P
CD	7.1		P	10.2		P	10.4		P	11.6		P	8.9		P
CA	5780		P	5740		P	5630		P	5530		P	5360		P
CR	44.6		P	51.8		P	45.8		P	49.3		P	43.2		P
CO	14.2		P	17.1		P	13		P	13.5		P	13.1		P
CU	190		P	182		P	182		P	186		P	184		P
FE	24300		P	25200		P	24500		P	24300		P	23600		P
PB	626		F	661		P	822	*	F	601		P	617		P
MG	3520		P	3140		P	4060		P	4240		P	3620		P
MN	10500		P	10500		P	11000		P	10200		P	10400		P
HG	0.28		CV	0.3		CV	0.37		CV	0.14		CV	0.36		CV
NI	26		P	29.1		P	30.9		P	35.9		P	27.4		P
K	2100		P	1900		A	2350		A	2950		A	2170		P
SE	0.8U		F	0.83U		F	0.68B		F	0.6U		F	0.34U		F
AG	0.42U		P	2.4		P	4		P	1.84B		P	1.9B		P
NA	502B		P	667B		A	446B		A	714B		P	500B		P
TL	0.95U		F	0.67B		F	1U		F	1.8U		F	0.28U		F
V	34.4		P	34.3		P	38.9		P	47.5		P	31.4		P
ZN	489		P	452		P	462		P	496		P	456		P

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-S)

<< LABORATORY CODE = (F) >>

ELEMENT	L			M			N			O			P		
AL	18100		P	12700		P	18000		P	16100		P	15100		P
SB	0.4U		F	0.6B		F	2.87U		P	1.9U		F	3.4U		P
AS	71.1		F	69		F	64.6		F	71		F	344	*	F
BA	232		P	228		P	231		P	215B		P	232		P
BE	1.16	+	P	10B		P	0.892	+	P	1	+	P	1.4	+	P
CD	8.84		P	10.7		P	8.32		P	12		P	7.1		P
CA	5100		P	5570		P	5516		P	4770		P	5310		P
CR	46		P	43		P	40.7		P	41		F	41.4		P
CO	12		P	14		P	13.3		P	12		P	13.1		P
CU	191		P	184		P	179		P	167		P	179		P
FE	23000		P	25700		P	22700		P	22500		P	22500		P
PB	596		F	594		P	632		P	656		F	2710	*	F
MG	3540		P	3130		P	3530		P	3050		P	3060		P
MN	12000	*	P	11400		P	12300	*	P	8960		P	10100		P
HG	0.28		CV	0.25		CV	0.318		CV	0.3		CV	0.31		CV
NI	25.6		P	19.8		P	25.9		P	39		P	22.8		P
K	1860		P	1610		P	1840		P	1700		A	1700		P
SE	0.4U		F	0.6B		F	0.402B		F	0.5B		F	0.2U		F
AG	4.5		P	4.8		P	3.67		P	1.9B		F	0.36		P
NA	438		P	703B		P	446B		P	454B		A	434B		P
TL	0.8B		F	0.7B		F	0.265U		F	1.1U		F	3.1B		F
V	31.8		P	28.8		P	32.6		P	25		P	29.2		P
ZN	464		P	451		P	438		P	458		P	441		P

ELEMENT	Q			R			S			T			U		
AL	13300		P	16300		P	19600		P	19000		P	11700		P
SB	10U		P	5U		F	8	+	F	10.8	+	P	5.1U		P
AS	58.4		P	110		F	69.4		F	64.3		F	61.3		F
BA	205		P	196		P	249		P	233		P	217		P
BE	1	+	P	0.66B		P	1	+	P	1	+	P	1B		P
CD	8.43		P	7.2		P	8.9		P	11.6		P	8.2		P
CA	4980		P	4620		P	5520		P	5220		P	5640		P
CR	34.9		P	34.9		P	54.8		P	41.8		P	33.8		P
CO	13.4		P	13.1		P	10.9		P	10.6		P	11.1		P
CU	171		P	159		P	194		P	185		P	184		P
FE	20000		P	21100		P	23800		P	27000		P	22000		P
PB	504		P	521		P	704		P	659S		F	566		F
MG	2720		P	2940		P	3820		P	3770		P	2720		P
MN	11300		P	10500		P	10600		P	379	*	P	10700		P
HG	0.24	*	C	0.22		CV	0.21		CV	0.5		CV	0.3		CV
NI	33.3		P	23.5		P	32.2		P	27.5		P	22.8		P
K	1640		P	1930		A	2180		P	1890		P	1470		P
SE	1U		F	2.2	+	F	4U		F	0.2U		F	0.4B		F
AG	3.61		P	1.2B		P	2.4		P	1.8B		P	2B		P
NA	458B		P	483B		A	765B		P	438B		P	220U	#	P
TL	2U		F	0.8U		F	0.6B		F	0.1U		F	0.4B		F
V	22.1		P	28.5		P	37.4		P	17.1		P	27.3		P
ZN	420		P	448		P	492		P	467		P	439		P

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PREAWARD PERFORMANCE EVALUATION SAMPLE - (K025-S)

<< LABORATORY CODE = (F) >>

ELEMENT	V			W			X			Y			Z		
AL	15900		P	17300		P	25532		P	15400		P	20900		P
SB	12U		P	32.9	+	P	2.14U		P	55U		P	3.7U		F
AS	71		F	60.2		F	72.7		F	76.2		F	63.7		F
BA	214		P	173	*	P	243.8		P	221		P	236		P
BE	1.6	+	P	0.89B		P	1.1B		P	0.8B		P	1	+	P
CD	7.9		P	8.7		P	10.8		P	10.3		P	11.8		P
CA	5080		P	5590		P	5023.7		P	5320		P	5240		P
CR	50		P	38.2		P	55.5		P	37.6		P	47.3		P
CO	13		P	11.9		P	16.7		P	13.5		P	12.4		P
CU	172		P	195		P	183.7		P	191		P	169		P
FE	22200		P	21000		P	26260		P	23500		P	26100		P
PB	585		P	554		P	606.6		F	674		F	558		F
MG	3210		P	3100		P	4046.1		P	3170		P	3710		P
MN	9630		P	9020		P	10138		P	11200		P	11600		P
HG	0.16	'	CV	0.29		CV	0.263		CV	0.2		CV	0.5		CV
NI	12	*	P	27.2		P	41.2	*	P	24.4		P	30		P
K	1660		P	1780		P	3100.7		P	1490		A	2060		P
SE	1.2U		F	0.55	+	F	0.81B		F	2.1	+	F	0.8U		F
AG	6.5	*	P	1.3U		P	3.3B		P	4.4		F	1.7U		P
NA	449		P	345		P	47.9	*	P	490B		P	1180	*	P
TL	0.7	+	F	0.7B		F	0.85B		F	1.6U		F	1.1B		F
V	32		P	28.1		P	47.9		P	27.2		P	38		P
ZN	426		P	437		P	486.4		P	479		P	406		P

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JA

FEB 12 1986

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

Dear Sir/Madam:

Please find enclosed a copy of the Performance Evaluation Sample Data Scoring Package which covers the results of your laboratory's performance on the inorganic pre-award samples for IFB WA-J838/J839.

Should you have any questions regarding these results, you may contact either Gary Ward or myself at (202) 382-7906.

Sincerely,

Gary K Ward

for Debra K. White
Project Officer
Analytical Support Branch
Hazardous Response Support Division

Enclosure

Code 44

PREAWARD PERFORMANCE EVALUATION SAMPLE DATA SCORING

Laboratory Martin Marietta Environmental Systems

IFB WA 85-J838/J839 Date 10/29/85

SUMMARY:

MAXIMUM SCORE FOR SECTIONS I - V	250	Points
TOTAL SCORE FOR SECTIONS I - V	236.9	Points
PERCENT SCORE FOR SECTIONS I - V	94.8	%

I. First Sample Analysis Results (Maximum = 90 points)

A. Identifications (Maximum = 10 points) 10

1. All parameters identified (10 pts)
2. One-two parameters not identified (5 pts)
3. Over two parameters not identified (0 pts)

B. Quantitation (Maximum = 75 points) 67.9

Number of parameters within acceptance windows (19) x 75/number of parameters present in sample (21) = (67.9) pts. (Round Fractions Upward)

Parameters Outside Acceptance Window:

Parameter	Reported Value(s)	Acceptance Window
Rb	5.2 ug/L	17.3-35.5 ug/L

C. False Positive Identifications above Contract Required Detection Limits (Maximum = 5 points) 5

1. No false positives (5 pts)
2. One-two false positives (2 pts)
3. Over two false positives (0 pts)

II. Second Sample Analysis Results (Maximum = 90 points)

A. Identifications (Maximum = 10 points) 10

1. All parameters identified (10 pts)
2. One-two parameters not identified (5 pts)
3. Over two parameters not identified (0 pts)

B. Quantitation (Maximum = 75 points) 75

Number of parameters within acceptance windows (19) x 75/number of parameters present in sample (19) = (75) pts. (Round Fractions Upward)

C. False Positive Identifications above Contract Required Detection Limits (Maximum = 5 points) 5

1. No false positives (5 pts)

2. One-two false positives (2 pts)

3. Over two false positives (0 pts)

III. Quality Control Requirements (Maximum = 50 points)

A. Initial Calibration Verification (Maximum = 10 points) 10

1. All initial calibration verifications within acceptance criteria (10 pts)

2. One-two outside of acceptance criteria (7 pts)

3. Three-four outside of acceptance criteria (3 pts)

4. More than four outside of acceptance criteria (0 pts)

B. Continuing Calibration Verification (Maximum = 10 points) 7

1. All continuing calibration verifications within acceptance criteria (10 pts)

2. One-two outside of acceptance criteria (7 pts)

3. Three-four outside of acceptance criteria (3 pts)

4. More than four outside of acceptance criteria (0 pts)

Parameters outside of acceptance criteria: Na

C. Preparation Blank Results (Maximum = 10 points) 10

1. All preparation blanks below the contract required detection limits (10 pts)

2. One-two parameters present in preparation blanks above the contract required detection limit (5 pts)

3. More than two parameters present in preparation blanks above the contract required detection limits (0 pts)

D. Matrix Spike Recovery (Maximum = 5 points) 2

1. All matrix spike recovery values within acceptance criteria (5 pts)

2. One-two matrix spike recovery values outside of acceptance criteria (2 pts)

3. Three or more matrix spike recovery values outside of acceptance criteria (0 pts)

Parameters outside of acceptance criteria:

Sample(s)	Parameter(s)	%Recovery(s)	Acceptance Criteria
J838-S	Ag	72	72-125

E. Duplicate Precision Results (Maximum = 5 points) 5

1. All duplicate precision results within acceptance criteria (5 pts)
2. One-two duplicate precision results outside acceptance criteria (2 pts)
3. More than two duplicate precision results outside of acceptance criteria (0 pts)

F. Laboratory Control Sample Results (Maximum = 10 points) 10
(The lab did 2 LCS.)

1. All Percent Recovery values on the LCS within acceptance criteria (10 pts).

2. One-two Percent Recovery values outside of acceptance criteria (7 pts).

3. Three-four Percent Recovery values outside of acceptance criteria (3 pts).

4. More than four Percent Recovery values outside of acceptance criteria (0 pts).

IV. Reporting and Deliverables (Maximum = 20 points)

A. Instrument detection limits determined and submitted with all contract required detection limits met. (5 pts) 5

B. ICP linear ranges and interelement correction factors determined and submitted. (5 pts) 5

C. All contractual QC forms submitted in a substantially complete manner. (5 pts) 5

D. Acceptable raw data submitted for the preaward analysis. (5 pts) 5

Notes:

1. The sample results recorded on Form I will be used as they are recorded. Any value rounded to a value outside of the acceptance windows will be considered a miss.

2. The values recorded by the laboratory will be used as they are recorded on Forms II-VII, unless the evaluator calculated value is outside the acceptance criteria.

INORGANIC PREAWARD WA 06 J038/J039

AQUEOUS SAMPLE (ug/L)

PARAMETER	A	B	C	D	E	F	G	H	I	J	K	L	90 % CI a
ALUMINUM	1,217		1300	1260	1110	1256	1160.	1203	1240	1200.	NA N	1230	1067-132
ANTIMONY	5U		40 U	5 U	15 U	700 @	20. U	60 U	55 U	<16.	NA N	5U	*
ARSENIC	100.7		90	89	83	71.96 N	84.	165M *N	86	90.	110	90	78-103
BARIUM	819 N		716	710	705	722	734.	700	746	770.	NA N	751	658-790
BERYLLIUM	30.9		30	26	28	29	30.	19 N	30	16. N	NA N	30	20.4-36.
CADMIUM	24		24	25	23	29	27.	22	24	14. *N	25	28	19.9-30.
CALCIUM	10,350		10200	10000	9500	9645	9920.	10,700	10,600	50. *N	NA N	10,100	8894-110
CHROMIUM	159.		144	137	128 N	154	142.	145	148	71. *N	NA N	152	126-166
COBALT	178.		176	207	194	198	192.	206	190	98. *N	200	183	160-226
COPPER	209.		189	207	206	173 N	198.	199	204	110. *N	190	197	176-218
IRON	1,260		1260	1310	1250	1152	1180.	1272	1200	630. *N	1200	1230	1082-131
LEAD	34.1		25	18	26	18.77	24.	26	26	28.	27	25	17.3-35.
MAGNESIUM	9800		10400	9640	8700	9493	9700.	9150	10400	5100. *N	NA N	10,100	8454-109
MANGANESE	198		180	220 N	182	207	193.	181	196	100. *N	210	200	173-219
MERCURY	5.5		3.9	4.8	4.7	NR N	4.3	5.1	4.3	4.2	5.0	6.8 N	1.94-6.4
NICKEL	562		542	661 N	528	577	580.	640	568	300. *N	NA N	594	503-647
POTASSIUM	11,850 N		9720	5100	16300 N	11210	9660.	[4137]	21500 *N	4800.	22,000 *N	8330	2571-141
SELENIUM	39.9		28	40	37	NR N	44.	28 N	46	40.	[4] *N	36	25.5-54.
SILVER	2U		20 U	1 U	(0.8) U	10 U	3.0 U	[0.5]N	6.3 U	<2.2>	NA N	6U	*
SODIUM	9,700		9660	10600	9130	6898 N	9630.	10,000	9950	5200. *N	10,000	9720	7801-125
THALLIUM	70.5 N		80 N	27	53	34.66	47.	64	33	40.	NA N	39	
VANADIUM	10U		50 U	[<25]	(0.6) U	[10]	10. U	30 U	8.9 U	2.	NA N	8U	
ZINC	301		280	307	266	322	280.	287	264	140. *N	NA N	310	* 247-342
CYANIDE	49		41	37	34	NR N	27	33.4	31	36	NA N	39	12.3-51.
TOTAL OUT	3		1	2	2	6	0	2	1	12	15	1	
UNIDENTIFIED	0		0	0	0	0	0	0	0	0	0	0	
FALSE POSITIVES	0		0	0	0	1	0	0	0	0	0	0	

D-18

a Confidence Intervals (CI) were not set.
b CI were derived from laboratory submitted values. Outliers were rejected using Grubb's Test.
Less than values (<N), U-values, estimated values ([N]), and non-submitted values (-) were not used in the calculation of the CI.
* Indicates an outlier from Grubb's Test.
S Indicates value determined by Method of Standard Addition.
U Analyzed for but not detected.
N Value was outside the action limit. Points deducted.
NA Not analyzed for.
M Duplicate outside of warning limit.
- Value not submitted for this parameter.
[] Indicates an estimated value.
@ False positive above CRDL.
< Indicates the value was either less than the instrument detection limit or the CRDL for the parameter.
@ Unidentified parameter present above the CRDL.

