Appendix F

QA/QC Review

Soil, groundwater, and tissue samples were collected at Rhodia between July and November of 2001. Samples were analyzed for some combination of the following analytes: copper, zinc, pH, sulfate, sulfide, TOC, TSS, salinity, and percent moisture. Samples were analyzed by Curtis & Tompkins in Berkeley, California; STL-Chromalab in Pleasanton, California; and Columbia Analytical in Kelso, Washington. A summary of the data review is presented in this appendix.

F.1 HOLDING TIME AND SAMPLE PRESERVATION REVIEW

Analytical methods used for this study have established holding times which are the maximum amount of time after collection that a sample may be held prior to sample preparation and/or analysis. Samples were analyzed within method-specified holding times.

Soil samples submitted to the lab for analysis on January 18, 2002 were cut from soil borings that had been collected in July, 2001. Soil borings were capped and stacked in a warehouse on the project site at ambient temperature until submission to the lab. Therefore, sample preservation requirements -- storage of samples at 4°C. -- were not met. All associated sample results were qualified as estimated, **J**, due to this discrepancy.

F.2 BLANK REVIEW

Method blanks consisted of deionized water that was carried through each step of the analysis along with the samples and were analyzed with each analytical parameter. Method blanks did not reveal any evidence of laboratory contamination.

F.3 MATRIX SPIKE (MS/MSD)

MS/MSD samples are analyzed to evaluate matrix interferences for an analytical batch and to assess accuracy. MS/MSD recoveries that were outside control limits are summarized in the following table along with any qualification deemed necessary. All other MS/MSD recoveries and RPDs were within control limits.

MS/MSD Recoveries Outside Control Limits

Batch ID	MS Recovery [%]	MSD Recovery [%]	RPD	Comment
Copper in water (control limits: 74%-122% for MS)				
68060	59	na	na	Associated samples qualified as estimated, **J** or **UJ**, to reflect potential low bias.
68114	-2946	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
Copper in soil (control limits: 24%-150% for MS/MSD and 0%-38% for RPDs)				
67305	430	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.

Batch ID	MS Recovery [%]	MSD Recovery [%]	RPD	Comment
67922	572	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
68032	-732	-107	nc	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
Copper in soil (control limits: 75%-125% for MS/MSD and 0%-20% for RPDs)				
2001/07/23-01.15	47.0	57.1	19.4	Associated sample results qualified as estimated, **J**, to indicate potential low bias.
2001/07/30-05.15	-30	-108	-113	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
Zinc in water (control limits: 69%-129% for MS)				
67924	-1995	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
68060	1900	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
68114	410	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
68120	-6900	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
Zinc in soil (control limits: 20%-146% for MS)				
67305	389	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
67922	134	na	na	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
68032	-34764	-34510	nc	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
Zinc in soil (control limits: 75%-125% for MS/MSD and 0%-20% for RPDs)				
2001/07/23-01.15	15.0	26.5	55.4	Associated sample results qualified as estimated, **J**, to indicate potential low bias.
2001/07/30-05.15	46	4.0	168	MS/MSD recoveries within range expected based on relative concentrations of sample and spike so no qualification was judged necessary.
2001/07/30-01.15	76.9	69.1	10.7	Associated samples qualified as estimated, **J**, to reflect potential low bias.
Sulfate (control limits: 70%-130% for MS/MSD and 0%-20% for RPDs)				
67362	74	65	1	Sample concentration greater than 4 times spike concentration so no qualification was necessary.

Batch ID	MS Recovery [%]	MSD Recovery [%]	RPD	Comment
67384	175	629	14	Sample concentration greater than 4 times spike concentration so no qualification was necessary.
68248	153	163	2	MS/MSD recoveries within range expected based on relative concentrations of sample and spike so no qualification was judged necessary.
Dissolved Sulfide (control limits: 20%-145% for MS/MSD and 0%-25% for RPDs)				
68155	8	6	4	Associated non-detect samples rejected, **R**.
TOC (control limits: 40%-150% for MS/MSD and 0%-20% for RPDs)				
68300	26	28	2	Spiked sample was not from this project, therefore no qualification was judged necessary.

na - not analyzed

J - estimated concentration

UJ - estimated as non-detect at noted concentration

R - rejected

F.4   LABORATORY CONTROL SAMPLES (LCS)

LCS are well-characterized, laboratory-generated samples used to monitor the laboratory's day-to-day performance for analyses and assess the accuracy of the analytical process independent of matrix effects. All LCS recoveries were within control limits.

F.5   LAB DUPLICATE SAMPLES

Lab duplicates are analyzed to assess accuracy and precision. Lab duplicates with RPDs outside control limits are summarized below. All other lab duplicate RPDs were within control limits.

Lab Duplicate RPDs Outside Control Limits

Batch ID	Original Result	Duplicate Result	Units	RPD	Comment
Copper in water (control limits: 0%-20% for RPDs)					
68060	56.69	46.00	μg/L	21	Associated results already qualified due to low MS recoveries. No additional qualification required.
68114	8,038	5,917	μg/L	30	Associated results qualified as estimated, **J**, to reflect imprecise results.

Batch ID	Original Result	Duplicate Result	Units	RPD	Comment
Zinc in water (control limits: 0%-33% for RPDs)					
67924	4291	2799	µg/L	42	Duplicate sample was not from this project, therefore no qualification was judged necessary.
Zinc in tissue (control limits: 0%-30% for RPDs)					
K2109387	64.6	265	mg/Kg	122	Sample used for duplicate was not representative of project samples, therefore no qualification was judged necessary.

