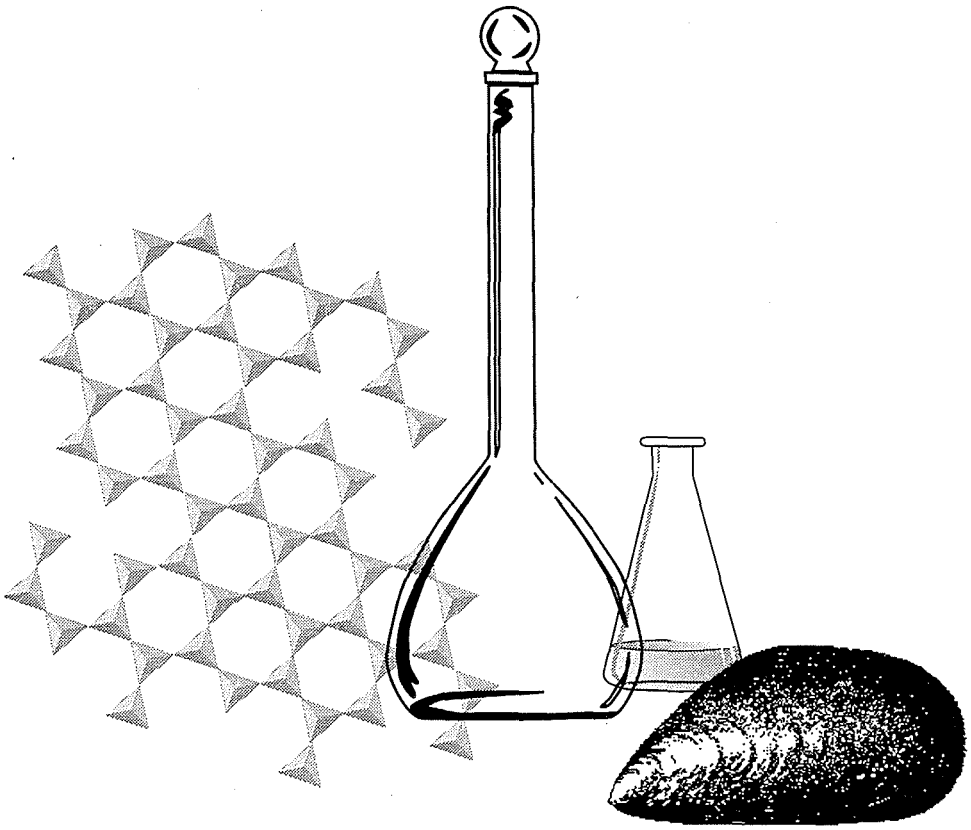
NOAA Technical Memorandum NOS ORCA 137

National Status and Trends Program
for Marine Environmental Quality

NOAA National Status and Trends Program Twelfth Round Intercomparison Exercise Results for Trace Metals in Marine Sediments and Biological Tissues



Silver Spring, Maryland
December 1998

US Department of Commerce
noaa NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

Coastal Monitoring and Bioeffects Assessment Division
Office of Ocean Resources Conservation and Assessment
National Ocean Service

INTRODUCTORY REMARKS

The National Oceanic and Atmospheric Administration's National Status and Trends (NS&T) Program measures levels of chemical contaminants in organisms and sediments from around the coasts of the United States. A number of different laboratories have participated in making there measurements. In order to help assure and document the intercomparability of the data from various participating laboratories, the NS&T Program has supported a series of intercomparison exercises. This has included providing support to the Institute of Environmental Chemistry, National Research Council (NRC) of Canada to conduct and evaluate the results from intercomparisons of analyses for trace metals in marine sediments and biological tissues. The following is a reproduction of a previously unpublished report provided to the NS&T Program by NRC Canada regarding one of these intercomparison. It is being reproduced here to provide a permanently available record of the exercise results.

National Research Council Canada
Conseil national de recherches Canada

Institute for National Measurement Standards
Institut des étalons nationaux de mesure

NRC · CNRC

NOAA/12

Twelfth Round Intercomparison for Trace Metals in Marine Sediments and Biological Tissues

Scott Willie

Prepared for the
Coastal Monitoring and Bioeffects Assessment Division
Office of Ocean Resources Conservation and Assessment
National Oceanic and Atmospheric Administration

November 1998

Canada

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Abstract

This report, prepared by the National Research Council of Canada (NRC), summarizes the results of the *Twelfth Round Intercomparison for Trace Metals in Marine Sediments and Biological Tissues* under the directive of the NOAA National Status and Trends Program. A total of forty-four participants were included in the exercise, including NOAA, USEPA, state, Australian, Canadian, Mexican and Argentinean laboratories. Two samples were sent by NRC to each participant, a marine sediment collected on the east coast of Canada and a freeze-dried mussel tissue. Laboratories were also asked to analyse two certified reference materials (CRMs) MESS-2 and CRM 2976. The elements to be determined were Al, Cr, Fe, Ni, Cu, Zn, As, Se, Ag, Cd, Sn, Hg and Pb for both matrices, plus Be, Si, Mn, Sb and Tl for the sediments. An accepted mean and confidence interval was calculated for each analyte in the two unknown samples, laboratory biases were identified and an overall rating of superior, good, fair or others were assigned to each laboratory. Seventy-two percent of the laboratories were rated in the superior or good category for the sediments. Eighty-seven percent of the laboratories were rated superior or good for the biological tissues, this represented a increase over last year.

Silver Spring, Maryland
December 1998

United States Department of Commerce — William M. Daley, Secretary
National Oceanic and Atmospheric Administration — D. James Baker, Under Secretary
National Ocean Service — Nancy Foster, Assistant Administrator

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APPENDICES

1. INTRODUCTION

This is the twelfth intercomparison exercise for trace metals organized by the National Research Council of Canada (NRC) on behalf of the Coastal Monitoring Branch of the National Oceanic and Atmospheric Administration (NOAA) Office of Ocean Resources, Conservation and Assessment (ORCA). The original purpose of this exercise was to assess the capabilities of a number of NOAA and other laboratories involved in the NOAA National Status and Trends program to analyze marine sediments and biological tissues for trace metals. Since 1990 external participation has expanded to include USEPA, state, Australian, Canadian, Mexican, Argentinean and Spanish laboratories.