INORGANIC PREAWARD WA 06 J038/J039

EOUS SAMPLE (ug/L)													
AMETER	M	N	O	P	Q	R	S	T	U	V	W	X	90 % CI *
MINUM	880 +N	1,100	1120	1260	1154	1495 +N	1240	1100	1266	1580 +N	1174	1190 E	1067-1325
IMONY	- N	60 U	31 U	60 U	<23 U	4.9	[10]	10 U	50 U	2 U	[4.0]	1 U	*
ENIC	90	96	96	100	90.9	131 +N	150 +N	86	88	87	89	110 N	78-105
IUM	630 N	750	765	714	703	263 +N	762	677	733	860 +N	731	740	658-790
YLLIUM	24	29	31	36	29.0	28	31	29	29	40 N	27	20 N	20.4-36.4
NIUM	20	23	31 N	25	25.1	20	23	26	26	35 +N	27	21	19.9-30.0
CIUM	9,500	9000	10900	10700	9634	203 +N	9970	9420	13070 +N	13000 +N	9540	9770	8894-11033
OMIUM	85 +N	140	153	138	137	148	156	138	150	196 +N	151	80 +N	126-166
ALT	240 N	190	211	203	188	209	201	187	197	222	210	213	160-226
PER	280 +N	200	205	207	186	180	197	216	204	232 N	167 N	206	176-218
N	1,300	1200	1240	10600 +N	1185	90 +N	1250	1240	1262	1460 +N	1129	1160 N	1082-1318
D	- N	18 N	26	5 U BN	29.3	0.7 +N	26	21.3	34	24	18.1	19	17.3-35.5
NESIUM	10,600	8000 N	11500 N	10600	9267	246 +N	9540	9360	11010 +N	13400 +N	9160	9910	8454-10968
GANESE	190	220 N	207	198	202	10 +N	190	185	212	246 +N	181	176	173-219
CURY	5.2	4.5	3.1	3.9	4.0	10 +N	4.8	1.9 N	4.48	3.4	4.32	7.2 N	1.94-6.48
CKEL	610	600	620	646	553	236 +N	553	494 N	590	858 N	565	720 N +N	503-647
TASSIUM	2,100 N	9800	13400	10100	7846	10.3 +N	9650	9600	8127	12600	10240	9790	2571-14169
LENIUM	25 N	38	44	52	34.1	41.8	20 N	36	60 N	12 U BN	37.7	27 U BN	25.5-54.0
VER	- N	10 U	3 U	5 U	<2.1 U	39 B	[4]	10 U	6 U	0.04 U	1 U	5	*
DIUM	9,900	14,000 N	12000	9800	9663	9.7 +N	10700	10070	13260 N	14000 N	9620	10030	7801-12556
LLIUM	- N	50 S N	49	40	60	33.5	45	45	55	64	44.3	38	23.2-69.7
ADIUM	24	30 U	4 U	50 U	<3.1 U	U	[2]	20 U	20 U	7.6 U	50 U	13 U	*
IC	330	370 N	304	328	268	246 N	276	260	296	365 N	272	300	247-342
NIDE	21	40	40	1050 +N	10.5 N	471 +N	42	46	98 +N	28	20	-- N	12.3-51.8
AL OUT	11	4	2	3	1	14	2	2	5	14	1	8	
DENTIFIED	0	0	0	1	0	0	0	0	0	1	0	1	
SE POSITES	0	0	0	0	0	1	0	0	0	0	0	0	

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INORGANIC PREAWARD WA 06 J038/J039

UEOUS SAMPLE (ug/L)

RAMETER	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ	90 % CI a
UMINUM	1050 M	867 +M	1297	1290	1215		1290		1300.	1200	1130	1070	1067-1325
TIMONY	32. U	<0.2	4.8 U	60 U	10 U		21 U		1. U	604 @	60 U	1.5 U	*
SENIC	90.6	<0.120 +M	80	10 U +M	- M		-- M		93.	60.4 +M	165 +M	85	78-105
RIUM	660	0.722 +M	670	665	715		753		710.	770	737	699	650-790
RYLLIUM	28	0.016 +M	24	31	29.7		28.8		28.	30.1	27	29	20.4-36.4
DMIUM	26	0.025 +M	22	32 M	23.9		23.0		23.	26.2	22	18 M	19.9-30.0
LCIUM	8920	9.85 +M	11189 M	10400	9870		11380 M		9700.	10200	12400 +M	9140	8894-11033
ROMIUM	126	0.19 +M	130	109 +M	160		172.6 M		130.	146	140	135	126-166
BALT	236 M	0.19 +M	176	144 M	197		232.8 M		170.	197	202	171	160-226
PPER	194	0.196 +M	163	186	193		193.0		290. +M	204	196	188	176-210
ON	1200	1.22 +M	1121	1200	1240		1346 M		1200.	1190	1260	1070 M	1082-1318
AD	36 M	<0.1 @M	1085 +M	28.1	32.1		28.1		33. M	25.2	18	20	17.3-35.5
GNESIUM	8640	10.08 +M	9245	7950 M	9340		10330		9200.	10100	11200 M	9240	8454-10968
NGANESE	192	0.20 +M	186	177	199		199.8		190.	192	211	186	173-219
RCURY	561 +M	- M	4.55	-- M	3.32		-- M		3.3 M	4.17	4.0	14 +M	1.94-6.48
CKEL	634	0.59 +M	554	518	560		623.2		560.	594	578	543	503-647
TASSIUM	9900	9.54 M	9385	9500	8510		-- M		9400.	12.8 +M	10300	42100 +M	2571-14169
LENIUM	44	<0.3 +@M	39.4	21.4 M	43.8		-- M		40.	36.8	63 M	39	25.5-54.0
LVER	9.2 U	<0.01	[0.07]	10 U	21.6 @		10.1		0.2 U	10 U	7.4 U	9.6 U	*
DIUM	8540	10.57 +M	9360	13000 M	9280		-- M		9500.	10340	9840	10400	7801-12556
ALLIUM	50	<0.25 @M	31.9	44	47.3		10.8 M		55.	10 U @	22 M	65	23.2-69.7
NADIUM	22 U	<0.025	16 U	50 U	[50]		12 U		40. U	50 U	15 U	12 U	*
NC	316	0.296 +M	288	283	292		309.7		350. M	288	299	280	247-342
ANIDE	26.8	- M	57.2 M	30	1.17 M		34.2		35.	37	38	24	12.3-61.8
TAL OUT	4	21	3	8	2		10		2	2	5	4	
IDENTIFIED	0	3	0	1	0		0		0	1	0	0	
LSE POSITIVES	0	0	0	0	1		0		0	1	0	0	

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AQUEOUS SAMPLE (ug/L)

INORGANIC PREAWARD WA 66 J038/J039

PARAMETER	KK	LL	MM	NN	OO	PP	QQ	RR	SS	TT	UU	90 % CI b
ALUMINUM	1230	994 N	1150	1300	1200	1152	1210	1160	1320	1220	640 +N	1067-1325
ANTIMONY	1 U	U	60 U	11 U	2.0 U	5 U	0.69 U	38 U	48 U	23 U	3.4 U	a
ARSENIC	88	2000 +N	94.2	99	86	98	99	86	95	102	94	78-105
BARIUM	820 N	4746 +N	712	749	704	692	745	685	752	763	709	650-790
BERYLLIUM	31	4.7 +N	25.9	26	27	42 N	28	28	30	25	16 N	20.4-36.4
CADMIUM	25	5.6 +N	30.6 N	32 N	25	24	26	25 M	26	23	27	19.9-30.8
CALCIUM	10700	9920	10700	10300	9850	8726 N	10400	9540	10800	9130	9180	8894-11033
CHROMIUM	150	122 N	153	137	167 N	151	151	0.202 M +N	146	139	162	126-166
COBALT	200	184	178	174	174	178	180	182	187	145 N	187	160-226
COPPER	220 N	263 +N	212	185	199	176	201	180	191 E	203	197	176-218
IRON	1250	1078 N	1180	1130	1160	1060 N	1170	1240	1080 E N	1100	1070 N	1082-1318
LEAD	32	U 8N	35.2	27	29	26	5.2 +N	34	24 SN	46 S +N	37 SN N	17.3-36.8
MAGNESIUM	10300	1115 +N	9840	9900	10100	9976	10000	8950	9780	9130	10100	8484-10968
MANGANESE	220 N	157 N	201	195	190	191	220 N	189	192	187	146 +N	173-219
MERCURY	4.8	33 +N	4.6	0.47 N	16 N	3.0	4.1	4.1	4.76	2.8 N	4.4	1.94-6.48
NICKEL	550	486 N	597	542	504	536	558	534	611	559	599	503-647
POTASSIUM	6400	9250	9530	[19903] N	9490	9100	10200	8910	8320	7680	9520	2571-14169
SELENIUM	36	-- N	36	39	43	44	49	50	43 S	38	37 N	25.8-54.0
SILVER	1 U	U	10 U	24 U	7.0 U	10 U	5.7 U	2.5 U	9.7 U	6 U	6 UN	a
SODIUM	11000	10375	9760	9450	9500	10000	11100	9820	13700 N	9280	10800	7801-12556
THALLIUM	21 N	U 8N	42.2	39	42	47	61	68	50	53	51	23.2-69.7
VANADIUM	4 U	U	50 U	14 U	6.0 U	40 U	9.0 U	4.2 U	20 U	[33]	35 U	a
ZINC	300	781 +N	318	278	315	260	280	316	276	276	252 E	247-342
CYANIDE	44.2	0.1 U 8N	30	37	40	10 N	44	31.6	27.5	33	18	12.3-51.8
TOTAL OUT	4	17	1	3	2	4	2	1	2	2	5	
UNIDENTIFIED	0	3	0	0	0	0	0	0	0	0	0	
FALSE POSITIVES	0	0	0	0	0	0	0	0	0	0	0	

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INORGANIC PREAWARD WA 86 J838/J839

AQUEOUS SAMPLE (ug/L) PARAMETER	VV a	VV a	WW a	WW a	90 % CI a
ALUMINUM	1110	1160	1180	1230	1067-1325
ANTIMONY	60 U	60 U	5 U	5 U	a
ARSENIC	83	82	90	93	78-105
BARIUM	696	695	715	710	658-790
BERYLLIUM	29	29	31	31	20.4-36.4
CADMIUM	25	25	25	24	19.9-30.0
CALCIUM	9680	9520	10100	9721	8894-11033
CHROMIUM	162	166	142	137	126-166
COBALT	202	210	189	189	160-226
COPPER	199	201	201	198	176-218
IRON	1220	1250	1248	1247	1082-1318
LEAD	26	26	26	26	17.3-35.5
MAGNESIUM	9480	9690	9443	9617	8454-10968
MANGANESE	211	197	201	200	173-219
MERCURY	6.7 H	5.9	0.2 U #H	0.2 U #H	1.94-6.48
NICKEL	610	604	541	537	503-647
POTASSIUM	9510	9490	8800	8700	2571-14169
SELENIUM	39	38	40	42	28.5-54.0
SILVER	0.1 U	0.1 U	10 U	10 U	a
SODIUM	9810	9990	8600	8900	7801-12556
THALLIUM	39	43	52	50	23.2-69.7
VANADIUM	50 U	50 U	20 U	20 U	a
ZINC	307	305	275	264	247-342
CYANIDE	14	15	40	40	12.3-51.8
TOTAL OUT	1	0	1	1	
UNIDENTIFIED	0	0	1	1	
FALSE POSITIVES	0	0	0	0	

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INORGANIC PREAWARD WA 86 J838/J839

SOIL SAMPLE (mg/Kg)

PARAMETER	A	B	C	D	E	F	G	H	I	J	K	L	90 % CI b
ALUMINUM	14,500		14000	13600	99,900+H	280 +H	15500	20,940	14,600	16,800	NA H	19,900	6039-22962
ANTIMONY	0.1 U		4 U	[11]	3 U	12.15	57 U	[24]	11 U	<12	NA H	1.2	a
ARSENIC	573		740	618	776	391 H	614	504	620	700	170 +H	699	461-886
BARIUM	443		406	409	2190+H	455	440	484 H	415	500 H	NA H	446	389-480
BERYLLIUM	0.2 U		1 U	1.2	2.3	[1]	[0.36]	0.2 U	[0.10]	600 @	NA H	1.6	a
CADMIUM	0.5 U		1 U	1.4	9.6	14	2.9	1 U	0.81 U	1,200 +H	14	8.1	0-15
CALCIUM	10,646		10400	9960	59,800+H	12209	10200	12,300 H	10,600	11,200	NA H	11,600	8912-12248
CHROMIUM	31.35		16	12	16.4	105 +H	28	12.8	7.8	12	NA H	11.8	0-51
COBALT	5.75		10 U	[7.6]	45 +H	55 +H	[6.3]	10 U	6.4	7.4	12	6.1	2.7-15.2
COPPER	261		239	257	1300 +H	289	264	307 H	245	280	260	178 +H	236-296
IRON	12,220		10700	10400	68,900+H	12688	10700	14,980 H	11,700	12,000	6,000 H	14,100	7786-14448
LEAD	6,124		5070	4590	7160 H	4826	5420	6630	5490	8,600	- H	5990	4816-6976
MAGNESIUM	15,260		15000	13700	82,500+H	16736	15500	15,500	14,800	15,800	NA H	16,800	12250-17102
MANGANESE	92,010		85400	85000	459,000+H	88786	90700	112,600 H	96,300	82,000	85,000	68,100 H	78749-105073
MERCURY	19.1		20	0.35 H	19	NR H	17	21	24	19	15.3	20.9	6.1-30.3
NICKEL	20.63		17	20	127 +H	58.3 +H	30	330 +H	19	22	NA H	14	10.7-31.8
POTASSIUM	10,849		8040	2380 H	130,000+H	10688	8410	9300	304,000+H	8,400	20 H	9270	2858-12366
SELENIUM	0.2 U		0.8	1 U	10 U	NR H	25 U	1 U	E H	<5	- H	7.3	a
SILVER	0.5 U		4 U	0.2 U	1.7 U	32.4 @	4.8	[1.2]	10	<2	NA H	13.2	a
SODIUM	3,766		3440	3570	16,100+H	[3687]	3660	3600	3040 EH	3,700	3.5 +H	3500	3080-4410
THALLIUM	6.44		7	4.6	5.0	7.95 H	3.3	11 +H	3.3	6.6	NA H	2.9	2.2-7.0
VANADIUM	18.0		10 U	19	1.7 UH	58.2 +H	15	10.2	17	22	NA H	29.7	4.7-39.1
ZINC	422		392	394	2000+H	501 H	407	503 H	375	440	NA H	464	350-491
TOTAL OUT	0		0	2	14	10	0	0	3	2	18	2	
UNIDENTIFIED	0		0	0	0	0	0	0	0	0	0	0	
FALSE POSITIVES	0		0	0	0	1	0	0	0	1	0	0	

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E Estimated value due to laboratory reported interference.

INORGANIC PREAWARD WA 06 J038/J039

SOIL SAMPLE (mg/Kg)

PARAMETER	M	N	O	P	Q	R	S	T	U	V	W	X	90 % CI b
ALUMINUM	28,000 H	16800	11700	16,000	1032 H	596.17 +H	21300	16,050	17774	10300	13850	15200 E	6039-22962
ANTIMONY	- H	12 U	31 U	12 U	<5 U	79.6	59.7	[5.6]	10 U	16	14.0	1 U	a
ARSENIC	500	760	731	702	778	79 +H	1410. +H	711	626	662	988 H	770	461-886
BARIUM	370 H	455	466	467	433	53.0 +H	462.	428	443	440	429	430	389-460
BERYLLIUM	0.60	0.79 U	[0.48]	1 U	[0.6]	5.85	6.4	1.1	0.61	1.4	1 U	32 @	a
CADMIUM	- H	0.99 U	4 U	1 U	8.4	4.032	12.	[0.29]	1 U	0.05	1 U	5.2	0-15
CALCIUM	9,900	10,700	11900	11200	9890	41.0 +H	11400.	10,100	10477	9760	10046	10700	8912-12248
CHROMIUM	- H	12	20	14	48	18.50	70.6 H	40	9.4	23	9.0	8	0-51
COBALT	28 +H	5.9 U	[7.3]	14	[7]	76.41 +H	18. H	[10]	87.8]	62 +H	10 U	21 U N	2.7-15.2
COPPER	234 H	115 H+H	273	281	258	83.47 +H	279.	267	286	273	281	202 E+H	235-296
IRON	9,600	13900	9680	11600	7184 H	63.77 +H	13100.	12,130	12218	9460	10722	26800 +H	7785-14448
LEAD	5,600	5780	6370	5960	5808	204 +H	5720.	5,885	5667	6606	5868	33000 +H	4516-6976
MAGNESIUM	37,000 +H	16000	15700	16100	12873	49.3 +H	14600.	15,100	14220	14300	13850	15900	12250-17102
MANGANESE	102,000	101000	97400	91800	103224	34.7 +H	102000.	85,950	92520	119000+H	85400	70700 EM	78749-105073
MERCURY	- H	22	16	21	16.8	3.71 H	25.	17	6.6	16	18.7	250 +H	6.1-30.3
NICKEL	51 +H	22	[18]	42 +H	24	16.53	38 H	28	17	24	20.6	30 HM	10.7-31.8
POTASSIUM	1600 H	9250	8290	8660	6592	10,226	8210	8720	6192	7590	9192	8990	2858-12366
SELENIUM	- H	0.99 U	6.1 U	1 U	<1.0 U	1.33	248 @	0.67 U	0.61 U	12 U	6.9	27 U	a
SILVER	3.3	2.0 H	3 U	3.3	13.8 U	8.10	[2.1]	13.1	1.2 U	0.04 U	.2 U	4	a
SODIUM	3,200	4750 H	5800 +H	3800	4188	8153 +H	3650	3730	4729 H	3860	3750	3580	3080-4410
THALLIUM	- H	2.0 UN 8H	3.4	6	4.8	2.30	6.4	4.7	4.3	3.4	4.4	3.3	2.2-7.0
VANADIUM	43 H	5.9 U	[6.8]	26	28.8	47.6 H	43.3 H	24	31	32	21.2	13 U N	4.7-39.1
ZINC	370	436	446	458	372	58.5 +H	438.	47.1 +H	432 H	424	430	420 E	350-491
TOTAL OUT	14	3	1	1	2	14	5	1	2	2	1	4	
UNIDENTIFIED	0	1	0	0	0	0	0	0	0	0	0	0	
FALSE POSITIVES	0	0	0	0	0	0	1	0	0	0	0	1	

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INORGANIC PREAWARD WA 06 J038/J039

SOIL SAMPLE (mg/Kg)