J - estimated concentration

F.6 FIELD DUPLICATE SAMPLES

Two sets of groundwater field duplicate samples were collected and analyzed. The following table summarizes the analytes detected in the field duplicates. Agreement is observed in the field duplicate results and no qualification is required due to matrix heterogeneity.

Summary of Field Duplicate RPDs

Analyte	Original Sample Result	Duplicate Sample Result	Units	RPD
MW8A and MW8Ad				
Copper, dissolved	<5.0	5.3	µg/L	nc
pH	7.0	7.0	SU	0
Salinity	20	20	g/Kg	0
Sulfate	34	32	mg/L	6.1
Sulfide	22	24	mg/L	8.7
Sulfide, dissolved	23	18	mg/L	24
TOC	62	53	mg/L	16
Hardness	3,400	3,200	mg/L	6.1
TSS	49	61	mg/L	22
GRD7 and GRD7D				
Copper	8,200	8,100	µg/L	1.2
Zinc	16,000	17,000	µg/L	6.1
pH	4.2	4.2	SU	0
Salinity	4.4	4.0	g/Kg	9.5

Analyte	Original Sample Result	Duplicate Sample Result	Units	RPD
Sulfate	600	590	mg/L	1.7
TOC	12	11	mg/L	8.7
Hardness	720	700	mg/L	2.8

nc - not calculable due to one or more non-detected concentrations

F.7   QUALITY CONTROL SUMMARY

The data for the soil and groundwater sampling were reviewed to evaluate their usability for project decisions. The accuracy and precision of the data were found to be acceptable for use of these data in project decisions with the following qualifications.

Summary of Qualified Data

Sample ID	Analyte	Result	Units	Qualification	Comment
GRD0	Copper,	6.2	µg/L	J	Low MS/MSD recoveries
GRD1	total	16		J	- qualified as estimated to
GRD2		8.0		J	indicate potential low
GRD3		<5.0		UJ	bias.
GRD4		8.3		J	
GRD5		8,800		J	
GRD6		6,000		J	
GRD7		8,200		J	
GRD8		9,100		J	
GRD7D		8,100		J	
MW19	Copper,	57	µg/L	J	Low MS/MSD recoveries
MW3A	total	22		J	- qualified as estimated to
MW20		<5.0		UJ	indicate potential low
MW8A		<5.0		UJ	bias.
MW8Ad		<5.0		UJ	
MW25		270		J	
GRD0	Copper,	12	µg/L	J	High lab duplicate RPDs -
GRD1	dissolved	17		"	qualified as estimated to
GRD2		11		"	indicate imprecise results.
GRD3		10		"	
GRD4		8.6		"	
GRD5		9,300		"	
GRD6		5,400		"	
GRD7		7,800		"	
GRD8		8,000		"	

Sample ID	Analyte	Result	Units	Qualification	Comment
SSB4-1	Copper	70	mg/Kg	**J**	Low MS/MSD recoveries
SSB4-4		5.2		"	- qualified to indicate
SSB6-1		17		"	potential low bias.
SSB6-4		10		"	
SSB8-1		15		"	
SSB8-4		4.8		"	
SSB10-0.5		44		"	
SSB10-4		32		"	
SSB11-0.5		210		"	
SSB11-4		160		"	
SSB12-1		240		"	
SSB12-4		210		"	
SSB4-0.5	Copper	200	mg/Kg	**J**	Sample results were
SSB5-4		400		"	qualified, due to improper
SSB6-0.5		21		"	sample storage, to
SSB8-0.5		320		"	indicate the uncertainty
SSB13-1		19		"	associated with them.
SSB4-1	Zinc	110	mg/Kg	**J**	Low MS/MSD recoveries
SSB4-4		320		"	- qualified to indicate
SSB6-1		48		"	potential low bias.
SSB6-4		130		"	
SSB8-1		240		"	
SSB8-4		3.5		"	
SSB10-0.5		52		"	
SSB10-4		87		"	
SSB11-0.5		120		"	
SSB11-4		120		"	
SSB12-1		350		"	
SSB12-4		110		"	
SSB1-0	Zinc	79	mg/Kg	**J**	Low MS/MSD recoveries
SSB1-1		620		"	- qualified as estimated to
SSB1-2		180		"	indicate potential low
SSB1-3		42		"	bias.
SSB1-4		100		"	
SSB1-0 PIER		69		"	
SSB2-0		66		"	
SSB2-1		23		"	
SSB2-2		25		"	
SSB2-3		26		"	
SSB2-4		24		"	
SSB3-0		81		"	
SSB3-1		130		"	
SSB3-2		130		"	
SSB3-4		210		"	
SSB5-3		94		"	
SSB7-3		130		"	
SSB9-0		370		"	
SSB13-0		130		"	
SSB14-0		390		"	

Sample ID	Analyte	Result	Units	Qualification	Comment
SSB4-0.5	Zinc	320	mg/Kg	**J**	Sample results were
SSB5-4		220		"	qualified, due to improper
SSB6-0.5		63		"	sample storage, to
SSB8-0.5		170		"	indicate the uncertainty
SSB13-1		84		"	associated with them.
SSB4-0.5	pH	5.3	S.U.	**J**	Sample results were
SSB5-4		4.2		"	qualified, due to improper
SSB6-0.5		4.2		"	sample storage, to
SSB8-0.5		4.5		"	indicate the uncertainty
SSB13-1		5.0		"	associated with them.
MW 51	Dissolved	< 0.04	mg/L	**R**	Very low MS/MSD
MW 57	sulfide	"		**R**	recoveries - rejected to
MW 58		"		**R**	indicate uncertainty
MW 62		"		**R**	associated with these data.

J - estimated concentration

UJ - estimated as non-detect at noted concentration

R - rejected