Participating laboratories, meeting in Charleston for the annual NOAA quality assurance workshop after the eleventh intercomparison exercise, had agreed for this study to analyze one sediment and one biological tissue as well as to analyze the certified reference materials (CRMs) NRC sediment MESS-2 and mussel tissue CRM 2976. CRM 2976 has progressed through several identities, it was used as the unknown tissue in NOAA/7 and it will soon be released by NIST as SRM 2976. For some elements only reference values are available for CRM 2976.

The test materials distributed by NRC were:

Sediment 98, a freeze-dried marine sediment collected for NRC from the east coast of Canada.

Tissue 98, a freeze-dried mussel tissue supplied by NIST which is a proposed SRM for organic constituents.

The participating laboratories were each sent an eight gram sample of each of the two unknowns with the understanding that each participating laboratory would be responsible for procuring its own samples of the recommended CRMs. The participants were also sent a data file on which to record their results and analytical procedures.

Following the protocol used for the first eleven NOAA exercises, each laboratory was requested to perform five replicate analyses on each of the four samples. Again, as last year, the evaluation of the biological tissue would not be based on a hydrofluoric acid digestion. The list of elements remained the same: Al, Cr, Fe, Ni, Cu, Zn, As, Se, Ag, Cd, Sn, Hg and Pb for both matrices, plus Be, Si, Mn, Sb and Tl for the sediments.

In order to help provide benchmarks of accuracy for Sediment 98 and Tissue 98, NRC also analyzed each of the samples for most of the analytes by two different analytical methods. Where possible, one set of results was produced using isotope dilution inductively coupled plasma mass spectrometry (IDICPMS). This technique, when used correctly, is capable of producing very reliable analytical values. This is not to infer that the NRC laboratory is infallible, however, it does have a long and successful record regarding analysis of marine samples and the production of certified reference materials for trace metal analysis. The ten replicates analyzed by NRC were taken from four separate bottles. This was done in order to validate the interbottle homogeneity of the materials.

2. RESULTS

The prepared samples were mailed to the fifty-one laboratories listed in Appendix A in mid-April 1998 with the deadline for receipt of results set at September 14, 1998. Forty-four sets of results were received. Sequential numbers were assigned to each responding laboratory upon receipt of its data. Laboratory numbers 45 and 46 were assigned to NRC.

Of the forty-four laboratories, eight did not submit data for the sediments and five did not submit data for the biological tissues. Five laboratories submitted results for the first time. Five of the seven laboratories which did not send results had participated in NOAA/11.

A copy of the tabulated raw data was sent to each participant that had submitted data by the deadline in order to verify that no errors had been made by us in the transposition of numbers. The data used for subsequent evaluation are listed in Appendix B. The data are listed as received with respect to significant figures.

If two or more "less than (<)" values were submitted in a set of replicate results the mean was not calculated and only the "less than" value was used for further data evaluation. To ensure that all laboratories are compared on a rather even basis, data sets containing less than four results were not evaluated. A Q test (Dixon's test) was used to determine outliers within a replicate set of data and, when warranted, the laboratory mean and standard deviation were recalculated excluding the outlier. These sets are indicated by an apostrophe adjoining the laboratory number on the graphs (e.g., 7'). The number of results used for the evaluation is noted next to the laboratory number in Appendix B along with a calculated mean, standard deviation (SD) and relative standard deviation (RSD).

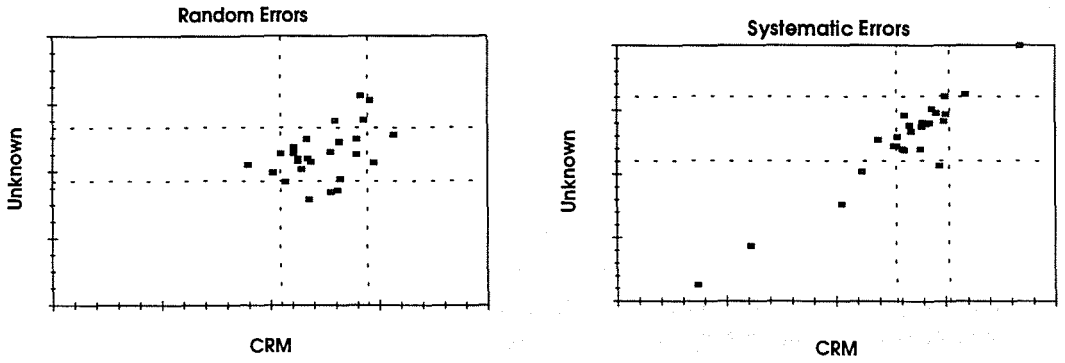
One purpose of the exercise was to arrive at an accepted value for each analyte concentration for each unknown sample in order to evaluate laboratory biases. The overall mean concentration for each metal was calculated from the mean of the laboratory replicates including the NRC data. These means were assumed to be normally distributed, which may not be a valid assumption at very low concentrations, but for the purpose of this exercise it is felt to be adequate. A successively applied Student t test[2] at the 95 percent confidence level was used to identify outliers.

A minimum acceptable range for the analytes in the CRMs was set at either the certified range or ten percent of the certified value, whichever is larger (five percent for Al, Si and Fe in the sediments). Where this occurred , the certified value is listed is followed by the acceptable range used for evaluation in parentheses. In several cases, the calculated acceptable range for the unknown samples was also very small (an indication of good performance by the group as a whole), and the same criterion of a minimal acceptable range of ten percent was used.