PARAMETER	Y	Z	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ	90 % CI b
ALUMINUM	22200	18476	18406	9390	14200		17350		14000	13600	13900	14000	6039-22962
ANTIMONY	8.1 U	<39.6	0.537 U	0.505 U	10 U		14.47		0.8 UE	<11 E	10 U	[9.6]	a
ARSENIC	666	614	530.2	207 +N	-- N		-- N		1000 N	580	798 E	606	461-886
BARIUM	419	429	391.0	171 +N	412		439.94		390	432	442	446	389-480
BERYLLIUM	1.53 U	<0.19	[0.8]	0.707	1.61		249 B		0.46	2.3	[0.71]	[0.62]	a
CADMIUM	1.17 U	<2.9	0.6 U	0.252 U	5.42		4.59		1 U	6.3	19 E N	2.9	0-15
CALCIUM	10600	9266	11604	10100	9810		10562		9500	9440	9640	10600	8912-12248
CHROMIUM	23.4	33.3	2 U	10.1 U	22.9		10.44		17	9.8	7.7	7.1	0-51
COBALT	15.3 UN	3.49	2.6 UN	5.05 UN	[10]		10.82		3.6	6.3	[7.1]	[10]	2.7-15.2
COPPER	286	246.8	70.2 +N	176 +N	276		295.47		250	256 E	258	271	238-296
IRON	15000 N	11890	11818.9	3930 +N	9850		13847		10000	9620	10400	10700	7785-14448
LEAD	5850	5301	11855 +N	0.505 UN	5300		4673		4500 N	5220	5660	6220	4516-6976
MAGNESIUM	14900	15158	14294	10600 N	14200		16133		13000	13700	14600	15900	12250-17102
MANGANESE	96700	86507	94000	24500 +N	90800		-- N		82000	81600	94700	96400	75749-105073
MERCURY	19.6	-- N	18.400	21.8	16.1		-- N		16	15.4	20	19	6.1-30.3
NICKEL	22.9	9.3 N	58.666 +N	15.2	30.3		21.69		9 N	18	18	23	10.7-31.8
POTASSIUM	9610	8761	11004	56.2 N	6520		-- N		7200	10300 +N	13600 N	2200 N	2858-12366
SELENIUM	0.86	<59	0.857 U	0.505 U	5 U		-- N		0.2 U	36 E	1.4 UE	11	a
SILVER	23.9	2.9	[0.063]	0.252 U	31.9		3.54 U		0.54	24	16	1.9 U	a
SODIUM	3590	3939	3773	44.4 +N	3240		-- N		3500	3190	4240	3750	3060-4410
THALLIUM	4.83	<49.5 N	4.26	0.252 UBN	4.56		5.67		3	<16 E N	3.0	7.5 N	2.2-7.0
VANADIUM	11.2 U	18.57	23.8	4.04 N	24.5		22.58		10	<9 E	14	22	4.7-39.1
ZINC	484	419.8	342.66 N	284 +N	412		324.17 N		400	399	423	401 E	350-491
TOTAL OUT	2	3	5	13	1		7		3	2	2	2	
UNIDENTIFIED	0	0	0	1	0		0		0	0	0	0	
FALSE POSITIVES	0	0	0	0	0		1		0	0	0	0	

a Confidence Intervals (CI) were not set.
b CI were derived from laboratory submitted values. Outliers were rejected using Grubb's Test.
Less than values (<N), U-values, estimated values ([N]), and non-submitted values (-) were not used in the calculation of the CI.
+ Indicates an outlier from Grubb's Test.
S Indicates value determined by Method of Standard Addition.
U Analyzed for but not detected.
N Value was outside the action limit. Points deducted.
NA Not analyzed for.
N Duplicate outside of warning limit.
- Value not submitted for this parameter.
[] Indicates an estimated value.
@ False positive above CRDL.
< Indicates the value was either less than the instrument detection limit or the CRDL for the parameter.
@ Unidentified parameter present above the CRDL.

INORGANIC PREAWARD WA 86 J038/J039

SOIL SAMPLE (mg/Kg)

PARAMETER	KK	LL	MM	NN	OO	PP	QQ	RR	SS	TT	UU	90 % CI b
ALUMINUM	14760	14850	10900	84 U @H	16000	13120	19200	11300	11532	15500	17400	6039-22962
ANTIMONY	1.7	U	22.2	11 U	0.40 U	1 U	0.69 U	69	9.6 UN	4.7 U	[1.1] N	a
ARSENIC	775	18000 +N	603	563	660	740	725	611	701	410 N	703 N	461-886
BARIUM	463	1090 +N	556 +N	794 +N	424	411	451	403	412	483 N	455	369-480
BERYLLIUM	0.6	U	<1	[2.3]	1.0 U	3.6	1.1	[0.7]	0.58 U	5.8	0.24 U	a
CADMIUM	2.6	U	13.8	[0.21]	[0.25]	2.6	[0.53]	14	0.74 U	3.0	[0.36] N	0-15
CALCIUM	11450	10618	9800	9340	12400 N	10180	10300	9210	9954	9640	10600	8912-12248
CHROMIUM	28	4	64.0 N	59 N	40.0	26.6	22	59 N	28 E	0.6 U	13	0-51
COBALT	3.8	U N	10 U	[17] N	6.0 U N	8.8	5.7	11	[6.6]	14	4.4 U N	2.7-15.2
COPPER	285	249	278	496 +N	277	227 N	264	241	241	290	278	235-296
IRON	11190	10682	10100	14 U @N	13700	10060	12800	8000	8622	10100	12700	7788-14448
LEAD	6166	83 +N	5510	7470 N	5990	6700	5500	6220	6180	6230	7420 S N	4516-6976
MAGNESIUM	13400	18040 N	13600	13200	18100 N	15180	13600	12800	12627	13600	15000	12250-17102
MANGANESE	9760 +N	968200 +N	81800	1.8 U @N	95800	93700	92900	82600	90614	101000	92900	75749-105073
MERCURY	24.1	51000 +N	36.5 N	3.5 N	3.5 N	21.6	17	37 N	18.8	15.1	17.6	6.1-30.3
NICKEL	21	17	23.6	36 U @N	20.3	16	21	34 N	17.4	117 +N	14	10.7-31.8
POTASSIUM	8120	6960	7710	35300 +N	9120	7360	9560	6060	7060	7900	9350	2858-12366
SELENIUM	0.3	296 @	10 UE	4.0 U	0.40 U	1 U	[0.16]	U	[0.80]	2.0 U	0.4 UN	a
SILVER	0.05	135 @	12.8	24 U	2.0 U	2 U	1 E	8.7	12 N	1.6 U	5.8 N	a
SODIUM	3900	3900	4280	[4490]	4180	3600	3560	3480	3440	4099	5710 +N	3080-4410
THALLIUM	0.8 U@N	U @N	2.72	11 +N	[4.6]	3	4.3	3.1	4.4	4.2	6.2 N	2.2-7.0
VANADIUM	27	U N	33.6	[16]	19.9	12	11	27	[7.2]	35	[14]	4.7-39.1
ZINC	489	346 N	457	722 +N	444	389	431	373	337 N	406	394	350-491
TOTAL OUT	2	10	3	13	4	1	0	3	1	3		
UNIDENTIFIED	1	1	0	4	0	0	0	0	0	0		
FALSE POSITIVES	0	2	0	0	0	0	0	0	0	0		

a Confidence Intervals (CI) were not set.
b CI were derived from laboratory submitted values. Outliers were rejected using Grubb's Test.
Less than values (<N), U-values, estimated values ([N]), and non-submitted values (-) were not used in the calculation of the CI.
+ Indicates an outlier from Grubb's Test.
S Indicates value determined by Method of Standard Addition.
U Analyzed for but not detected.
N Value was outside the action limit. Points deducted.
NA Not analyzed for.
N Duplicate outside of warning limit.
- Value not submitted for this parameter.
[] Indicates an estimated value.
@ False positive above CRDL.
< Indicates the value was either less than the instrument detection limit or the CRDL for the parameter.
@ Unidentified parameter present above the CRDL.

INORGANIC PREAWARD WA 06 J038/J039

SOIL SAMPLE (mg/Kg) PARAMETER	VV *	VV *	WW *	WW *	90 % CI b
ALUMINUM	11700	11600	14722	14492	6039-22962
ANTIMONY	0.06 UR	0.06 UR	1 U	1 U	a
ARSENIC	641	631	640	640	461-896
BARIUM	428	442	414	422	389-480
BERYLLIUM	0.005 U	0.005 U	[0.6]	[0.8]	a
CADMIUM	0.005 U	0.005 U	[0.4]	[0.4]	0-18
CALCIUM	13100 H	13100 H	10132	9944	8912-12248
CHROMIUM	11	11	9.2	12	0-51
COBALT	12	11	11.0	10.8	2.7-18.2
COPPER	267	271	269.4	266.8	235-296
IRON	9250	9250	11334	11800	7785-14448
LEAD	5940	5980	5800	5800	4616-6976
MAGNESIUM	13400	13500	14208	14466	12250-17102
MANGANESE	88400	82600	87520	86000	75749-105078
MERCURY	18.2	17.6	23.77	22.99	6.1-30.3
NICKEL	23	24	24.8	28.2	10.7-31.8
POTASSIUM	7130	7150	7000	7200	2858-12366
SELENIUM	0.005 UR	0.005 UR	0.4 U	0.4 U	a
SILVER	0.01 U	0.01 U	20.8	25	a
SODIUM	3840	3840	3160	3340	3080-4410
THALLIUM	4.1	4.3	4.8	4.8	2.2-7.0
VANADIUM	16	15	23	24.2	4.7-39.1
ZINC	939 *H	878 *H	410.4	429.4	350-491
TOTAL OUT	2	2	0	0	
UNIDENTIFIED	0	0	0	0	
FALSE POSITIVES	0	0	0	0	

a Confidence Intervals (CI) were not set.
b CI were derived from laboratory submitted values. Outliers were rejected using Grubb's Test.
Less than values (<N), U-values, estimated values ([N]), and non-submitted values (-) were not used in the calculation of the CI.
* Indicates an outlier from Grubb's Test.
S Indicates value determined by Method of Standard Addition.
U Analyzed for but not detected.
H Value was outside the action limit. Points deducted.
NA Not analyzed for.
N Duplicate outside of warning limit.
- Value not submitted for this parameter.
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@ False positive above CRDL.
< Indicates the value was either less than the instrument detection limit or the CRDL for the parameter.
@ Unidentified parameter present above the CRDL.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

JUN 11 1987

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

To: Laboratories Participating in Pre-Award Performance Evaluation Samples for IFB's WA 87-J005

Dear Participant:

Enclosed are copies of your score sheet for the pre-award "Performance Evaluation Samples" for IFB's WA 87-J005 and the acceptance windows.

The acceptable score for performance on those samples is 830 points.

If you wish to have a debriefing, please contact Larry Butler at EMSL-LV.

Sincerely,

Joan F. Fisk

Joan F. Fisk
National Organics Program Manager

Enclosure

cc: Larry Butler, EMSL-LV

VOA ONLY
PREAWARD PERFORMANCE EVALUATION SAMPLE DATA SCORING

Laboratory Martin Marietta Environmental Systems (MMES) #18

IFB Volatiles only J005 Date 4-7-87

SUMMARY:

		150 points for water	150 points for soil		
I.	Identification				
a.	Total number of I pts. deducted	6	3.5		
				Water	Soil
b.	pts. awarded for I			144	146.5
II.	Quantification				
a.	Total number of II pts deducted	0	0		
b.	pts. awarded for II			150	150
	Total points awarded for I and II, water and soil			591	out of 600 pts.
III.	Quality Control	300 pts.			
a.	Total number of III pts. deducted	0			
b.	pts. awarded for III			300	out of 300 pts
IV.	Reporting/Deliverables	100 pts.			
a.	Total number of IV pts. deducted	0			
b.	pts. awarded for IV			100	out of 100 pts
V.	Score				
a.	Total number of I, II, III, and IV pts. awarded			991	out of 1000 pts.
b.	Total pts. awarded			991	out of 1000 pts
VI.	Number of days late			0	

IMPORTANT: 1) Points deducted will not exceed the maximum possible number of points.

I. Identification (150 points for water sample; 150 points for soil samples.

	Water	Soil
A. Target Compound List (TCL) identification (Water Sample = 100 pts. max.; Soil Sample = 100 pts. max.).		
Number of compounds not identified (0/0) X 100 pts. (Number of compounds in study (8/8)/10 = (0/0) pts. ded.	0	0
B. TCL false positives (Water Sample = 30 pts. max.; Soil Sample = 30 pts. max.)		
Number of TCL false positives (0/0) X 3 points = (0/0) points deducted	0	0
C. Tentatively Identified Compounds (TIC) identification (Water Sample = 10 pts. max.; Soil Sample = 10 pts. max.)		
Number of compounds not identified (3/1) X 10 pts. Number of compounds in study (6/4) = (5/2.5) pts. ded.	5	2.5
D. TIC false positives (Water Sample = 10 pts. max.; Soil Sample = 10 pts. max.)		
Number of TIC false positives (1/1) X 1 point = (1/1) points deducted	1	1
Total number of I pts. deducted	6	3.5

II. Quantification of the TCL (150 points for water sample; 150 points for soil sample)

A. TCL quantification include VOA (Water Sample = 150 pts. max.; Soil Sample = 150 pts. max.)		
Number of compounds not within criteria (0/0) x 150 pts Number of compounds in study (8/8)/5 = (0/0) pts. ded.	0	0
Total number of II pts deducted	0	0

III. Quality Control (300 points)

A. Instrument Quality Control (150 points)

Number of pts deducted

1. Tuning (50 points)

b. BFB (50 pts. max.)

1. For any BFB performance tune analyzed separately or added to reagent water with any critical ions abundance ratios outside criteria deduct a maximum of 25 points. (Critical key ions are: 95, 96, 174, 175 176, 177.) 0

2. For any BFB performance tune analyzed separately or added to reagent water with any non-critical ions abundance ratios outside criteria deduct 2 points for each to a maximum of 25 points. (Non-critical key ions are: 50, 75, 173.) 0

3. Failure to perform a BFB tune at the 12-hour frequency, deduct a maximum of 50 pts. 0

2. Initial Calibration (50 points)

a. For initial calibration data for VOA with System Performance Check Compound (SPCC) average relative response factor (RRF) less than 0.300 (less than 0.250 for Bromoform) (25 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (10)
X 25 pts = (0) pts. ded. 0

b. For initial calibration data for VOA with Calibration Check Compound (CCC) percent relative standard deviation greater than 30%, (25 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (12)
X 25 pts. = (0) pts. ded. 0

c. Failure to perform initial calibration will result in the deduction of all the Quality Control points, which equals 300. 0

Number of
Pts. Deducted

3. Continuing Calibration (50 points)

a. For continuing calibration data for VOA with System Performance Check Compound (SPCC) average relative response factor (RRF) less than 0.300 (less than 0.250 for Bromoform). (25 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (10)
X 25 pts. = (0) pts. ded. — 0

b. For continuing calibration data for VOA with Calibration Check Compound (CCC) percent relative standard deviation greater than 25% (25 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (12)
X 25 pts. = (0) pts. ded. — 0

c. Failure to perform continuing calibration will result in the deduction of all the continuing calibration points, which equals 50 points. — 0

B. Sample/Method Quality Control (150 points)

1. Surrogate Spike recovery (60 points) NOTE: Do not include Method Blanks.

a. VOA (60 pts. max.)

Number of surrogate compounds not within criteria (0)
Total number of VOA surrogate compounds (12).
X 60 pts. = (0) pts. deducted — 0

2. Method Blank Analyses (60 points)

Failure to perform the method blank analysis for any of the fractions will result in the deduction of 60 points.

a. VOA surrogate recovery (30 pts. max.)

Number of surrogate compounds not within criteria (0)
Total number of VOA surrogate compounds (6)
X 30 pts. = (0) pts. deducted. — 0

	Number of Pts. Deducted
b. VOA method blank contamination (30 pts. max.). If one or more TCL compounds are detected in the method blank above the contract required quantitation limit (5X the CRQL for methylene chloride, acetone, toluene, and 2-butanone) deduct the maximum points, 30.	0
3. Matrix Spike/Matrix Spike Duplicate (30 points)	
a. Utilization of the wrong spiking concentration in one or more of the fractions will result in the deduction of 30 points.	NR
b. Failure to perform matrix spike or matrix spike duplicate analysis will result in the deduction of 30 points.	NR
Total number of III pts. deducted	0
IV. Reporting and Deliverables (100 points)	
A. BFB (25 points max)	
1. Mass listing and bar graph output submitted for each instrument and for every 12-hour period samples were analyzed. Deduct 25 points for any BFB violation.	0
B. RICs, Chromatograms, quantitation reports, and system print-outs (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the statement of work.	0
C. Mass spectra (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the Statement of Work.	0
D. Contractual Forms (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the Statement of Work.	0
Total number of IV pts. deducted	0

PREAWARD SAMPLE RESULTS
IFB WA-87-J004/5

SCORE OUT OF 1000/FINAL SCORE
(4/30/87)

SCORE OUT OF 520/QUANT & ID ONLY
(4/15/87)

AQUEOUS MATRIX ANALYTE	THEO. CONC. ug/L	ACCEPTANCE WINDOWS LOWER	UPPER
1,1-DICHLOROETHANE	50	37.3 -	60.0
CHLOROFORM	70	50.7 -	79.3
TETRACHLOROETHENE	70	47.6 -	79.0
ETHYLBENZENE	60	46.1 -	72.3
TIC			
1-CHLOROPENTANE	72		
ETHYLCYCLOHEXANE	81		
HEPTALDEHYDE	62		

SOLID MATRIX ANALYTE	THEO. CONC. ug/kg	ACCEPTANCE WINDOWS LOWER	UPPER
TRANS-1,2-DICHLOROETHENE	4428	2620 -	4590
DIBROMOCHLOROMETHANE	1788	537 -	1780
TOLUENE	3025	1260 -	4230
O-XYLENE	1375	660 -	2220
FLUOROBENZENE	3285		
CYCLOHEXYL CHLORIDE	3264		

VOA ONLY
PREAWARD PERFORMANCE EVALUATION SAMPLE DATA SCORING

Laboratory Martin Marietta Environmental Systems (MMES) #18

IFB Volatiles only Date 4-7-87

SUMMARY:

		150 points for water	150 points for soil	Water	Soil
I.	Identification				
a.	Total number of I pts. deducted	6	3.5		
b.	pts. awarded for I			144	146.5
II.	Quantification				
a.	Total number of II pts deducted	0	0		
b.	pts. awarded for II			150	150
	Total points awarded for I and II, water and soil			591	out of 600 pts.
III.	Quality Control	300 pts.			
a.	Total number of III pts. deducted	0			
b.	pts. awarded for III			300	out of 300 pts
IV.	Reporting/Deliverables	100 pts.			
a.	Total number of IV pts. deducted	0			
b.	pts. awarded for IV			100	out of 100 pts
V.	Score				
a.	Total number of I, II, III, and IV pts. awarded			991	out of 1000 pts.
b.	Total pts. awarded			991	out of 1000 pts
VI.	Number of days late			0	

IMPORTANT: 1) Points deducted will not exceed the maximum possible number of points.