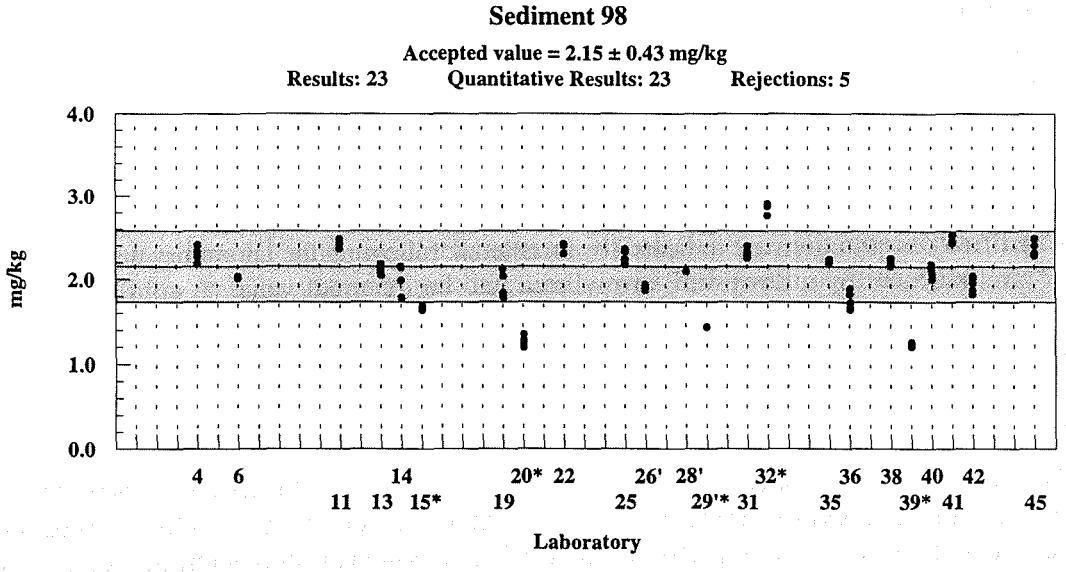
The evaluated replicate data are plotted on the graphs where possible. Means that were outliers from the accepted or certified concentration are indicated by an asterisk following the laboratory number (e.g., 5*). "Less thans" are indicated by a downward arrow head and the reported value. A solid horizontal line represents the accepted mean for an unknown or the certified value of a CRM. The shaded area represents the 95% confidence intervals for these values. A short summary of results for each set of results is listed above the appropriate graph. All concentrations are expressed in mg/kg on a dry weight basis except for aluminum, iron and silicon in the sediments where the concentrations are in percent.

We have also included Youden (or two sample plots) for the sediment and the tissue samples. These plots of the overall mean for the CRM versus the mean for the unknown sample can give useful information when the analyte concentrations of the two samples are similar. If non-systematic or random errors are occurring,

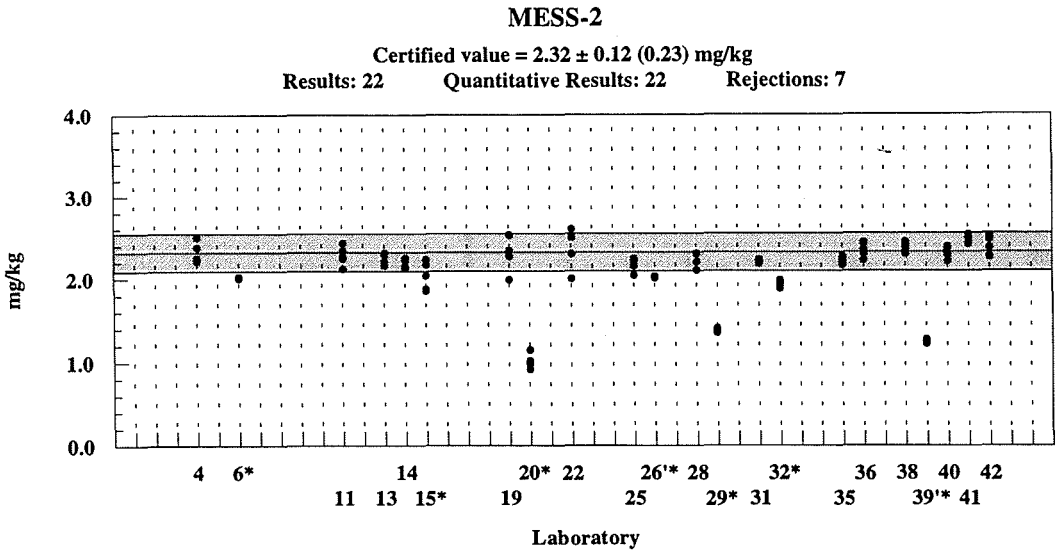
the results would be expected to group at random about the intersection of the two means. If, however, systematic errors occur (e.g. a high or low result for both the CRM and the unknown) a predominance of points would be expected to group about a line running from the origin through the intersection of the two means. The latter case is common in intercomparison exercises due to calibration and blank errors. The laboratory number appears to the left of a marker if both of the laboratory results are rejected. Unfortunately, when a group of laboratories report similar rejected results the labels become illegible. The accepted confidence range is indicated by the dashed lines. Examples of Youden plots, demonstrating random and systematic errors respectively, are shown below.

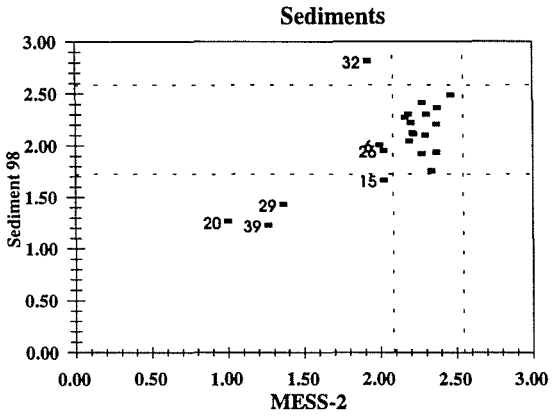


BERYLLIUM



BERYLLIUM





Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	9	1	13	4	1	0	9	1	0	-	10	3	17	4

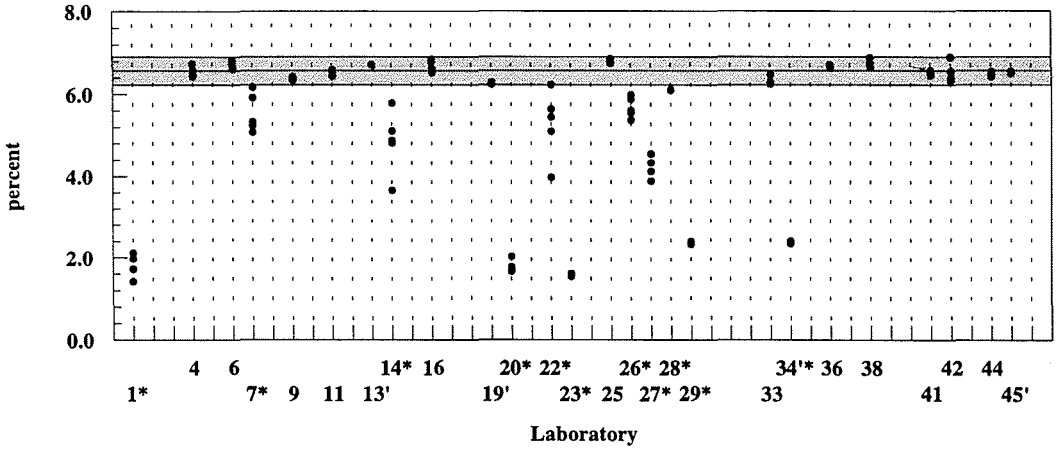
The determination of Be was not required in the tissues.