I. Identification (150 points for water sample; 150 points for soil samples.

	Water	Soil
A. Target Compound List (TCL) identification (Water Sample = 100 pts. max.; Soil Sample = 100 pts. max.).		
Number of compounds not identified (0/0) X 100 pts. (Number of compounds in study (8/8)/10 = (0/0) pts. ded.	0	0
B. TCL false positives (Water Sample = 30 pts. max.; Soil Sample = 30 pts. max.)		
Number of TCL false positives (0/0) X 3 points = (0/0) points deducted	0	0
C. Tentatively Identified Compounds (TIC) identification (Water Sample = 10 pts. max.; Soil Sample = 10 pts. max.)		
Number of compounds not identified (3/1) X 10 pts. Number of compounds in study (6/4) = (5/2.5) pts. ded.	5	2.5
D. TIC false positives (Water Sample = 10 pts. max.; Soil Sample = 10 pts. max.)		
Number of TIC false positives (1/1) X 1 point = (1/1) points deducted	1	1
Total number of I pts. deducted	6	3.5

II. Quantification of the TCL (150 points for water sample; 150 points for soil sample)

A. TCL quantification include VOA (Water Sample = 150 pts. max.; Soil Sample = 150 pts. max.)		
Number of compounds not within criteria (0/0) x 150 pts Number of compounds in study (8/8)/5 = (0/0) pts. ded.	0	0
Total number of II pts deducted	0	0

III. Quality Control (300 points)

A. Instrument Quality Control (150 points)

Number of pts deducted

1. Tuning (50 points)

b. BFB (50 pts. max.)

1. For any BFB performance tune analyzed separately or added to reagent water with any critical ions abundance ratios outside criteria deduct a maximum of 25 points. (Critical key ions are: 95, 96, 174, 175 176, 177.) 0

2. For any BFB performance tune analyzed separately or added to reagent water with any non-critical ions abundance ratios outside criteria deduct 2 points for each to a maximum of 25 points. (Non-critical key ions are: 50, 75, 173.) 0

3. Failure to perform a BFB tune at the 12-hour frequency, deduct a maximum of 50 pts. 0

2. Initial Calibration (50 points)

a. For initial calibration data for VOA with System Performance Check Compound (SPCC) average relative response factor (RRF) less than 0.300 (less than 0.250 for Bromoform) (25 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (10)
X 25 pts = (0) pts. ded. 0

b. For initial calibration data for VOA with Calibration Check Compound (CCC) percent relative standard deviation greater than 30%, (25 pts. max.)

compounds not within criteria, both fractions (0)
Total number of compounds, include both fractions (12)
X 25 pts. = (0) pts. ded. 0

c. Failure to perform initial calibration will result in the deduction of all the Quality Control points, which equals 300. 0

	Number of Pts. Deducted
3. Continuing Calibration (50 points)	
a. For continuing calibration data for VOA with System Performance Check Compound (SPCC) average relative response factor (RRF) less than 0.300 (less than 0.250 for Bromoform). (25 pts. max.)	
# compounds not within criteria, both fractions (0) Total number of compounds, include both fractions (10) X 25 pts. = (0) pts. ded.	0
b. For continuing calibration data for VOA with Calibration Check Compound (CCC) percent relative standard deviation greater than 25% (25 pts. max.)	
# compounds not within criteria, both fractions (0) Total number of compounds, include both fractions (12) X 25 pts. = (0) pts. ded.	0
c. Failure to perform continuing calibration will result in the deduction of all the continuing calibration points, which equals 50 points.	0
B. Sample/Method Quality Control (150 points)	
1. Surrogate Spike recovery (60 points) NOTE: Do not include Method Blanks.	
a. VOA (60 pts. max.)	
Number of surrogate compounds not within criteria (0) Total number of VOA surrogate compounds (12). X 60 pts. = (0) pts. deducted	0
2. Method Blank Analyses (60 points)	
Failure to perform the method blank analysis for any of the fractions will result in the deduction of 60 points.	
a. VOA surrogate recovery (30 pts. max.)	
Number of surrogate compounds not within criteria (0) Total number of VOA surrogate compounds (6) X 30 pts. = (0) pts. deducted.	0

	Number of Pts. Deducted
b. VOA method blank contamination (30 pts. max.). If one or more TCL compounds are detected in the method blank above the contract required quantitation limit (5X the CRQL for methylene chloride, acetone, toluene, and 2-butanone) deduct the maximum points, 30.	0
3. Matrix Spike/Matrix Spike Duplicate (30 points)	
a. Utilization of the wrong spiking concentration in one or more of the fractions will result in the deduction of 30 points.	NR
b. Failure to perform matrix spike or matrix spike duplicate analysis will result in the deduction of 30 points.	NR
Total number of III pts. deducted	0
IV. Reporting and Deliverables (100 points)	
A. BFB (25 points max)	
1. Mass listing and bar graph output submitted for each instrument and for every 12-hour period samples were analyzed. Deduct 25 points for any BFB violation.	0
B. RICs, Chromatograms, quantitation reports, and system printouts (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the statement of work.	0
C. Mass spectra (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the Statement of Work.	0
D. Contractual Forms (25 pts. max.)	
1. Deduct 25 points if any of the required deliverables are not submitted in accordance with the Statement of Work.	0
Total number of IV pts. deducted	0

COMMENTS

III.A.2 A separate initial 5-point calibration was submitted for the low water and medium soil volatiles.

State of Florida

Department of Health and Rehabilitative Services

OFFICE OF LABORATORY SERVICES

This is to Certify That

Versar, Inc.
ESM Operations
9200 Rumsey Road
Columbia, MD 21045-1934

has complied with Florida Administrative Code section 10D-41.100 for the examination of environmental water in the following categories:

Metals, Nutrients, Demands, Extractable Organics, General Parameters I, General Parameters II, Pesticides/Herbicides/PCB's, Purgeable Organics, Hazardous Waste Characteristics, Basic Environmental Laboratory**********

Specific methods, parameters, and analytes certified are on file in the Office of Laboratory Services, P.O. Box 210, Jacksonville, Florida 32231.

EFFECTIVE December 11, 1987 **through** June 30, 1988

1987 - 1988

DEPARTMENT OF HEALTH & REHABILITATIVE SERVICES STATE OF FLORIDA CERTIFICATE

No: 87132
Non-Transferable

Eldert C. Hartwig, Jr., Sc.D., M.P.H.
Laboratory Services Administrator
Office of Laboratory Services

HRS Form 1697, Mar 87

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

Recv 7/26/85

July 23, 1985

LAB ID: EL144

Water * Chemistry * Quality Assurance
Performance Evaluation Samples *
Volatile Organics * Study F025

MR JOSEPH ARLAUSKAS
LAB SUPERVISOR
ANALYTICAL CHEMISTRY LAB
MARTIN MARIETTA ENV SYSTEMS
9200 RUMSEY RD
COLUMBIA MD 21045

Dear Mr. Arlauskas:

Enclosed are the attachments which summarize the results of the Florida Department of Environmental Regulation Statewide Chemistry Laboratory Quality Assurance Program PERFORMANCE EVALUATION STUDY: F025 - VOLATILE ORGANICS.

1. TABLE
2. STATISTICAL SUMMARY

The TABLE lists by LAB ID number each laboratory which received VOLATILE ORGANICS - F025 samples and each result received prior to the due date.

The STATISTICAL SUMMARY shows the mean, the EXPECTED value, the standard deviation, the confidence intervals and the percent relative standard deviation for each concentration, and the Treatment of Data wherein terms are defined.

If there are any questions or comments concerning this Study - F025 or this Quality Assurance Program, please call Jack Merritt at 904/487-2571 or write.

Sincerely,

Jack Merritt

Jack Merritt
Chemistry Section

JM:ac
Enclosures
cc: File Reference: T.10.B.8.dd

D-994

FLORIDA DEPARTMENT OF ENIVRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS
STUDY F025

APRIL 1985

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS — STUDY - F025

LAB ID	Bromodichloromethane		Bromoform	
	(1) ug/l	(2) ug/l	(1) ug/l	(2) ug/l
EL001	1.52	6.11	2.09	7.55
EL003	5.1 *	16.1 *	7.7 *	28.4 *
EL009	2.30 *	8.16	3.18	9.01
EL010	----	----	----	----
EL012	1.3	4.1	1.4	2.9 *
EL013	0.601 *	5.57	2.06	6.91
EL017	1.21	6.56	1.43	5.97
EL018	1.55	5.39	2.00	6.00
EL020	1.55	5.88	2.00	6.75
EL023	2.0	6.3	2.5	7.7
EL024	1.45	6.74	2.24	6.12
EL026	----	----	----	----
EL033	1.6	6.6	2.5	7.5
EL039	1.4	5.4	1.5	5.0
EL046	0.91	4.87	1.45	7.78
EL048	1.7	5.6	2.2	6.6
EL050	1.3	4.7	1.4	5.2
EL054	1.0	4.2	1.3	5.6
EL056	----	----	----	----
EL058	----	----	----	----
EL062	9.63 *	19.8 *	6.45 *	16.2 *
EL075	----	----	----	----
EL076	----	----	----	----
EL078	1.5	5.8	2.3	6.7
EL087	1.0	6.2	2.9	9.7
EL088	1.4	7.0	2.2	8.5
EL089	2.0	8.1	2.5	9.2
EL090	1.4	5.6	2.2	5.9
EL094	0.9	4.9	2.0	6.5
EL096	12.3 *	15.8 *	3.08	9.88
EL103	----	----	----	----
EL108	0.32 *	1.8 *	0.38 *	2.0 *
EL113	1.4	6.6	2.0	7.8
EL115	1.8	7.1	2.3	8.4
EL116	----	----	----	----
EL118	2.18	5.20	-ND #	2.95 *
EL120	1.8	6.8	0 *	0 *
EL121	----	----	----	----
EL125	----	----	----	----
EL127	----	----	----	----
EL128	1.4	5.8	1.8	7.0
EL131	----	----	----	----
EL134	1.46	30.99 *	2.4	15.79 *
EL135	----	----	----	----
EL136	1.6	6.0	2.1	7.2
EL138	2.0	10 *	1.5	8.6
EL139	----	----	----	----
EL140	415 *	139 *	<10 #	<10 #
EL143	4.45 *	15.3 *	1.64	9.62
EL144	2	5	-ND #	6
Mean	1.51179	5.93857	2.07483	7.31035
Expected Value	1.5	5.93	2.18	7.43

MAILED →

---- Denotes missing data 996
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
# Denotes unusable data

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS STUDY - F025

Statistical Summary

(Concentration in micrograms per liter)

Parameter: Bromodichloromethane	(1)	(2)
Number of values used :	28.0	28.0
Mean Recovery :	1.51179	5.93857
Expected Value :	1.5	5.93
Standard Deviation :	.34049	1.00998
95% Confidence Interval :	.844424 - 2.17915	3.95901 - 7.91813
99% Confidence Interval :	.63332 - 2.39025	3.33282 - 8.54431
Percent Relative Std. Dev. :	22.5224	17.0071

Parameter: Bromoform	(1)	(2)
Number of values used :	29.0	28.0
Mean Recovery :	2.07483	7.31035
Expected Value :	2.18	7.43
Standard Deviation :	.500097	1.39508
95% Confidence Interval :	1.09464 - 3.05502	4.576 - 10.0447
99% Confidence Interval :	.784576 - 3.36508	3.71105 - 10.9097
Percent Relative Std. Dev. :	24.1031	19.0836

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FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS — STUDY - F025

LAB ID	Carbon Tetrachloride		Chloroform	
	(1) ug/l	(2) ug/l	(1) ug/l	(2) ug/l
EL001	2.05	7.82	8.99	31.69
EL003	3.8 *	11.7 *	9.2	28.4
EL009	2.70**	13.08 *	13.51 *	45.24
EL010	----	----	----	----
EL012	2.2	6.2	6.0	18
EL013	1.57	5.80	8.87	32.9
EL017	1.68	10.0	12.4	54.3 *
EL018	1.95	6.49	9.50	29.46
EL020	1.87	6.90	8.70	27.3
EL023	1.9	8.4	9.2	37.2
EL024	1.61	7.51	10.6	27.9
EL026	----	----	----	----
EL033	1.7	7.9	10	35
EL039	1.8	7.0	7.2	28.2
EL046	1.49	7.20	8.71	37.8
EL048	2.2	7.5	11.0	45.6
EL050	1.8	4.8	7.8	25.9
EL054	1.4	5.3	9.3	24.4
EL056	----	----	----	----
EL058	----	----	----	----
EL062	8.60 *	13.8 *	17.6 *	34.8
EL075	----	----	----	----
EL076	----	----	13	35
EL078	1.7	6.0	9.1	33
EL087	3.3 *	13.6 *	13.9 *	41.7
EL088	1.5	9.1	8.6	37.9
EL089	2.3	11.9 *	11.2	41.0
EL090	1.5	6.7	9.1	35
EL094	1.7	6.8	8.8	32
EL096	4.48 *	7.99	12.1	42.6
EL103	----	----	----	----
EL108	0.34 *	1.7 *	2.0 *	8.2 *
EL113	1.9	8.0	8.7	30.8
EL115	2.4	9.5	11.4	38.5
EL116	----	----	----	----
EL118	1.54	5.40	8.10	26.4
EL120	3.4 *	13.9 *	10.8	58.6 *
EL121	----	----	----	----
EL125	----	----	----	----
EL127	----	----	----	----
EL128	1.9	7.3	8.5	27.4
EL131	----	----	----	----
EL134	2.18	22.40 *	13.0	32.54
EL135	----	----	----	----
EL136	2.0	7.8	7.5	33
EL138	1.4	7.2	7.8	29
EL139	----	----	----	----
EL140	58 *	3 *	1954 *	469 *
EL143	0.82 *	3.65 *	6.99	28.1
EL144	2	6	8	27
Mean	1.855	7.1773	9.38	32.7494
Expected Value	1.95	7.5	9.0	32.25

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
# Denotes unusable data

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS STUDY - F025

Statistical Summary

(Concentration in micrograms per liter)

Parameter: Carbon Tetrachloride	(1)	(2)
Number of values used :	28.0	26.0
Mean Recovery :	1.855	7.1773
Expected Value :	1.95	7.5
Standard Deviation :	.321841	1.27052
95% Confidence Interval :	1.22419 - 2.48581	4.68709 - 9.66752
99% Confidence Interval :	1.02465 - 2.68535	3.89937 - 10.4552
Percent Relative Std. Dev. :	17.3499	17.7019

Parameter: Chloroform	(1)	(2)
Number of values used :	32.0	33.0
Mean Recovery :	9.38	32.7494
Expected Value :	9.0	32.25
Standard Deviation :	1.74449	6.30437
95% Confidence Interval :	5.9608 - 12.7992	20.3928 - 45.1059
99% Confidence Interval :	4.87922 - 13.8808	16.4841 - 49.0147
Percent Relative Std. Dev. :	18.598	19.2504

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FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS — STUDY - F025

LAB ID	1,2-Dichloroethane		Dibromochloromethane	
	(1) ug/l	(2) ug/l	(1) ug/l	(2) ug/l
EL001	1.49	11.97	2.02	7.99
EL003	4.5 *	21.2	3.5 *	13.1 *
EL009	2.40 *	26.5 *	2.63	10.35
EL010	----	----	----	----
EL012	1.3	19	1.6	3.9 *
EL013	0.291 *	17.8	2.04	8.14
EL017	1.79	17.2	2.32	5.03
EL018	1.65	16.13	3.65 *	8.03
EL020	3.76 *	17.8	5.00 *	8.20
EL023	1.5	21.1	2.7	9.2
EL024	2.37 *	16.7	2.31	7.38
EL026	----	----	----	----
EL033	1.3	18	2.4	9.0
EL039	1.2	15.9	1.6	7.5
EL046	1.77	18.1	1.03	5.85
EL048	1.5	20.0	2.1	7.5
EL050	1.4	14.0	1.4	5.9
EL054	1.6	3.0 *	1.6	6.5
EL056	----	----	----	----
EL058	----	----	----	----
EL062	2.36 *	5.97 *	11.1 *	22.4 *
EL075	----	----	----	----
EL076	----	24	----	----
EL078	1.8	19	2.3	8.0
EL087	0.9**	21.2	2.6	11.3
EL088	2.6 *	23.0	2.2	12.1 *
EL089	2.3 *	24.2	2.6	12.0
EL090	1.6	18	2.1	7.6
EL094	1.6	18	1.6	6.7
EL096	1.39	17.0	2.57	9.39
EL103	----	----	----	----
EL108	-ND #	-ND #	0.34 *	2.7 *
EL113	1.5	16.6	2.0	8.1
EL115	3.0 *	22.9	2.3	9.6
EL116	----	----	----	----
EL118	2.75 *	15.5	2.42	6.83
EL120	2.5 *	26.6 *	2.6	10.6
EL121	----	----	----	----
EL125	----	----	----	----
EL127	----	----	----	----
EL128	1.7	15.8	1.8	7.3
EL131	----	----	----	----
EL134	4.44 *	23.97	3.42 *	19.91 *
EL135	----	----	----	----
EL136	1.5	16	2.1	8.0
EL138	1.6	19	2.3	12
EL139	----	----	----	----
EL140	<10 #	37 *	43 *	21 *
EL143	1.45	10.4	4.03 *	18.2 *
EL144	1.5	15.7	-ND #	5
Mean	1.50182	18.2313	2.12	8.17821
Expected Value	1.5	16.65	1.95	8.03