ALUMINUM

Sediment 98

Accepted value = 6.57 ± 0.34 %

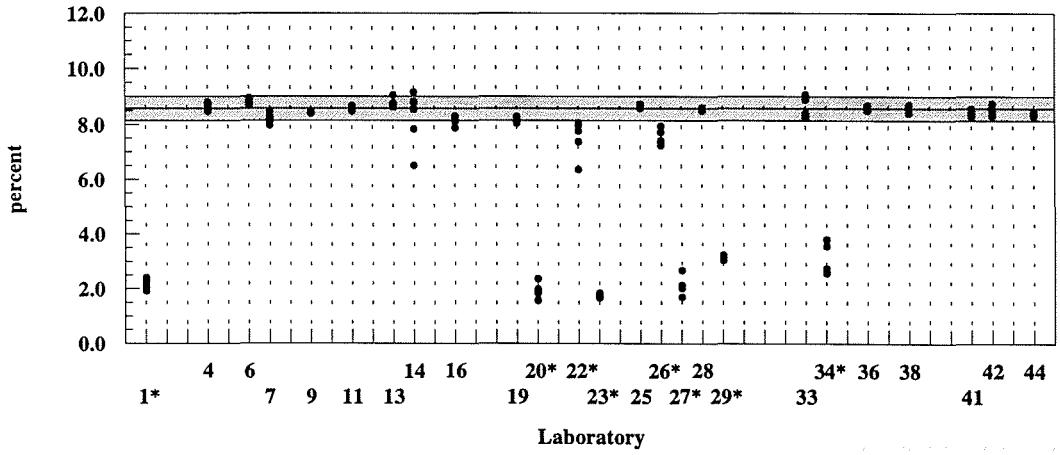
Results: 26 Quantitative Results: 26 Rejections: 11



MESS-2

Certified value = 8.57 ± 0.26(0.43) %

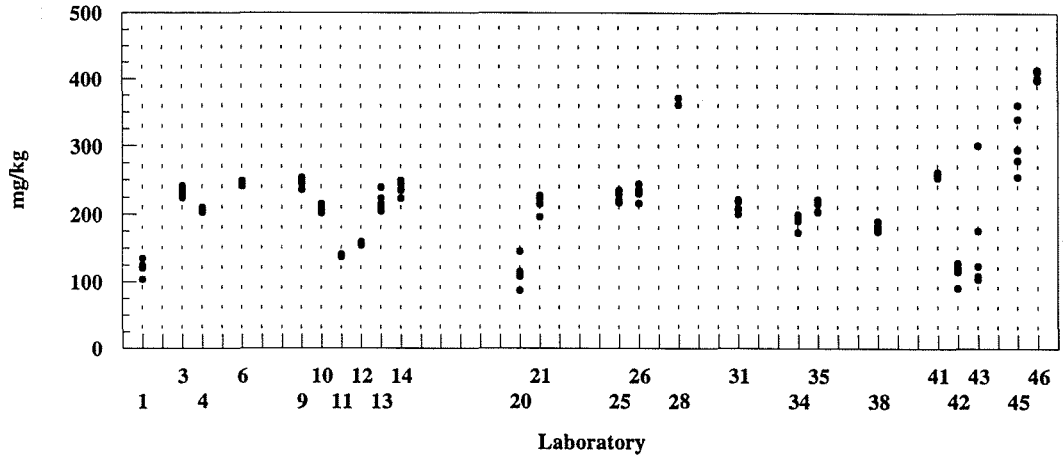
Results: 25 Quantitative Results: 25 Rejections: 8



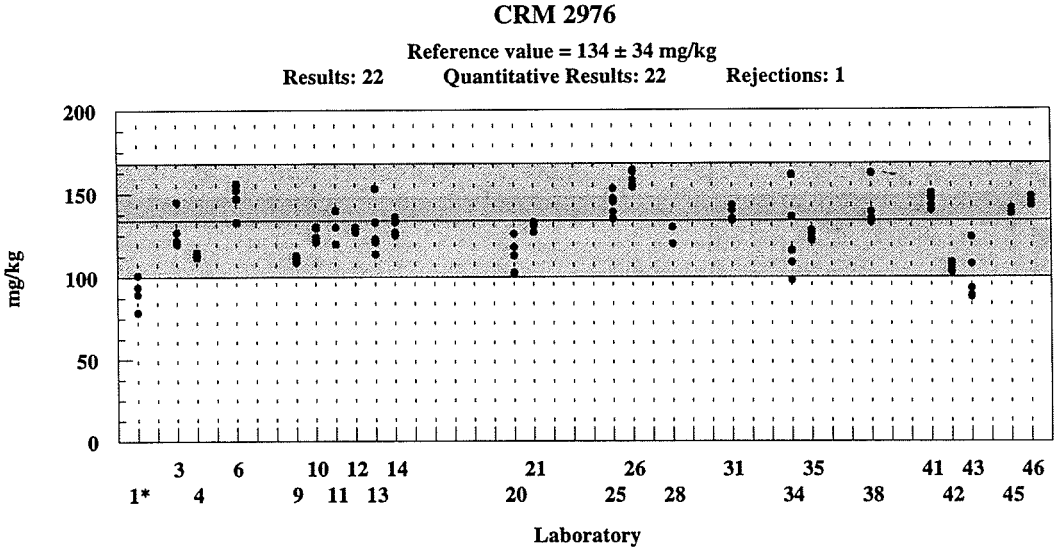
Tissue 98

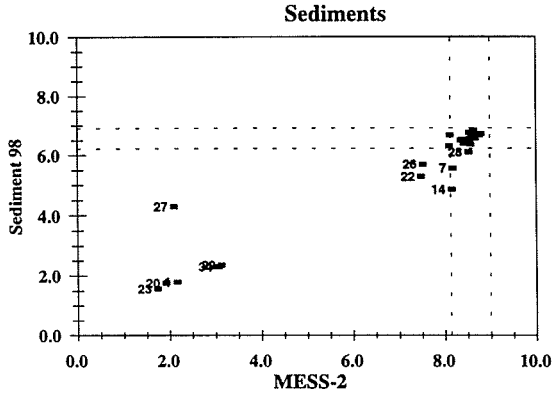
Accepted value = not determined

Results: 24 Quantitative Results: 24 Rejections: -



ALUMINUM





No Youden Plot
for Al in Tissues

Unknown Sample	Digestion						Instrumentation						NOAA/11	
	open		closed		HF		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	yes	no	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	10	4	14	5	17	4	1	1	5	0	13	9	26	11
Tissue	9	-	12	-			9	-	3	-	11	-	30	-

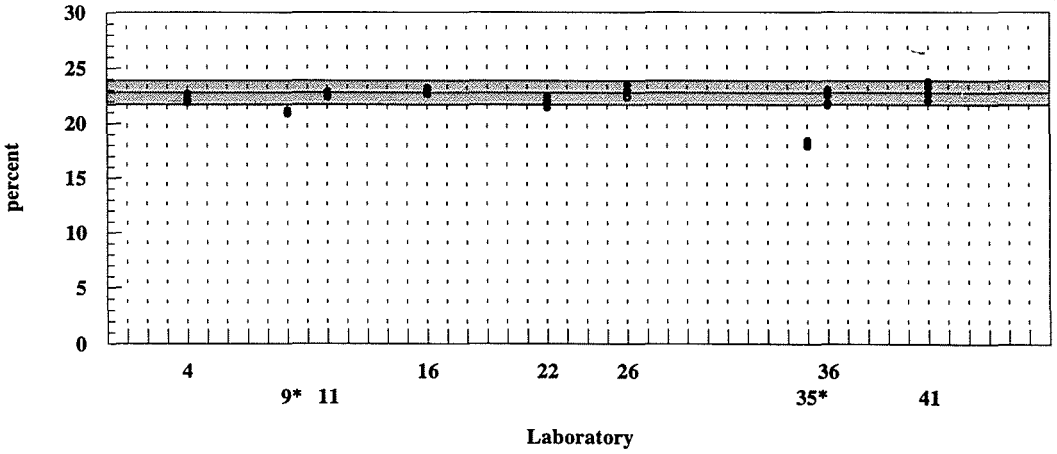
Laboratories 20, 23, 29 and 34 did not use HF for the dissolution of the sediment.

The use of HF is required for the determination of total Al in Tissue 98. The NRC results (45,46), respectively without and with HF, show different values. Our result for CRM 2976 indicate the use of HF is not crucial. Laboratories 13, 28 and 42 also used HF in their dissolution procedures

SILICON

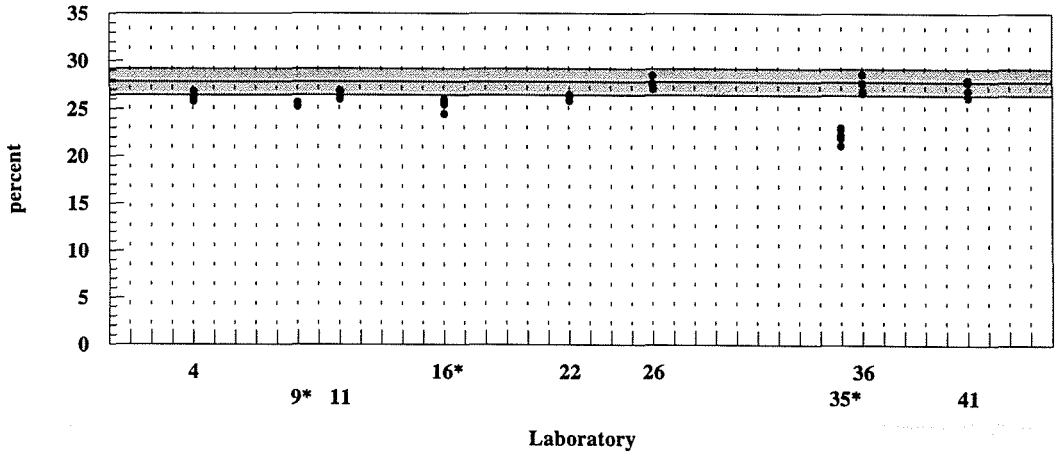
Sediment 98

Accepted value = 22.8 ± 1.1 %
Results: 9 Quantitative Results: 9 Rejections: 2

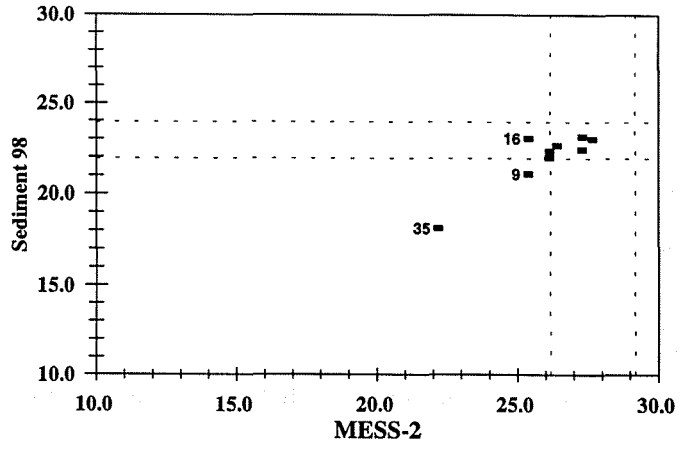


MESS-2

Certified value = 27.8 ± 1.1 (1.4) %
Results: 9 Quantitative Results: 9 Rejections: 3



Sediments



SILICON

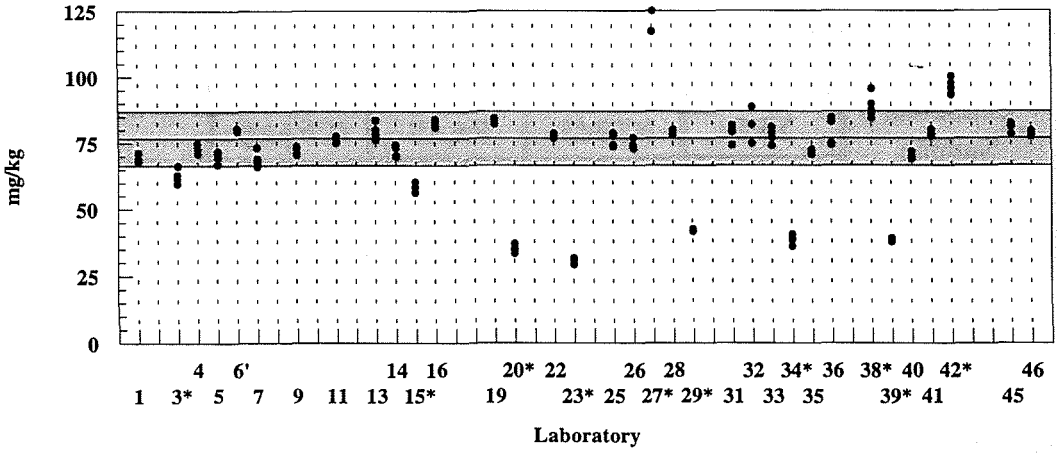
Unknown Sample	Instrumentation								NOAA/11	
	XRF		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	3	1	0	-	1	0	5	1	11	2

The determination of silicon was not required in the tissues.