---- Denotes missing data
* Denotes 'extreme' statistical outlier
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\# Denotes unusable data

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS STUDY - F025

Statistical Summary

(Concentration in micrograms per liter)

Parameter: 1,2-Dichloroethane	(1)	(2)
Number of values used :	22.0	31.0
Mean Recovery :	1.50182	18.2313
Expected Value :	1.5	16.65
Standard Deviation :	.207494	3.35813
95% Confidence Interval :	1.09513 - 1.90851	11.6494 - 24.8132
99% Confidence Interval :	.966484 - 2.03715	9.56732 - 26.8952
Percent Relative Std. Dev. :	13.8162	18.4196

Parameter: Dibromochloromethane	(1)	(2)
Number of values used :	27.0	28.0
Mean Recovery :	2.12	8.17821
Expected Value :	1.95	8.03
Standard Deviation :	.427911	1.8756
95% Confidence Interval :	1.28129 - 2.9587	4.50204 - 11.8544
99% Confidence Interval :	1.01599 - 3.22401	3.33916 - 13.0173
Percent Relative Std. Dev. :	20.1845	22.9341

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS — STUDY - F025

LAB ID	Tetrachloroethene		1,1,1-Trichloroethane	
	(1) ug/l	(2) ug/l	(1) ug/l	(2) ug/l
EL001	1.23	4.49	1.00	9.28
EL003	5.0 *	12.5 *	3.3 *	13.6
EL009	1.32	6.94	1.69 *	21.50 *
EL010	----	----	----	----
EL012	0.92	3.3	0.68	7.3
EL013	1.25	4.32	1.11	9.40
EL017	1.50	3.99	1.13	12.9
EL018	1.05	3.83	1.20	9.88
EL020	1.18	4.79	1.09	10.5
EL023	1.3	5.0	1.1	12.8
EL024	0.93	3.66	0.99	9.71
EL026	----	----	----	----
EL033	1.2	4.6	0.97	11
EL039	1.2	4.2	1.2	9.2
EL046	0.97	3.97	1.15	12.2
EL048	1.2	4.4	1.2	11.6
EL050	1.2	5.4	0.9	9.2
EL054	1.0	3.9	0.7	8.1
EL056	----	----	----	----
EL058	----	----	----	----
EL062	6.68 *	14.4 *	3.75 *	16.7 *
EL075	----	----	----	----
EL076	----	----	----	17 *
EL078	1.1	4.3	1.3	13
EL087	1.0	6.2	2.8 *	18.8 *
EL088	1.0	4.8	1.0	14.4
EL089	1.7**	6.6	1.4	16.2 *
EL090	1.1	4.7	1.4	12
EL094	1.4	4.8	1.2	11
EL096	0.77	4.89	1.61 *	10.1
EL103	----	----	----	----
EL108	0.16 *	0.61 *	0.46 *	2.8 *
EL113	1.4	4.0	1.1	10.3
EL115	1.8 *	6.2	1.8 *	13.3
EL116	----	----	----	----
EL118	1.05	3.21	1.22	9.76
EL120	0 *	5.0	1.6 *	15.4
EL121	----	----	----	----
EL125	----	----	----	----
EL127	----	----	----	----
EL128	1.9 *	5.2	1.1	11.2
EL131	----	----	----	----
EL134	6.14 *	26.58 *	2.59 *	28.75 *
EL135	----	----	----	----
EL136	1.2	4.8	1.0	9.5
EL138	0.84	5.1	1.1	11
EL139	----	----	----	----
EL140	38 *	12 *	67 *	36 *
EL143	0.83	4.69	3.11 *	10.2
EL144	1.3	4.2	3 *	11
Mean	1.14786	4.6929	1.09333	10.9941
Expected Value	1.2	4.65	1.05	10.73

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS

STUDY - F025

Statistical Summary

(Concentration in micrograms per liter)

Parameter: Tetrachloroethene	(1)	(2)
Number of values used :	28.0	31.0
Mean Recovery :	1.14786	4.6929
Expected Value :	1.2	4.65
Standard Deviation :	.212801	.883448
95% Confidence Interval :	.730767 - 1.56495	2.96134 - 6.42446
99% Confidence Interval :	.598831 - 1.69688	2.4136 - 6.9722
Percent Relative Std. Dev. :	18.539	18.8252

Parameter: 1,1,1-Trichloroethane	(1)	(2)
Number of values used :	24.0	29.0
Mean Recovery :	1.09333	10.9941
Expected Value :	1.05	10.73
Standard Deviation :	.175986	1.88654
95% Confidence Interval :	.748401 - 1.43826	7.2965 - 14.6918
99% Confidence Interval :	.639289 - 1.54738	6.12685 - 15.8614
Percent Relative Std. Dev. :	16.0963	17.1596

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS — STUDY - F025

LAB ID	Trichloroethene (1) ug/l	Trichloroethene (2) ug/l
EL001	2.22	8.57
EL003	4.8 *	13.6 *
EL009	2.90	12.48
EL010	----	----
EL012	1.4	5.2
EL013	2.59	9.93
EL017	1.49	6.85
EL018	1.90	7.96
EL020	2.25	8.28
EL023	2.4	10.2
EL024	2.05	7.18
EL026	----	----
EL033	2.3	9.5
EL039	2.2	8.0
EL046	2.05	8.31
EL048	3.5 *	10.3
EL050	2.3	8.6
EL054	3.9 *	11.2
EL056	----	----
EL058	----	----
EL062	6.50 *	17.3 *
EL075	----	----
EL076	----	8
EL078	2.1	9.0
EL087	2.9	11.3
EL088	1.9	12.0
EL089	3.1	12.2
EL090	2.3	9.6
EL094	2.1	8.4
EL096	2.31	8.69
EL103	----	----
EL108	0.26 *	3.1 *
EL113	2.8	8.3
EL115	4.0 *	15.8 *
EL116	----	----
EL118	2.01	6.98
EL120	4.1 *	18.3 *
EL121	----	----
EL125	----	----
EL127	----	----
EL128	2.1	8.2
EL131	----	----
EL134	3.57 *	17.21 *
EL135	----	----
EL136	2.1	8.5
EL138	2.1	7.9
EL139	----	----
EL140	85 *	22 *
EL143	0.86 *	4.22 *
EL144	2.3	7.8
Mean	2.23731	8.94586
Expected Value	2.18	9.0

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

APRIL 1985

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

VOLATILE ORGANICS ANALYSIS

STUDY - F025

Statistical Summary

(Concentration in micrograms per liter)

Parameter: Trichloroethene	(1)	(2)
Number of values used :	26.0	29.0
Mean Recovery :	2.23731	8.94586
Expected Value :	2.18	9.0
Standard Deviation :	.390697	1.70464
95% Confidence Interval :	1.47154 - 3.00307	5.60476 - 12.287
99% Confidence Interval :	1.22931 - 3.24531	4.54788 - 13.3438
Percent Relative Std. Dev. :	17.4628	19.0551

Treatment of Data

1. For a particular sample, the EXPECTED VALUE C was taken as that concentration which the fully diluted sample as prepared for analysis would be if the chemical(s) and D.I. water used to prepare the solution in the ampul were pure and that concentration was made up accurately. However, this value was not verified by external laboratories doing multiple analyses; thus, it cannot be said to be the 'true value'.

2. The EXPECTED value C was used to omit Extreme Statistical Outliers, i.e., outside of range $(C \div 2 \leq x_i \leq C \cdot 1.5)$.

3. The Mean and Standard Deviation were calculated as:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \quad \text{and} \quad s = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n - 1}}$$

4. The Confidence Intervals were computed as:

$\bar{x} \pm 1.96 \cdot s$ - - - 95% Confidence Interval, and

$\bar{x} \pm 2.58 \cdot s$ - - - 99% Confidence Interval.

5. Percent Relative Standard Deviation:

$$\frac{s \cdot 100}{\bar{x}}$$

6. Statistical sets of data with less than six sample points (results) are not considered to yield useful information. Therefore, only the mean and the number of results used to generate that mean are presented when less than six results were inside of the range used to omit Extreme Statistical Outliers.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

August 12, 1985

MR JOSEPH ARLAUSKAS
SUPERVISOR
MARTIN MARIETTA ENV SYS
ANALYTICAL CHEMISTRY LAB
9200 RUMSEY RD
COLUMBIA MD 21045

Dear Mr. Arlauskas:

In response to your telecom request to receive an update of the Martin Marietta Environmental Systems Analytical Chemiistry Lab in Columbia, Maryland, please see below.

The above-mentioned laboratory has satisfactorily performed the Volatile Organics Performance Evaluation Tests, STUDY FO25 and is approved for that category; the laboratory has requested participation in other categories - Trace Metals, Minerals, Pesticides, PCB's, Total Cyanide and Priority Pollutants, but has not yet had the opportunity to participate in these categories as these categories have not been sent out by the Florida Department of Environmental Regulation Statewide Environmental Chemistry Laboratory Quality Assurance Program since this laboratory requested to participate.

If there are questions regarding the above, please write or call Jack Merritt at 904/487-2571.

Sincerely,

Jack Merritt

JM:ac

D-1007

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

December 20, 1985

LAB ID: EL144

Water * Chemistry Section * Quality Assurance * Laboratory Performance Evaluation * Results and Summary Statistics * Cyanide * F029 *

MR JOSEPH ARLAUSKAS
SUPERVISOR
MARTIN MARIETTA ENV SYS
ANALYTICAL CHEMISTRY LAB
9200 RUMSEY RD
COLUMBIA, MD 21045

Dear Mr. Arlauskas:

Enclosed are the attachments which summarize the results of the Florida Department of Environmental Regulation Statewide Chemistry Laboratory Quality Assurance Program PERFORMANCE EVALUATION STUDY F029, CYANIDE:

1. TABLE
2. STATISTICAL SUMMARY

The TABLE lists by LAB ID number each laboratory which received CYANIDE, F029 samples and each result received prior to the due date.

The STATISTICAL SUMMARY shows the mean, the EXPECTED value for each concentration. The standard deviation, the confidence intervals and the percent relative standard deviation for each concentration is given where six or more results were submitted. The Treatment of Data, wherein terms are defined, is presented on the last page.

If there are any questions or comments concerning this Study-F029 or this Quality Assurance Program, please call Jack Merritt at 904/487-2571 or write.

Sincerely,

Jack Merritt

Jack Merritt
Chemistry Section

JM/ac
Enclosures
cc: File Reference: T.10.B.8.jj.

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

CYANIDE ANALYSIS
STUDY F029

NOVEMBER 1985

D-1009

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

CYANIDE SAMPLE ANALYSIS STUDY - F029

LAB ID	TOT CYANIDE (1) ug/l	TOT CYANIDE (2) ug/l
EL001	----	----
EL003	109	327
EL009	----	----
EL012	----	----
EL013	----	----
EL014	251.	514.
EL016	164	271
EL017	207	391
EL018	151	94 *
EL020	180	369
EL022	----	----
EL023	183	432
EL024	189	397
EL027	----	----
EL033	140	530
EL034	170.3	----
EL039	216.0	480.6
EL048	215.	416.
EL049	----	----
EL050	256	556
EL054	210	430
EL056	200	460
EL058	----	----
EL062	198.	355.
EL068	----	----
EL076	150	300
EL078	350 *	580
EL084	----	----
EL087	145	340
EL088	220	440
Mean	188.713	410.149
Expected Value	200	410

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

CYANIDE SAMPLE ANALYSIS STUDY - F029

LAB ID	TOT CYANIDE (1) ug/l	TOT CYANIDE (2) ug/l
EL089	240	485
EL094	172	383
EL096	----	----
EL097	120	400
EL103	----	----
EL105	----	----
EL106	192	373
EL108	144	348
EL110	148	355
EL113	203	406
EL115	211	381
EL120	226	472
EL121	194	409
EL123	329 *	691 *
EL126	200	380
EL127	162	402
EL129	202	479
EL130	140	320
EL135	27.5 *	10.0 *
EL138	156	351
EL139	----	----
EL141	180	375
EL142	278.81	415.92
EL144	200	380
EL150	----	----
EL152	----	----
EL154	248	472
Mean	188.713	410.149
Expected Value	200	410

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FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

CYANIDE SAMPLE ANALYSIS STUDY - F029

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	TOT CYANIDE(1)	TOT CYANIDE(2)
Number of values used :	38	37
Mean Recovery :	188.713	410.149
Expected Value :	200.0	410.0
Standard Deviation :	38.9575	69.8978
95% Confidence Interval :	112.357 - 265.07	273.149 - 547.149
99% Confidence Interval :	88.2031 - 289.224	229.813 - 590.485
Percent Relative Std. Dev. :	20.6437	17.042

Treatment of Data

1. For a particular sample, the EXPECTED VALUE C was taken as that concentration which the fully diluted sample as prepared for analysis would be if the chemical(s) and D.I. water used to prepare the solution in the ampul were pure and that concentration was made up accurately. However, this value was not verified by external laboratories doing multiple analyses; thus, it cannot be said to be the 'true value'.

2. The EXPECTED value C was used to omit Extreme Statistical Outliers, i.e., outside of range $(C \div 2 \leq x_i \leq C \cdot 1.5)$.

3. The Mean and Standard Deviation were calculated as:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \quad \text{and} \quad s = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n - 1}}$$

4. The Confidence Intervals were computed as:

   $\bar{x} \pm 1.96 \cdot s$ - - - 95% Confidence Interval, and

   $\bar{x} \pm 2.58 \cdot s$ - - - 99% Confidence Interval.

5. Percent Relative Standard Deviation:

$$\frac{s \cdot 100}{\bar{x}}$$

6. Statistical sets of data with less than six sample points (results) are not considered to yield useful information. Therefore, only the mean and the number of results used to generate that mean are presented when less than six results were inside of the range used to omit Extreme Statistical Outliers.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

July 10, 1986

LAB ID: EL144

Water * Chemistry Section * Quality Assurance * Laboratory Performance Evaluation * Results and Summary Statistics * TRACE METALS ANALYSES * F031 *

MR JOSEPH ARLAUSKAS
SUPERVISOR
MARTIN MARIETTA ENV SYS
ANALYTICAL CHEMISTRY LAB
9200 RUMSEY RD
COLUMBIA, MD 21045

Dear Mr. Arlauskas:

Enclosed are the attachments which summarize the results of the Florida Department of Environmental Regulation Statewide Chemistry Laboratory Quality Assurance Program PERFORMANCE EVALUATION STUDY F031, TRACE METALS:

1. TABLE
2. STATISTICAL SUMMARY

The TABLE lists by LAB ID number each laboratory which received TRACE METALS ANALYSES, F031 samples and each result received prior to the due date.

The STATISTICAL SUMMARY shows the mean and the EXPECTED value for each concentration. The standard deviation, the confidence intervals and the percent relative standard deviation for each concentration are also given. The Treatment of Data, wherein terms are defined, is presented on the last page.

If there are any questions or comments concerning this Study-F031 or this Quality Assurance Program, please call Jack Merritt at 904/487-2571 or write.

Sincerely,

Jack Merritt

Jack Merritt
Chemistry Section

JM/ac
Enclosures
cc: File Reference: T.10.B.8.11.