CHROMIUM

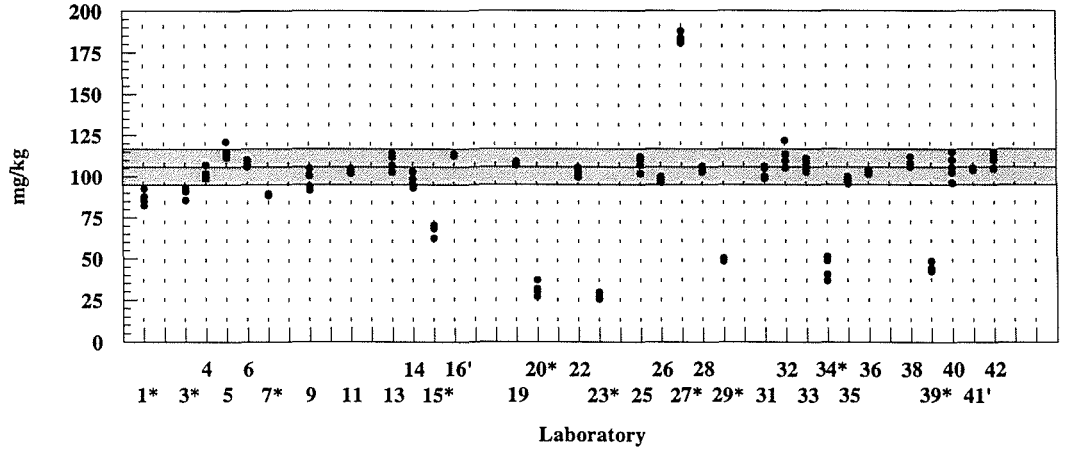
Sediment 98

Accepted value = 76.7 ± 10.2 mg/kg
Results: 34 Quantitative Results: 34 Rejections: 10



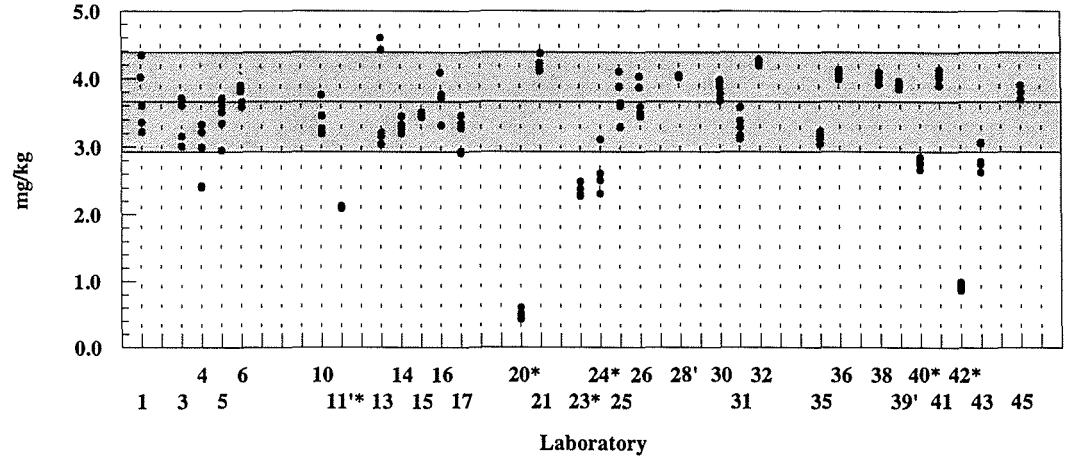
MESS-2

Certified value = 106 ± 8 (11) mg/kg
Results: 34 Quantitative Results: 34 Rejections: 10



Tissue 98

Accepted value = 3.66 ± 0.73 mg/kg
Results: 31 Quantitative Results: 31 Rejections: 6

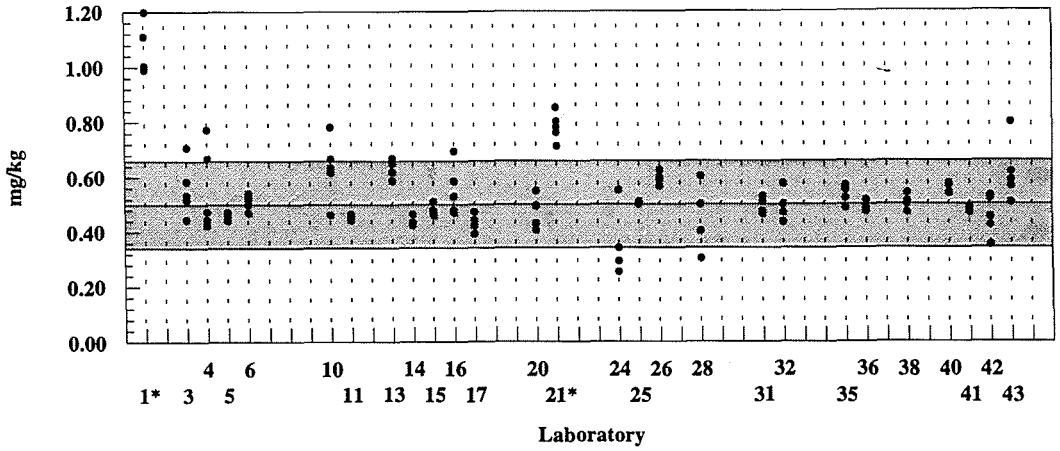


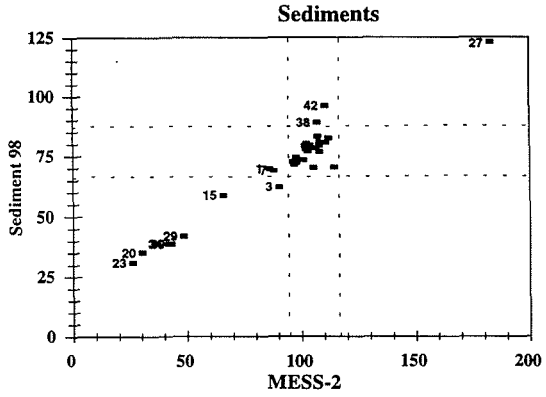
CHROMIUM

CRM 2976

Reference value = 0.50 ± 0.16 mg/kg

Results: 27 Quantitative Results: 27 Rejections: 2





No Youden Plot
for Cr in Tissues

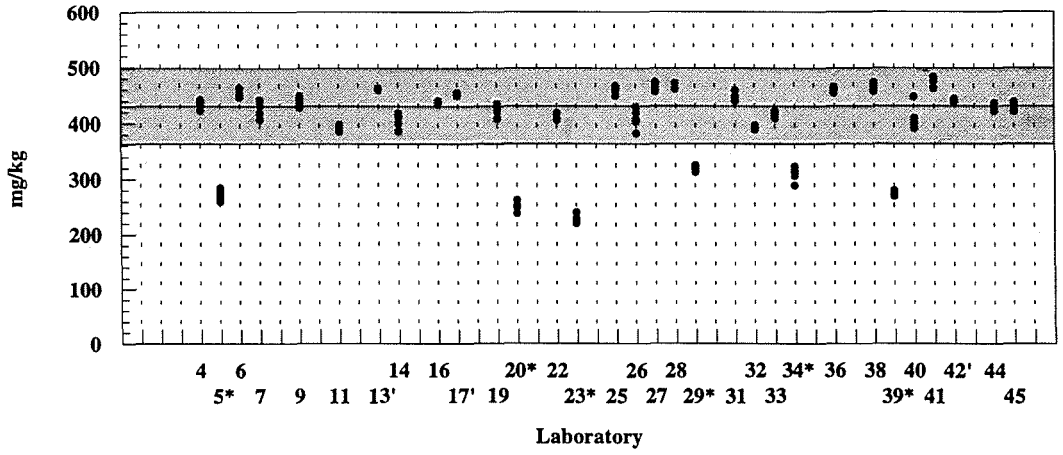
Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	10	3	23	7	4	2	10	1	3	0	14	7	31	9
Tissue	12	3	18	3	12	4	10	1	1	0	8	1	28	7

Laboratories 3, 15, 20, 23, 29, 34 and 39 did not use HF in their digestion procedure for dissolution of the sediments.

MANGANESE

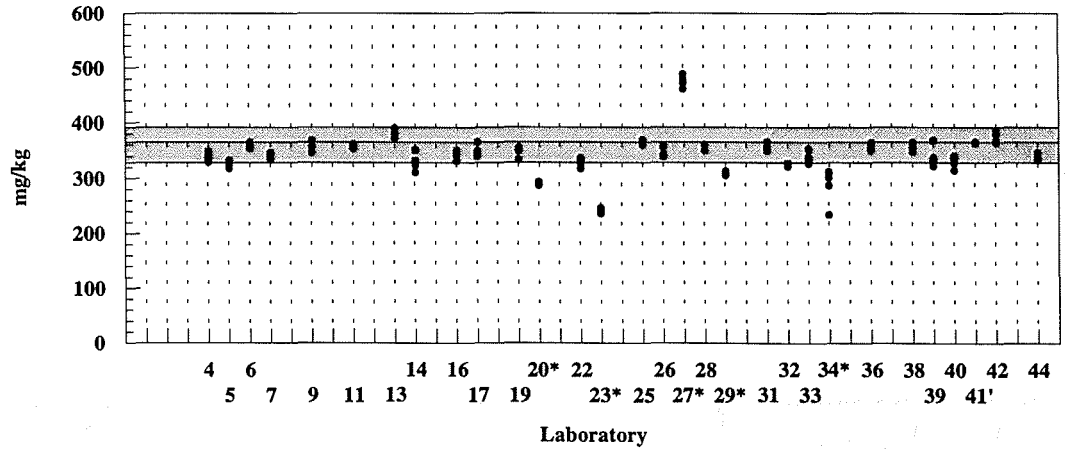
Sediment 98

Accepted value = 431 ± 67 mg/kg
Results: 31 Quantitative Results: 31 Rejections: 6

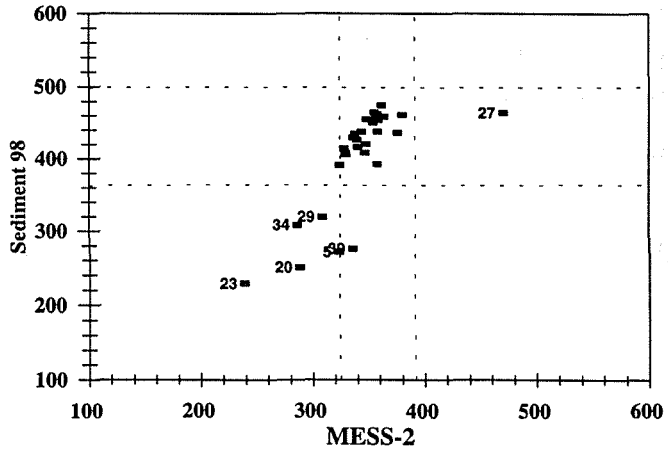


MESS-2

Certified value = 365 ± 21 (37) mg/kg
Results: 30 Quantitative Results: 30 Rejections: 5



Sediments



MANGANESE

Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		XRF		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	12	2	17	4	2	0	6	1	6	1	14	4	33	9