D-1014

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS ANALYSES
STUDY F031

May 1986

D-1015

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	ALUMINUM		ARSENIC	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL001	----	----	----	----
EL003	----	----	80.7	448.6
EL009	1000	748	85.1	457
EL010	1150.	920.	108.	542.
EL012	1020	780	71	516
EL013	----	----	88.0	572
EL014	990.	800.	95.	480.
EL016	----	----	----	----
EL017	1040	841	87.6	503
EL018	1085.1	773.5	88.78	487.0
EL019	----	----	----	----
EL020	1060	710	6.6 *	13.7 *
EL021	----	----	----	----
EL023	1120	901	78.5	482
EL024	980	741	83.0	456
EL025	----	----	86.4	444.
EL028	1034	782	90.4	500
EL030	1060	808	77.8	548
EL032	----	----	72	350
EL033	975	740	88	480
EL038	----	----	----	----
EL039	1030	770	77.7	450
EL042	----	----	87.9	476.
EL045	----	----	----	----
EL046	858	690	77.7	406
EL048	1024	794.5	80.04	458.3
EL049	925	740	96	650
EL050	977	724	88	450
EL054	977	592	97	541
EL055	964	748	----	----
EL056	----	----	----	----
EL058	----	----	----	----
EL062	949.0	731.0	85.0	451.0
EL064	----	----	----	----
EL065	1210.	810.	85.5	495.
EL068	1150	887	93	452
EL069	----	----	----	----
EL070	1045	752	88.5	451
EL072	----	----	----	----
EL076	1000	720	100	600
EL078	1100	720	87	460
EL079	965	845	85.0	430
EL081	1120	809	91.3	474
EL083	1202	826	82.96	469
EL084	1050	810	73.5	468
EL085	----	----	----	----
Mean	1024.71	770.344	86.4517	483.239
Expected Value	1074	815	84.1	468

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	ALUMINUM		ARSENIC	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL088	900	650	87	525
EL089	910	610	96	518
EL090	1054	766	93.4	613
EL094	1040	880	49.9**	314
EL096	1120	892	90.5	452
EL097	1100	800	90	550
EL103	1098	815	88	497
EL104	----	----	100	335
EL105	1040	810	90	580
EL106	1100	890	93.0	464
EL107	----	----	84	424
EL108	883	654	118.6**	460.6
EL110	749**	856	78.4	420
EL111	----	----	----	----
EL113	1068	805	85	494
EL115	1100	850	77.9	460
117	1000	725	24 *	640
EL120	1110	810	87.5	456
EL121	952	892	86.7	544
EL123	1140	500**	30 *	158 *
EL126	1060	754	85	491
EL127	895	655	94.8	445
EL129	994	767	86.4	443
EL130	1090	820	----	----
EL133	----	----	----	----
EL134	913	1440 *	81.0	447
EL135	33.75 *	10.7 *	5.0 *	25.0 *
EL136	281.8 *	198.6 *	253 *	439
EL137	----	----	----	----
EL138	1120	816	95.4	500
EL139	----	----	----	----
EL141	961	763	79	413
EL142	1005	850.0	95.33	555.3
EL144	1030	788	85	455
EL145	----	----	73.4	442
EL146	1000	500**	----	----
EL148	990	740	65.6	429.
EL150	----	----	----	----
EL151	688**	660	110	690**
EL152	1110	704	82.1	404
EL154	1040	770	84	470
EL160	----	----	6 *	80 *
EL161	1130	891	81.9	550
EL162	----	----	81.7	527
EL164	1082	795	----	----
Mean	1024.71	770.344	86.4517	483.239
Expected Value	1074	815	84.1	468

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# Denotes unusable data

MAY 1986

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	ALUMINUM(1)	ALUMINUM(2)
Number of values used :	62	61
Mean Recovery :	1024.71	770.344
Expected Value :	1074.0	815.0
Standard Deviation :	96.0719	88.0844
95% Confidence Interval :	836.41 - 1213.01	597.699 - 942.99
99% Confidence Interval :	776.846 - 1272.58	543.086 - 997.602
Percent Relative Std. Dev. :	9.37551	11.4344

Parameter :	ARSENIC (1)	ARSENIC (2)
Number of values used :	64	66
Mean Recovery :	86.4517	483.239
Expected Value :	84.1	468.0
Standard Deviation :	10.1658	68.0754
95% Confidence Interval :	66.5267 - 106.377	349.811 - 616.667
99% Confidence Interval :	60.2239 - 112.679	307.605 - 658.874
Percent Relative Std. Dev. :	11.759	14.0873

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	BERYLLIUM		CADMIUM	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL001	----	----	393	104
EL003	112	836	371.8	92.4
EL009	104	905	385	90.1
EL010	137.	862.	530.**	121.**
EL012	113	920	395	92
EL013	158**	1490 *	326	93.1
EL014	109.	920.	322.	92.
EL016	----	----	----	----
EL017	116	998	404	92.5
EL018	----	----	411.7	102.8
EL019	----	----	370	90
EL020	96	850	365	85
EL021	----	----	----	----
EL023	105	1050	368	86
EL024	107	920	359	92.0
EL025	----	----	382.	86.7
EL028	126	1000	428	93.2
EL030	116	1010	396	93.7
EL032	----	----	411	87
EL033	94	908	89 *	394 *
EL038	----	----	398	94.3
EL039	111	944	387	99.8
EL042	----	----	398.	90.7
EL045	----	----	362	76
EL046	138	992	352	720 *
EL048	110.6	1036	379.0	121.7**
EL049	108	960	390	90
EL050	106	897	378	92.5
EL054	110	914	358	92
EL055	----	----	288	35.4 *
EL056	----	----	----	----
EL058	----	----	----	----
EL062	117.0	1010.	350.0	77.0
EL064	----	----	392	85
EL065	----	780.	----	----
EL068	----	----	455	113
EL069	----	----	394	78
EL070	117	951	395	90.9
EL072	----	----	----	----
EL076	130	1100	340	80
EL078	130	1000	390	88
EL079	135	685**	292	78.0
EL081	303 *	930	5.0 *	8.8 *
EL083	----	----	422	101
EL084	----	----	410	92
EL085	----	----	----	----
Mean	114.706	942.031	386.437	92.1427
Expected Value	111	951	391	90.4

---- Denotes missing data
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# Denotes unusable data

MAY 1986

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

LAB ID	BERYLLIUM		CADMIUM	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL088	115	990	415	110
EL089	105	950	413	100
EL090	108	951	360	81
EL094	99.0	735	379	99.0
EL096	222 *	1700 *	418	102
EL097	110	940	390	90
EL103	110	820	400	92
EL104	----	----	350	94
EL105	111	963	385	88
EL106	114	960	385	90.5
EL107	----	----	372	84
EL108	117	199 *	380	100
EL110	181 *	1082	408	87.7
EL111	----	----	380	90
EL113	108	930	396	92
EL115	112	990	395	90.0
117	----	----	405	90.9
EL120	120	1051	345	80
EL121	114	918	415	90.8
EL123	----	----	465	128**
EL126	----	----	408	90.4
EL127	112	1140	360	81.4
EL129	113	967	368	89.8
EL130	110	971	372	86.3
EL133	----	----	----	----
EL134	130	928.6	358	85
EL135	400.0 *	980.0	130.0 *	33.0 *
EL136	----	----	347.3	80.5
EL137	----	----	----	----
EL138	110	928	413	91.9
EL139	----	----	----	----
EL141	111	954	390	91
EL142	108.6	921.0	396.3	92.95
EL144	112	941	390	87
EL145	----	----	394	89.0
EL146	----	----	367	85
EL148	----	----	398.	94.
EL150	----	----	374	87
EL151	98	930	360	78
EL152	----	----	387	92.3
EL154	----	----	400	90
EL160	----	----	397	102
EL161	142	906	544**	124**
EL162	98.0	840	370	87.0
EL164	127.4	979	345	85
Mean	114.706	942.031	386.437	92.1427
Expected Value	111	951	391	90.4

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** Denotes outside 99% confidence interval
\# Denotes unusable data

MAY 1986

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	BERYLLIUM(1)	BERYLLIUM(2)
Number of values used :	49	51
Mean Recovery :	114.706	942.031
Expected Value :	111.0	951.0
Standard Deviation :	12.5332	83.0123
95% Confidence Interval :	90.1411 - 139.271	779.327 - 1104.74
99% Confidence Interval :	82.3706 - 147.042	727.86 - 1156.2
Percent Relative Std. Dev. :	10.9263	8.81205

Parameter :	CADMIUM (1)	CADMIUM (2)
Number of values used :	78	76
Mean Recovery :	386.437	92.1427
Expected Value :	391.0	90.4
Standard Deviation :	38.4653	10.2878
95% Confidence Interval :	311.045 - 461.829	71.9785 - 112.307
99% Confidence Interval :	287.197 - 485.678	65.6001 - 118.685
Percent Relative Std. Dev. :	9.95384	11.1651

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	CHROMIUM		COBALT	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL001	75	952	----	----
EL003	68.9	889.2	----	----
EL009	51.7	902	725	277
EL010	77.7	1070.	967.**	322.
EL012	56	880	751	301
EL013	5.49 *	7.15 *	700	280
EL014	46.2	624.**	778.	298.
EL016	----	----	----	----
EL017	53.4	879	724	295
EL018	66.88	874.9	----	----
EL019	40	910	----	----
EL020	650 *	1080	840	295
EL021	----	----	----	----
EL023	75	936	700	300
EL024	58.0	843	683	273
EL025	65.7	985.	868.	398.**
EL028	72.4	907	738	287
EL030	59.4	928	800	300
EL032	59	890	660	384
EL033	69	930	930	312
EL038	56.2	906	----	----
EL039	54.6	918	771	304
EL042	71.3	907.	----	----
EL045	55	795	----	----
EL046	61.2	1015	718	296
EL048	104.4 *	835.0	755.0	302.9
EL049	66	952	740	280
EL050	68.0	1000	835	336
EL054	84	940	759	307
EL055	60.2	806	692	234
EL056	----	----	----	----
EL058	----	----	----	----
EL062	80.0	743.0	758.0	315.0
EL064	----	----	----	----
EL065	65.0	907.	780.	306.
EL068	77	986	794	319
EL069	----	----	----	----
EL070	66.8	949	729	290
EL072	69	949	----	----
EL076	50	920	740	260
EL078	65	870	720	280
EL079	63.9	900	745	275
EL081	61.9	828	27.8 *	59.4 *
EL083	68.1	948	----	----
EL084	72	1030	----	----
EL085	----	----	----	----
Mean	64.8247	910.159	755.467	292.84
Expected Value	66.2	916	762	303

---- Denotes missing data
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** Denotes outside 99% confidence interval
# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	CHROMIUM		COBALT	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL088	78	915	765	243
EL089	63	958	730	260
EL090	82	867	732	289
EL094	62.7	860	730	280
EL096	69.8	938	808	288
EL097	70	950	720	290
EL103	71	1030	755	275
EL104	71	800	----	----
EL105	45	1016	436**	171**
EL106	72	1016	847	351
EL107	44	1027	742	307
EL108	60.5	609.5**	808	209
EL110	104 *	940	747	282
EL111	----	1210**	----	----
EL113	65	911	787	311
EL115	67.9	918	760	303
117	100 *	725	----	----
EL120	65	830	263 *	658 *
EL121	63.9	904	761	298
EL123	80	945	----	----
EL126	73.5	1020	858	303
EL127	76.9	903	785	322
EL129	65.5	869	708	280
EL130	60.7	893	759	297
EL133	----	----	----	----
EL134	100 *	922	822	185**
EL135	178.6 *	357.0 *	550.0**	230.8
EL136	37.8	872	679	300
EL137	----	----	----	----
EL138	63.0	885	746	288
EL139	----	----	----	----
EL141	69	932	776	300
EL142	56.10	966.5	----	----
EL144	70	922	790	310
EL145	54.8	966	----	----
EL146	63	89 *	----	----
EL148	70.3	939.	----	----
EL150	84	862	----	----
EL151	80	107 *	646	300
EL152	38	524**	----	----
EL154	54	870	800	340
EL160	70	943	----	----
EL161	68.5	1010	868	343
EL162	72	920	766	297
EL164	----	----	736.1	305
Mean	64.8247	910.159	755.467	292.84
Expected Value	66.2	916	762	303

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	CHROMIUM(1)	CHROMIUM(2)
Number of values used :	72	76
Mean Recovery :	64.8247	910.159
Expected Value :	66.2	916.0
Standard Deviation :	10.5082	99.9527
95% Confidence Interval :	44.2286 - 85.4208	714.252 - 1106.07
99% Confidence Interval :	37.7135 - 91.9358	652.281 - 1168.04
Percent Relative Std. Dev. :	16.2102	10.9819

Parameter :	COBALT (1)	COBALT (2)
Number of values used :	58	58
Mean Recovery :	755.467	292.84
Expected Value :	762.0	303.0
Standard Deviation :	78.6212	38.0665
95% Confidence Interval :	601.37 - 909.565	218.229 - 367.45
99% Confidence Interval :	552.624 - 958.31	194.628 - 391.051
Percent Relative Std. Dev. :	10.407	12.9991

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	COPPER		IRON	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL001	647	108	1419	980
EL003	673.6	106.2	1430	1004
EL009	628	103	1460	1000
EL010	642.	104.	1690.	1230.
EL012	666	107	1571	1130
EL013	750	120	1600	1140
EL014	658.	108.	1623.	1100.
EL016	----	----	----	----
EL017	696	108	1437	1069
EL018	595.0	101.3	1675	1266.5
EL019	650	100	2040**	1520**
EL020	705	110	1640	1250
EL021	----	----	----	----
EL023	668	106	1610	1180
EL024	660	103	1460	1060
EL025	71.8 *	1032. *	----	----
EL028	695	106	1445	1015
EL030	713	133	1520	1180
EL032	680	109	1520	1130
EL033	670	102	1578	1044
EL038	704	109	1343	980
EL039	676	110	1629	1085
EL042	683.	112.	1520.	1050.
EL045	676	112	1392	1045
EL046	795	113	1418	1376**
EL048	643.2	108.5	1492	1140
EL049	669	102	1502	1074
EL050	715	115	1570	1135
EL054	699	110	1430	978
EL055	689	97.1	1280	828
EL056	----	----	----	----
EL058	----	----	----	----
EL062	768.0	117.0	1980.**	1230.
EL064	621	92	1480	1070
EL065	671.	95.5	1520.	1050.
EL068	666	115	1660	1180
EL069	746	118	1440	1029
EL070	673	111	1527	1110
EL072	706	118	----	----
EL076	640	110	1500	880
EL078	620	99	1500	1100
EL079	690	100	1500	1000
EL081	25.5 *	122	599 *	740**
EL083	723	114	1500	1100
EL084	750	114	1800	1200
EL085	----	----	----	----
Mean	686.231	109.604	1541.39	1097.75
Expected Value	694	110	1558	1120

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

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FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

LAB ID	COPPER		IRON	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL088	690	120	1555	1120
EL089	699	108	1620	1110
EL090	658	110	1498	1063
EL094	624	104	1450	1020
EL096	699	111	100 *	107 *
EL097	670	110	1500	1100
EL103	711	118	1638	1019
EL104	650	92	1450	1050
EL105	600	97	1520	1100
EL106	675	110	1510	1085
EL107	685	104	1535	1119
EL108	720	90	1480	1060
EL110	698	108	1460	1060
EL111	660	110	1410	1000
EL113	676	108	1543	1113
EL115	686	109	1600	1130
117	680	112	1500	1100
EL120	700	110	1540	1085
EL121	688	111	1570	1130
EL123	912**	158**	1650	1180
EL126	674	113	1520	1110
EL127	660	102	1760	1005
EL129	712	108	1471	1003
EL130	685	110	1500	1090
EL133	----	----	----	----
EL134	650	155**	1580	1225
EL135	800.0	350.0 *	205.9 *	412.0 *
EL136	672	108	1486	1090
EL137	----	----	----	----
EL138	702	103	1590	1100
EL139	----	----	----	----
EL141	705	113	1540	1160
EL142	674.9	109.6	1492	1101
EL144	751	112	1600	1150
EL145	696	98.7	1580	1250
EL146	681	110	1510	1000
EL148	650.	108.	160. *	116. *
EL150	674	113.	1493	1103
EL151	696	108	410 *	1200
EL152	716	114	1510	1120
EL154	690	105	1680	1160
EL160	682	112	1473	1089
EL161	658	105	1700	1260
EL162	666	107	1580	1120
EL164	689	115	1351	966
Mean	686.231	109.604	1541.39	1097.75
Expected Value	694	110	1558	1120

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	COPPER (1)	COPPER (2)
Number of values used :	81	81
Mean Recovery :	686.231	109.604
Expected Value :	694.0	110.0
Standard Deviation :	44.7835	10.2085
95% Confidence Interval :	598.455 - 774.006	89.5949 - 129.612
99% Confidence Interval :	570.689 - 801.772	83.2656 - 135.942
Percent Relative Std. Dev. :	6.52602	9.31406

Parameter :	IRON (1)	IRON (2)
Number of values used :	76	78
Mean Recovery :	1541.39	1097.75
Expected Value :	1558.0	1120.0
Standard Deviation :	120.317	107.821
95% Confidence Interval :	1305.57 - 1777.22	886.42 - 1309.08
99% Confidence Interval :	1230.98 - 1851.81	819.571 - 1375.93
Percent Relative Std. Dev. :	7.8057	9.82202

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
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TRACE METALS STUDY - F031

LAB ID	LEAD		MANGANESE	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL001	260	504	678	213
EL003	187.7	495.2	667.7	201.3
EL009	232	526	763	242
EL010	291.	654.	940	323**
EL012	260	563	812	256
EL013	300	600	810	295
EL014	248.	553.	800.	246.
EL016	----	----	----	----
EL017	259	559	768	247
EL018	232.1	523.9	856.0	232.0
EL019	200	590	----	----
EL020	280	582	840	272
EL021	----	----	----	----
EL023	570.*	240 *	794	242
EL024	213	501	739	234
EL025	454. *	715.**	886.	275.
EL028	236	540	821	250
EL030	266	622	834	260
EL032	218	520	770	260
EL033	251	558	771	229
EL038	266	572	759	239
EL039	185	515	862	264
EL042	251.	579.	751.	247.
EL045	----	----	775	242
EL046	296	620	795	265
EL048	266.5	459.6	943.4	223.0
EL049	246	539	804	262
EL050	275	550	830	260
EL054	259	546	779	211
EL055	275	342**	703	170**
EL056	----	----	----	----
EL058	----	----	----	----
EL062	215.0	372.0**	754.0	235.0
EL064	190	670	----	----
EL065	243.	530.	----	264.
EL068	296	623	843	266
EL069	270	580	640	190
EL070	263	576	793	253
EL072	----	----	----	----
EL076	250	530	770	240
EL078	240	520	780	250
EL079	240	530	800	235
EL081	251	540	49.8 *	72.2 *
EL083	231	508	791	240
EL084	----	----	820	250
EL085	----	----	----	----
Mean	249.851	551.305	794.846	245.747
Expected Value	250	556	803	252

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	LEAD		MANGANESE	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL088	304	575	840	230
EL089	241	526	785	237
EL090	241	538	737	250
EL094	228	464	769	233
EL096	265	582	736	237
EL097	260	570	800	230
EL103	248	589	835	234
EL104	210	540	790	230
EL105	220	522	787	244
EL106	250	555	802	256
EL107	228	483	807	241
EL108	250.1	584.9	862	261
EL110	252	562	805	255
EL111	270	640	----	----
EL113	255	566	796	248
EL115	252	563	809	257
117	240	510	850	247
EL120	310	644	757	234
EL121	262	577	800	243
EL123	342**	738**	978	321**
EL126	255	552	847	247
EL127	245	550	794	259
EL129	235	530	764	216
EL130	250	559	765	242
EL133	----	----	----	----
EL134	236.3	577	799	260
EL135	560.0 *	440.0	212.5 *	104.2 *
EL136	244	510	780	245
EL137	----	----	----	----
EL138	237	517	804	243
EL139	----	----	----	----
EL141	252	558	790	247
EL142	256.2	571.2	786.8	251.7
EL144	250	552	818	251
EL145	242	533	811	267
EL146	500 *	243 *	----	----
EL148	242	520	771	243
EL150	240	547	----	----
EL151	259	508	498**	142**
EL152	213	475	812	250
EL154	250	560	800	230
EL160	223	529	770	243
EL161	269	623	1060**	361**
EL162	263	571	747	241
EL164	256.8	583	714.7	221
Mean	249.851	551.305	794.846	245.747
Expected Value	250	556	803	252

---- Denotes missing data
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\# Denotes unusable data

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ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	LEAD (1)	LEAD (2)
Number of values used :	76	78
Mean Recovery :	249.851	551.305
Expected Value :	250.0	556.0
Standard Deviation :	27.0514	60.3324
95% Confidence Interval :	196.83 - 302.872	433.054 - 669.556
99% Confidence Interval :	180.059 - 319.644	395.648 - 706.962
Percent Relative Std. Dev. :	10.827	10.9436

Parameter :	MANGANESE(1)	MANGANESE(2)
Number of values used :	74	75
Mean Recovery :	794.846	245.747
Expected Value :	803.0	252.0
Standard Deviation :	71.4103	28.8186
95% Confidence Interval :	654.882 - 934.81	189.262 - 302.231
99% Confidence Interval :	610.607 - 979.084	171.395 - 320.098
Percent Relative Std. Dev. :	8.98418	11.7269

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ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

LAB ID	MERCURY		NICKEL	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL001	----	----	277	163**
EL003	6.38	27.14	222.2	112.3
EL009	7.61	22.9	276	123
EL010	5.18	18.8	237.	106.
EL012	7.5	25	288	122
EL013	6.21	23.5	280	115
EL014	4.3	14.7	285.	120.
EL016	----	----	----	----
EL017	7.53	10.3 *	278	117
EL018	8.36	26.90	352	158
EL019	----	----	220	70**
EL020	7.4	8.8 *	310	140
EL021	----	----	----	----
EL023	7.14	23.7	294	106
EL024	6.5	19.1	260	110
EL025	3.9	30.5	1181. *	32.8 *
EL028	4.47	20.9	260	119
EL030	7.89	24.9	276	114
EL032	4.2	14.1	284	116
EL033	9.2	29	323	126
EL038	5.01	22.9	280	110
EL039	6.59	23.4	293	128
EL042	7.34	25.1	289.	118.
EL045	6.3	23.8	----	----
EL046	7.08	24.0	329	127
EL048	6.59	23.2	307.0	140.8
EL049	8.1	24.2	282	115
EL050	5.73	20.7	323	135
EL054	5.1	18.3	301.	128
EL055	5.04	20.2	314	106
EL056	----	----	----	----
EL058	----	----	----	----
EL062	5.90	22.0	278.0	122.0
EL064	1 *	15	----	----
EL065	----	----	246.	94.
EL068	4.8	18.2	321	208 *
EL069	----	----	270	98
EL070	9.13	24	286	119
EL072	----	----	281	121
EL076	4.8	17.8	400**	100
EL078	10	31	270	110
EL079	5.84	18.7	295	120
EL081	8.5	18.0	304	128
EL083	9.13	28.7	298	128
EL084	----	----	380**	120
EL085	----	----	----	----
Mean	6.44761	22.2644	288.828	118.77
Expected Value	7.19	24.0	288	121

---- Denotes missing data
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# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	MERCURY		NICKEL	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL088	6.4	24.8	320	145
EL089	6.54	24.3	319	152
EL090	7.5	29.1	270	103
EL094	6.51	20.9	262	112
EL096	3.30 *	8.87 *	254	79.7
EL097	7.0	25	290	120
EL103	7.4	23.1	288	105
EL104	----	----	----	----
EL105	----	20	259	112
EL106	5.20	17.0	285	118
EL107	----	----	272	125
EL108	6.45	----	390**	500 *
EL110	4.78	20.7	272	123
EL111	----	----	280	120
EL113	7.1	21	299	123
EL115	4.54	17.0	292	124
117	9.0	16.0	255	110
EL120	14.2 *	30.0	319	100
EL121	7.87	25.9	253	97.0
EL123	3.5 *	29	348	151
EL126	4.7	18.0	262	114
EL127	5.8	21.5	281	118
EL129	4.9	21.9	322	128
EL130	4.80	16.3	278	117
EL133	----	----	----	----
EL134	5.77	16.4	315	130
EL135	225.0 *	450.0 *	499.9 *	249.5 *
EL136	6.62	24.5	285	117
EL137	----	----	----	----
EL138	7.1	25.0	291	119
EL139	----	----	----	----
EL141	6.8	24.5	285	103
EL142	4.66	18.08	291.6	128.4
EL144	6.3	18	282	116
EL145	----	----	270	120
EL146	----	----	277.7	98
EL148	7.23	25.0	310	120
EL150	----	----	291	124
EL151	----	----	250	11000 *
EL152	7.1	30.8	262	108
EL154	7.7	26	----	----
EL160	4	17	----	----
EL161	5.40	18.7	233	140
EL162	6.28	19.1	290	120
EL164	----	----	278.4	125
Mean	6.44761	22.2644	288.828	118.77
Expected Value	7.19	24.0	288	121

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

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FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	MERCURY (1)	MERCURY (2)
Number of values used :	63	64
Mean Recovery :	6.44761	22.2644
Expected Value :	7.19	24.0
Standard Deviation :	1.44574	4.33531
95% Confidence Interval :	3.61396 - 9.28127	13.7671 - 30.7616
99% Confidence Interval :	2.7176 - 10.1776	11.0793 - 33.4495
Percent Relative Std. Dev. :	22.4229	19.472

Parameter :	NICKEL (1)	NICKEL (2)
Number of values used :	76	73
Mean Recovery :	288.828	118.77
Expected Value :	288.0	121.0
Standard Deviation :	32.8129	15.5273
95% Confidence Interval :	224.514 - 353.141	88.3363 - 149.203
99% Confidence Interval :	204.17 - 373.485	78.7093 - 158.83
Percent Relative Std. Dev. :	11.3607	13.0735

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ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

LAB ID	SELENIUM (1) ug/L	SELENIUM (2) ug/L	VANADIUM (1) ug/L	VANADIUM (2) ug/L
EL001	----	----	----	----
EL003	57.98	48.23	----	----
EL009	47.2	38.2	538	907
EL010	89.3**	67.1**	460.	799.
EL012	55	40	487	744
EL013	54.4	154 *	426	702
EL014	44.	19. *	466.	781.
EL016	----	----	----	----
EL017	41.0	23.2	444	773
EL018	44.30	29.26	----	----
EL019	----	----	----	----
EL020	194 *	13 *	610**	1010
EL021	----	----	----	----
EL023	57.6	46.0	475	728
EL024	49.4	37.3	432	767
EL025	----	----	----	----
EL028	37.4	38.6	----	----
EL030	44.3	35.9	----	----
EL032	42	47	----	----
EL033	60	43	413	690
EL038	----	----	----	----
EL039	25.9 *	29.9	448	807
EL042	52.4	37.1	----	----
EL045	----	----	----	----
EL046	40.3	27.6	366	632
EL048	58.2	41.9	463.6	794.0
EL049	44	33	391	709
EL050	51.5	37.5	420	696
EL054	72	63**	440	776
EL055	----	----	----	----
EL056	----	----	----	----
EL058	----	----	----	----
EL062	139.0 *	40.0	459.0	842.0
EL064	----	----	----	----
EL065	50.7	34.7	----	690.
EL068	----	----	----	----
EL069	----	----	----	----
EL070	53.6	44.4	452	966
EL072	----	----	----	----
EL076	50	36	500	900
EL078	44	33	430	770
EL079	61.5	40.0	435	760
EL081	40.2	26.1	522	1005
EL083	56.0	38.95	445	759
EL084	----	----	----	----
EL085	----	----	----	----
Mean	51.1912	37.6464	463.887	809.06
Expected Value	60.6	45.4	450	791

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 95% confidence interval
\# Denotes unusable data

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FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS

STUDY - F031

LAB ID	SELENIUM		VANADIUM	
	(1) ug/L	(2) ug/L	(1) ug/L	(2) ug/L
EL088	35	27.5	500	700
EL089	40.2	27.2	430	681
EL090	69	45.5	423	758
EL094	55.3	26.9	446	782
EL096	52.6	39.3	519	825
EL097	58	31	440	840
EL103	50.7	37.3	465	778
EL104	----	----	----	----
EL105	44	27	502	915
EL106	47	45	450	820
EL107	----	----	----	----
EL108	98.7 *	40.2	390	825
EL110	65.0	36.8	387	765
EL111	----	----	----	----
EL113	61	41	445	778
EL115	53.9	41.3	464	809
117	12.9 *	3.99 *	----	----
EL120	56.2	43.9	453	754
EL121	58.2	43.8	473	767
EL123	6 *	15 *	----	----
EL126	41	37	490	880
EL127	53.2	32.6	472	924
EL129	34.2	24.7	----	----
EL130	----	----	----	----
EL133	----	----	----	----
EL134	46.6	32.0	221 *	852
EL135	17.0 *	35.0	----	----
EL136	65.7	47.2	623**	1027
EL137	----	----	----	----
EL138	37.6	26.5	452	769
EL139	----	----	----	----
EL141	45	36	446	777
EL142	53.72	38.90	----	----
EL144	52	37	467	825
EL145	50.0	35.5	----	----
EL146	----	----	----	----
EL148	31.9	27.2	540	920
EL150	----	----	----	----
EL151	33	27.5	552	865
EL152	46.6	31.4	----	----
EL154	56	42	----	----
EL160	----	----	----	----
EL161	80.8**	64.5**	434	812
EL162	46.2	35.5	481	998
EL164	----	----	----	----
Mean	51.1912	37.6464	463.887	809.06
Expected Value	60.6	45.4	450	791

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	SELENIUM(1)	SELENIUM(2)
Number of values used :	57	59
Mean Recovery :	51.1912	37.6464
Expected Value :	60.6	45.4
Standard Deviation :	11.0692	8.99071
95% Confidence Interval :	29.4956 - 72.8867	20.0246 - 55.2682
99% Confidence Interval :	22.6328 - 79.7496	14.4504 - 60.8425
Percent Relative Std. Dev. :	21.6232	23.882

Parameter :	VANADIUM(1)	VANADIUM(2)
Number of values used :	48	50
Mean Recovery :	463.887	809.06
Expected Value :	450.0	791.0
Standard Deviation :	50.6747	91.8691
95% Confidence Interval :	364.565 - 563.21	628.997 - 989.123
99% Confidence Interval :	333.147 - 594.628	572.038 - 1046.08
Percent Relative Std. Dev. :	10.9239	11.355

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	ZINC	
	(1) ug/L	(2) ug/L
EL001	194	1311
EL003	167	1300
EL009	187	1390
EL010	187.	1400.
EL012	196	1360
EL013	211	1420
EL014	203.	1370.
EL016	----	----
EL017	210	1497
EL018	221	1418
EL019	200	1340
EL020	220	1460
EL021	----	----
EL023	202	1380
EL024	183	1240
EL025	202.	1330.
EL028	198	1295
EL030	204	1380
EL032	205	1390
EL033	194	1380
EL038	200	1390
EL039	200	1364
EL042	200.	1400.
EL045	205	1339
EL046	184	1267
EL048	205.3	1368
EL049	209	1336
EL050	205	1412
EL054	206	1430
EL055	273**	585 *
EL056	----	----
EL058	----	----
EL062	205.0	1460.
EL064	204	1322
EL065	218.	1240.
EL068	----	----
EL069	188	1340
EL070	202	1352
EL072	199	1342
EL076	200	1200
EL078	200	1300
EL079	200	1250
EL081	149**	1149
EL083	202	1360
EL084	220	1430
EL085	----	----
Mean	200.995	1359.14
Expected Value	201	1378

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable data

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

LAB ID	ZINC (1) ug/L	ZINC (2) ug/L
EL088	250**	1470
EL089	215	1450
EL090	140**	1307
EL094	178	1220
EL096	214	1420
EL097	210	1400
EL103	210	1453
EL104	190	1160
EL105	195	1345
EL106	202	1420
EL107	193	1309
EL108	190	1550
EL110	193	1450
EL111	183	125 *
EL113	212	1368
EL115	203	1415
117	198	1300
EL120	175	1045**
EL121	190	1260
EL123	192	1260
EL126	207	1410
EL127	208	1360
EL129	181	1188
EL130	201	1370
EL133	----	----
EL134	202.5	1381
EL135	2.2 *	475.0 *
EL136	203	138 *
EL137	----	----
EL138	216	1420
EL139	----	----
EL141	199	1360
EL142	204.3	1401
EL144	211	1400
EL145	209	1410
EL146	201	1494
EL148	205	1398.
EL150	215	1436
EL151	199	1410
EL152	212	1440
EL154	200	1360
EL160	209	1360
EL161	198	1420
EL162	202	1370
EL164	206.5	1311
Mean	200.995	1359.14
Expected Value	201	1378

---- Denotes missing data
* Denotes 'extreme' statistical outlier
** Denotes outside 99% confidence interval
\# Denotes unusable

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
ENVIRONMENTAL CHEMISTRY LABORATORY
PERFORMANCE EVALUATION

TRACE METALS STUDY - F031

Statistical Summary

(Concentration in micrograms per liter)

Parameter :	ZINC (1)	ZINC (2)
Number of values used :	81	78
Mean Recovery :	200.995	1359.14
Expected Value :	201.0	1378.0
Standard Deviation :	16.7365	85.1801
95% Confidence Interval :	168.192 - 233.799	1192.19 - 1526.09
99% Confidence Interval :	157.815 - 244.175	1139.38 - 1578.91
Percent Relative Std. Dev. :	8.32682	6.2672

Treatment of Data

1. For a particular sample, the EXPECTED VALUE C was taken as that concentration which the fully diluted sample as prepared for analysis would be if the chemical(s) and D.I. water used to prepare the solution in the ampul were pure and that concentration was made up accurately. However, this value was not verified by external laboratories doing multiple analyses; thus, it cannot be said to be the 'true value'.

2. The EXPECTED value C was used to omit Extreme Statistical Outliers, i.e., outside of range $(C \div 2 \leq x_i \leq C \cdot 1.5)$.

3. The Mean and Standard Deviation were calculated as:

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \quad \text{and} \quad s = \sqrt{\frac{\sum_{i=1}^{n} (\bar{x} - x_i)^2}{n - 1}}$$

4. The Confidence Intervals were computed as:

   $\bar{x} \pm 1.96 \cdot s$ - - - 95% Confidence Interval, and

   $\bar{x} \pm 2.58 \cdot s$ - - - 99% Confidence Interval.

5. Percent Relative Standard Deviation:

$$\frac{s \cdot 100}{\bar{x}}$$

6. Statistical sets of data with less than six sample points (results) are not considered to yield useful information. Therefore, only the mean and the number of results used to generate that mean are presented when less than six results were inside of the range used to omit Extreme Statistical Outliers.

SECTION IV

SOURCE OF INDEPENDENT QC STANDARD

LABORATORY DATA FOR SAMPLE "MSTD" *

COMPOUND	SOURCE	LOT #	SPIKED LEVEL (UG/L)
PHENOL	ALDRICH	04624PL	200
2-CHLOROPHENOL	ALDRICH	02322PM	200
1,4-DICHLOROBENZENE	ALDRICH	1607TL	100
N-NITROSO-DI-N-PROPYL AMINE	CHEM SERVICE	F63/A6556E	100
1,2,4-TRICHLOROBENZENE	ALDRICH	5011BL	100
4-CHLORO-3-METHYLPHENOL	ALDRICH	00606LL	200
ACENAPHTHENE	ALDRICH	0425 JL	100
4-NITROPHENOL	ALDRICH	05102CM	200
2,4-DINITROTOLUENE	ALDRICH	2207DK	100
PENTACHLOROPHENOL	ALDRICH	00914LM	200
PYRENE	ALDRICH	BD020897	100

* BNA Std. used in Appd. C, C-16,17 and C-26,27 in the 29 Sept 87 report

Table 2

Source of alkalinity and chloride independent QC sample shown in Table B-52 and B-53 in appendix B of 29 September 87 report.

Compound	Source	Lot No.
Chloride	Fisher Scientific	745791-24 and 857151-24
Alkalinity (C_aCO_3)	Fisher Scientific	852237-24
	Baker	722109

SECTION V

IRON RESULTS FOR CYANIDE MATRIX INTERFERENCE STUDY

TELECOPIER TRANSMITTAL PAGE

VERSAR, INC.
ESM Operations

9200 Rumsey Road
Columbia, MD 21045
(301) 964-9200

Telecopier Extension: 350
Confirmation Extention: 336

TO: CHARLES ANKERBERG

COMPANY: GERAGHTY & MILLER

TELEPHONE: 813-961-2599

FROM: D. BADIO
Versar, ESM Operations

DATE SENT 9/29/87

NUMBER OF PAGES: 2 PLUS COVER PAGE

NOTES: Iron results for CN-Study
We can discuss the results Tomorrow
Sometime.

VERSAR INC., ESM OPERATIONS
INORGANIC ANALYSIS RESULTS/QC DATA SUMMARY

CLIENT: Charles Ankerberg — MATRIX: Soil Leachates

PARAMETER	METHOD	LOQ	ESM SAMPLE ID: 2910	2911	2912	2913	2914	2916	2917	2910
			CLIENT SAMPLE ID: LRASC	LRBSC	LRCSC	SOIL REP1E	LRDSC	PHASC	SOILREP2	LRASC
			SAMPLE RESULTS (mg/250ml)							BATCH QC RESULTS
			RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	RESULT	SPIKE % REC
Iron	200.7	0.25	12	8.0	3.0	55	67	<0.25	<0.25	NA
Total Cyanide	335.2	0.0025	0.10	0.070	0.58	0.035	0.040	0.14	0.16	NA
Free Cyanide	412H	0.0025	0.0065	0.0075	0.048	0.0065	0.0050	0.040	0.048	73

CLIENT: Charles Ankerberg — MATRIX: Soil Lechates

PARAMETER	METHOD	LOQ	ESM SAMPLE ID: 2935	2938	2939	2940	2935
			CLIENT SAMPLE ID: MPASG	CWASG	CWBSG	CWCSG	MPASG
			SAMPLE RESULTS (mg/250ml)				BATCH QC RESULTS
			RESULT	RESULT	RESULT	RESULT	SPIKE % REC
Iron	200.7	0.25	0.34	1.0	2.0	<0.25	NA
Total Cyanide	335.2	0.0025	0.014	0.20	0.16	0.18	NA
Free Cyanide	412H	0.0025	0.0027	0.095	0.048	0.14	102

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CLIENT: Charles Ankerberg — MATRIX: Soil Leachates

PARAMETER	METHOD	LOQ	ESM SAMPLE ID: 2990	2991	2993	2994	2995	2990
			CLIENT SAMPLE ID: SASC	CWASG-1	OCWPSC-B	OCWPSC-A	OCWPSC-C	SASC
			SAMPLE RESULTS (mg/250ml)					BATCH QC RESULTS
			RESULT	RESULT	RESULT	RESULT	RESULT	SPIKE % REC
Iron	200.7	0.25	1.4	<0.25	11	35	4.0	NA
Total Cyanide	335.2	0.0025	1.9	0.065	0.24	0.25	0.18	NA
Free Cyanide	412H	0.0025	0.082	0.0050	0.0027	0.0060	0.048	49

VERSAR INC., ESM OPERATIONS
INORGANIC ANALYSIS RESULTS/QC DATA SUMMARY

CLIENT: Charles Ankerberg MATRIX: Groundwater

			ESM SAMPLE ID:	3334	3335	3336	3337	3458	3463
			CLIENT SAMPLE ID:	MW-20S	MW-23S	MW-26S	MWREP8	MW-8S	MWR-9A
PARAMETER	METHOD	LOQ	SAMPLE RESULTS (mg/250ml) RESULT		RESULT	RESULT	RESULT	BATCH QC RESULTS SPIKE % REC	LAB BLANK RESULT
Iron	200.7	0.25		0.28	2.5	4.0	0.25	1.7	NA
Total Cyanide	335.2	0.0025		<0.0025	0.045	<0.0025	0.66	1.8	NA
Free Cyanide	412H	0.0025		<0.0025	0.0038	<0.0025	0.0053	0.035	91

CLIENT: Charles Ankerberg MATRIX: Groundwater

			ESM SAMPLE ID:	3461	3463	3484	3485	3485
			CLIENT SAMPLE ID:	MWREP5	MWR-9A	MWR-7A	MW-21S	MW-21S
PARAMETER	METHOD	LOQ	SAMPLE RESULTS (mg/250ml) RESULT		RESULT	RESULT	RESULT	BATCH QC RESULTS SPIKE % REC	LAB BLANK RESULT
Iron	200.7	0.25		1.9	2.1	0.17	0.027	NA	
Total Cyanide	335.2	0.0025		0.32	0.38	0.20	0.0035	NA	
Free Cyanide	412H	0.0025		0.028	0.032	0.025	<0.0025	80	

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CLIENT: Charles Ankerberg MATRIX: Groundwater

			ESM SAMPLE ID:	3530	3534	3541	3541
			CLIENT SAMPLE ID:	MW-5A	MWREP2	MWR-3A	MWR-3A
PARAMETER	METHOD	LOQ	SAMPLE RESULTS (mg/250ml) RESULT		RESULT	RESULT	BATCH QC RESULTS SPIKE % REC
Iron	200.7	0.25		<0.25	0.38	0.45	NA
Total Cyanide	335.2	0.0025		0.10	0.11	0.0040	NA
Free Cyanide	412H	0.0025		<0.0025	0.0028	<0.0025	111

ITEM III

Doug McInnes
Versar, ESM Operations
9200 Rumsey Road
Columbia, MD 21045

(301) 964-9200

22 October 1987

Charles W. Ankerberg
Geraghty and Miller, Inc.
3820 Northdale Blvd.
Suite 200B
Tampa, FL 33624

Subject: Matrix Interference Study Report

Dear Mr. Ankerberg;

Enclosed is the report titled "Matrix Interference Study for Free Cyanide Spike Recoveries". This report summarizes the free cyanide matrix interference experiment related to the last round of cyanide samples collected from The Dalles, Oregon.

If there should be any questions or comments about the report, or any further information required, please call Joe Arlauskas or myself.

Sincerely,

Douglas J. McInnes
Project Manager

Joe Arlauskas
Laboratory Manager

DJM
Enclosures

cc: J. Bou
J. Arlauskas

MATRIX INTERFERENCE STUDY FOR FREE CYANIDE SPIKE RECOVERIES
Performed for Martin Marietta Corporation and Geraghty & Miller, Inc.
by Versar, Inc., ESM Operations

Study Objective

To determine whether soluble iron ions, which are naturally found in soils and groundwater, interfere in the analysis of "free" cyanides.

Study Design

It is known that alkali cyanides (ie. NaCN, KCN) react in solution with iron salts (ie. FeSO4, FeCl3) to form the metal/cyanide complex, ferrocyanide (ie. Fe(CN)6 -4). [ref 1,2,3] Alkali cyanides dissociate in water, depending on pH, to form CN- and HCN, otherwise defined as free cyanide. One method used to distinguish the free cyanide content of a sample from the metal/cyanide complexes is Method 412.H - "Weak and Acid Dissociable Cyanide" in Standard Methods, 16th edition. As part of the laboratorys' analytical QA/QC protocols, five percent of the samples are spiked with the free cyanide (ie. KCN) and the percent recovery calculated to monitor matrix interferences. One of the potential matrix interferences may be soluble iron. The presence of iron in the field samples in question has been documented previously.

To determine whether iron present in samples complexes with the cyanide spike forming ferrocyanide, the following experiment was performed. Ferrocyanide, if formed, is not measured as cyanide by the weak and dissociable method, and thereby result in a low percent spike recovery. In order to minimize study variables, the experiment was conducted using laboratory deionized water and not actual samples. The distillation flask solutions containing FeSO4 and KCN were allowed to react for one hour prior to the addition of acid and subsequent distillation. The pH of the FeSO4/KCN solution was between 6 and 8, ie., the same as observed in actual field samples. Iron and cyanide concentrations represent those reported in field samples. Since sulfide was not present, lead acetate scrubbers were not used. However, this additional variable was tested as shown below.

Fe = FeSO4 * 7 H20
CN = KCN
Distillation flask volume = 250 ml

[CN] ppb	NUMBER OF REPLICATES		
	0 ppm Fe	10 ppm Fe	200 ppm Fe
* Run without lead acetate scrubber			
200	4	4	4
1000	4	4	4
* Run with lead acetate scrubber			
200	4	----	----
1000	4	----	----

Results

As shown by the generally high cyanide spike recoveries (>90%) in Tables 1 and 2, the spiking CN did not react with the FeSO4 to form a metal/cyanide complex, which would have resulted in a low spike recovery. The lowest average CN percent recovery of 88.7% did occur at the highest iron (200 ppm) and cyanide (1000 ppb) concentrations (Table 2). However, according to the calculated upper and lower 95% confidence interval (Table 2), this was not significantly different than the 0 ppm Fe control.

The unexpected result of this study was the dramatic effect that the lead acetate scrubber had on CN spike recovery. The average percent recovery was only 79.7 and 77.2 for the 200 and 1000 ppb CN spike concentrations,respectively. More importantly, by examining the respective relative standard deviation and 95% confidence intervals (Table 2) poor spike recovery is likely to occur with the use of lead acetate scrubbers.

Summary

It appears that the lead acetate scrubber used to remove sulfides may have a significant impact on the recovery of cyanide spikes. The lead acetate scrubber acts to "scrub" a portion of the distilled gaseous cyanide that would normally be scrubbed and recovered in the sodium hydroxides scrubber. To confirm this, the lead acetate scrubber solution could be distilled and the cyanide content determined. A mass balance for cyanide would then locate and confirm the "lost" or "scrubbed" cyanide.

Our laboratory has contacted EPA, Cincinnatti, OH regarding this concern, and they have stated that 'QA/QC' data (re: accuracy and precision) for (total) cyanide measurement using the lead acetate scrubber are not available at this time. We are currently pursuing this with the agency.

Addendum Note:

In order to better simulate field conditions, the study was performed using potassium ferricyanide [K3Fe(CN)6] as a source of total cyanide. It was thought that a catalyzed reaction with KCN, FeSO4, and Fe(CN)6 -4 might occur. However, the results shown in Appendix A demonstrate good CN spike recovery and therefore, no matrix interference. The relatively high free cyanide in the ferricyanide control is most likely due to contamination during manufacturing (NaCN is used during production) of the reagent grade product (ref 4). A lead acetate scrubber was not used for this experiment.

TABLE 1

CYANIDE MATRIX EXPERIMENT
ANALYSIS RESULTS
20 OCTOBER 1987

TEST DESCRIPTION	CONCENTRATION OF CYANIDE	REPLICATE NUMBER	ANALYSIS RESULT	% CYANIDE RECOVERY	AVERAGE OF RESULTS
RUN W/O LEAD ACETATE SCRUBBER					
10 ppm Fe	200 ppb	1	190.8	95.4	194.8
		2	193.1	96.6	
		3	206.0	103.0	
		4	189.3	94.6	
200 ppm Fe	200 ppb	1	202.1	101.1	200.6
		2	203.4	101.7	
		3	206.0	103.0	
		4	191.1	95.5	
10 ppm Fe	1000 ppb	1	980.5	98.0	981.1
		2	953.3	95.3	
		3	995.3	99.5	
		4	995.3	99.5	
200 ppm Fe	1000 ppb	1	815.9	81.6	887.0
		2	972.0	97.2	
		3	838.7	83.9	
		4	921.5	92.1	
0 ppm Fe	200 ppb	1	203.9	101.9	199.1
		2	188.6	94.3	
		3	198.9	99.4	
		4	204.9	102.5	
0 ppm Fe	1000 ppb	1	1027.2	102.7	980.6
		2	998.6	99.9	
		3	954.0	95.4	
		4	942.6	94.3	
RUN WITH LEAD ACETATE SCRUBBER					
0 ppm Fe w/ Lead Acetate scrubber	200 ppb	1	159.0	79.5	159.4
		2	136.3	68.1	
		3	152.9	76.5	
		4	189.4	94.7	
0 ppm Fe w/ Lead Acetate scrubber	1000 ppb	1	838.9	83.9	772.4
		2	554.2	55.4	
		3	814.5	81.5	
		4	881.9	88.2	

TABLE 1 (contd.)

CYANIDE MATRIX EXPERIMENT
ANALYSIS RESULTS
20 OCTOBER 1987

TEST DESCRIPTION	CONCENTRATON OF CYANIDE	REPLICATE NUMBER	ANALYSIS RESULT	% CYANIDE RECOVERY	AVERAGE OF RESULTS
QC SOLUTIONS					
DI water (not distlled)	200 ppb	1	219.1	109.5	219.5
		2	220.0	110.0	
		3	216.2	108.1	
		4	222.6	111.3	
DI water (not distilled)	1000 ppb	1	1027.9	102.8	998.0
		2	1003.4	100.3	
		3	982.0	98.2	
		4	978.9	97.9	

TABLE 2

CYANIDE MATRIX EXPERIMENT
DATA SUMMARY
20 OCTOBER 1987

TEST DESCRIPTION	NUMBER OF REPLICATES	AVERAGE RESULT	AVERAGE % RECOVERY	STANDARD DEVIATION	% RELATIVE STD. DEV.	95% CONFIDENCE RANGE
10 ppm Fe, 200 ppb CN	4	194.8 ppb CN	97.4 %	7.60	3.90 %	182.7 - 206.9
200 ppm Fe, 200 ppb CN	4	200.6	100.3	6.57	2.78	190.1 - 211.1
10 ppm Fe, 1000 ppb CN	4	981.1	98.1	19.83	2.02	949.6 - 1012.6
200 ppm Fe, 1000 ppb CN	4	887.0	88.7	72.59	8.18	771.5 - 1002.5
0 ppm Fe, 200 ppb CN	4	199.1	99.5	7.48	3.76	187.2 - 211.0
0 ppm Fe, 1000 ppb CN	4	980.6	98.6	39.35	4.02	918.0 - 1043.2
0 ppm Fe, 200 ppb CN w/PbAc scrubber	4	159.4	79.7	22.16	13.90	124.1 - 194.7
0 ppm Fe, 1000 ppb CN w/PbAc scrubber	4	772.4	77.2	148.08	19.17	536.8 - 1008.0
200 ppb CN QC solution (not distilled)	4	219.5	97.4	2.65	1.21	215.3 - 223.7
1000 ppb CN QC solution (not distilled)	4	998.0	99.8	22.68	2.27	961.9 - 1034.1

D-10554

AVERAGE RESULT = [result 1 + result 2 + result 3 + result 4] / 4

% RECOVERY OF AVERAGE = [average result / CN-spike added] x 100

STANDARD DEVIATION = $\sqrt{(x_\eta - \bar{x})^2 / (n - 1)}$ when x_η = analysis result, $\bar{x}$ = average of analysis results, n = number of replicates run

% RELATIVE STD. DEV. = standard deviation / average of analysis results

95% CONFIDENCE RANGE = $\bar{x} \pm \frac{s}{\sqrt{n}} t$ when s = standard deviation, t = t number from literature @ 95% confidence level, for 3 degrees of freedom (3.182)

APPENDIX A

CYANIDE MATRIX EXPERIMENT
ADDITIONAL ANALYSIS RESULTS
22 OCTOBER 1987

TEST DESCRIPTION	CONCENTRATION OF FREE CYANIDE (from KCN)	REPLICATE NUMBER	ANALYSIS RESULT (free CN)	% CYANIDE RECOVERY (free CN)	AVERAGE OF RESULTS (free CN)
RUN W/O LEAD ACETATE SCRUBBER					
200 ppm Fe (from FeSO4), 1000 ppm total CN (from K3Fe(CN)6)	---------	1	2302 ppb	(a)	2588 ppb
		2	3197	(a)	
		3	2555	(a)	
		4	2299	(a)	
200 ppm Fe (from FeSO4), 1000 ppm total CN (from K3Fe(CN)6)	1000 ppb	1	4978	497.8 %	4528
		2	3194	319.4	
		3	5277	527.7	
		4	4662	466.2	

CORRECTION FOR HIGH BLANK

AVERAGE RESULT WITH FREE CYANIDE ADDED (ppb free cyanide)	AVERAGE RESULT WITHOUT FREE CYANIDE ADDED (ppb free cyanide)	CORRECTED RESULT (WITH - WITHOUT) (ppb free cyanide)	CORRECTED AVERAGE % FREE CN RECOVERY
4528	2588	1940	194 %

DET055

DATA SUMMARY

TEST DESCRIPTION	NUMBER OF REPLICATES	AVERAGE RESULT	AVERAGE % RECOVERY	STANDARD DEVIATON	% RELATIVE STD. DEV.	95% CONFIDENCE RANGE
200 ppm Fe (from FeSO4), 1000 ppm CN (from K3Fe(cn)6) 0 ppb CN (from KCN)	4	2588	(a)	423.2	16.35	1915 - 3261
200 ppm Fe (from FeSO4) 1000 ppm CN (from K3Fe(CN)6) 1000 ppb CN (form KCN)	4	4528	452.8	923.9	20.41	3058 - 5998
Corrected Results (see above)	1 (av. of 4)	1940	194.0	(b)	(b)	(b)

(a) No free cyanide has been added, % Recovery cannot be calculated
(b) Only one data point exits, Deviation and Confidence values cannot be calculated

REFERENCES

1) "FREE" CYANIDE--A DELEMMA FOR REFINERS, R. G. Kunz, R. R. Lessard, and P. K. Staines; Proceedings of the API Refining 40th Midyear Meeting. Pub. by API, Washington, DC, 1975

2) PRECIPITATE FLOTATION OF COMPLEXED CYANIDE, R. B. Grieves, D. Bhattacharyya, University of Kentucky; Industrial Waste Conference Proceedings, 24 May, '69

3) CYANIDES; Degussa Ch 85-1-205-978 Vol. Darmstadt, West Germany.

4) DETERMINATION OF FREE CYANIDE IN FERRO- AND FERRICYANIDES, J. M. Kruse, and L. E. Thibault.; Analytical Chemistry; Vol 45 No. 13, November 1973