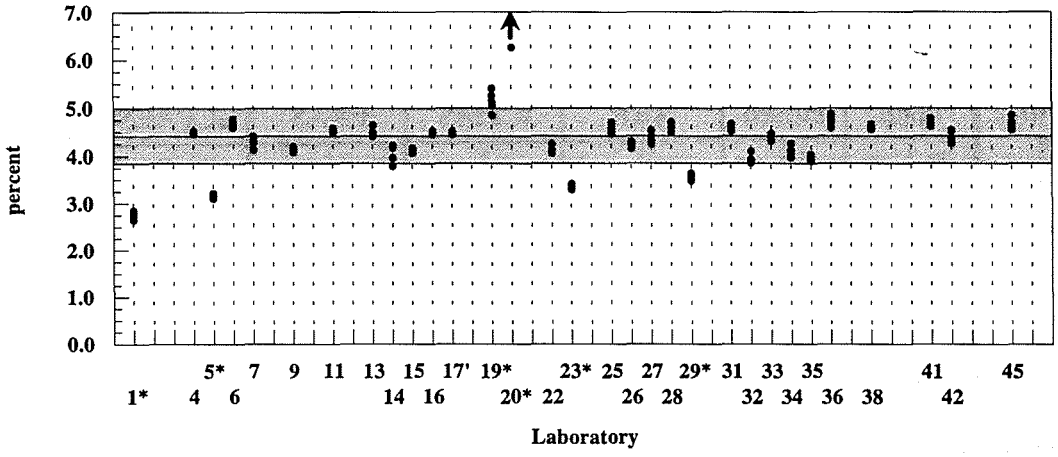
Laboratories 20, 23, 29, 34 and 39 did not use HF in their digestion procedure for the sediments.

The determination of manganese was not required in the biological tissues.

IRON

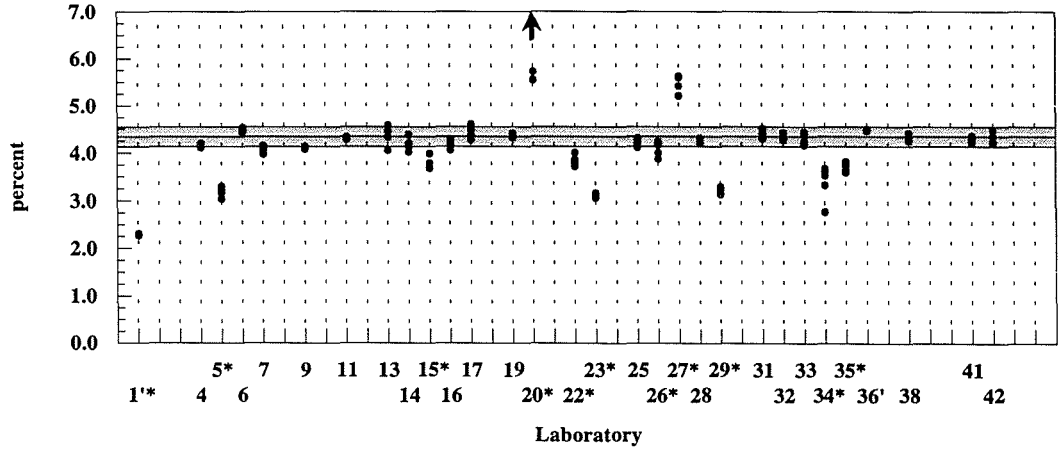
Sediment 98

Accepted value = 4.42 ± 0.58 %
Results: 31 Quantitative Results: 31 Rejections: 6



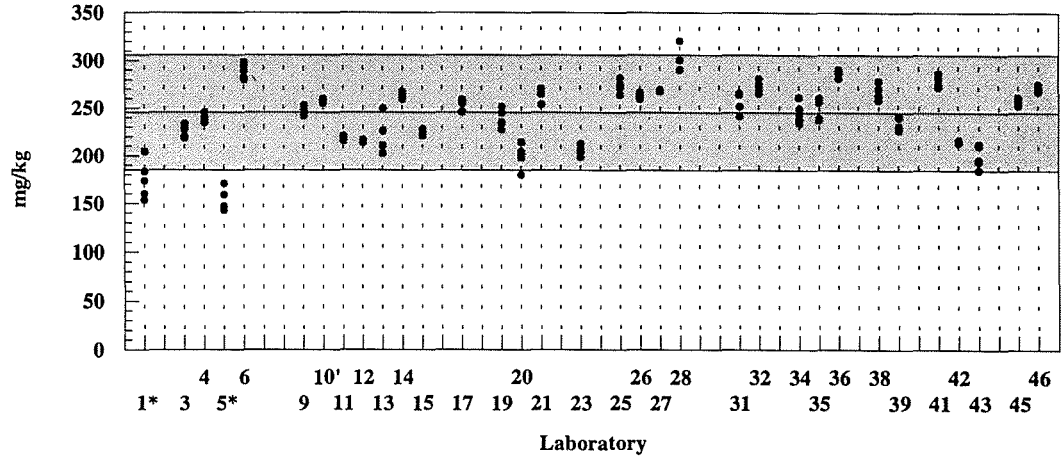
MESS-2

Certified value = 4.34 ± 0.21 %
Results: 30 Quantitative Results: 30 Rejections: 11



Tissue 98

Accepted value = 246 ± 61 mg/kg
Results: 33 Quantitative Results: 33 Rejections: 2

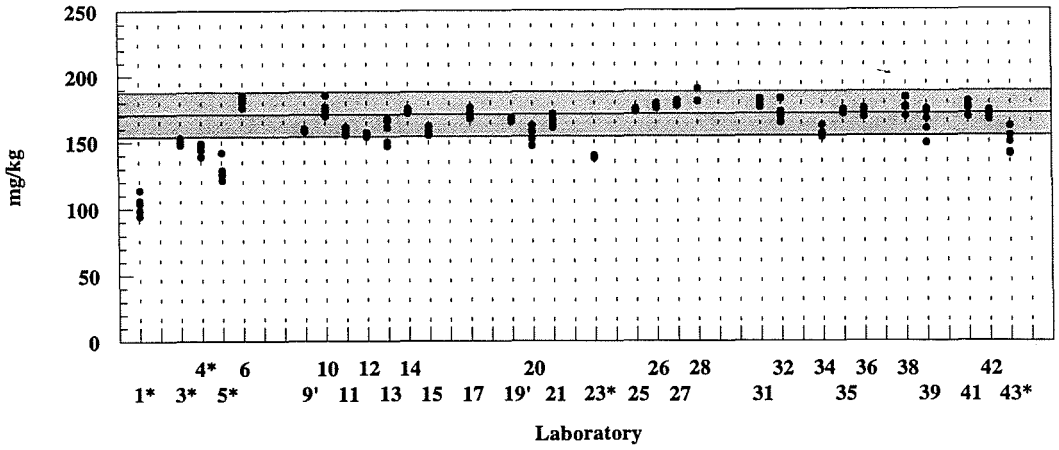


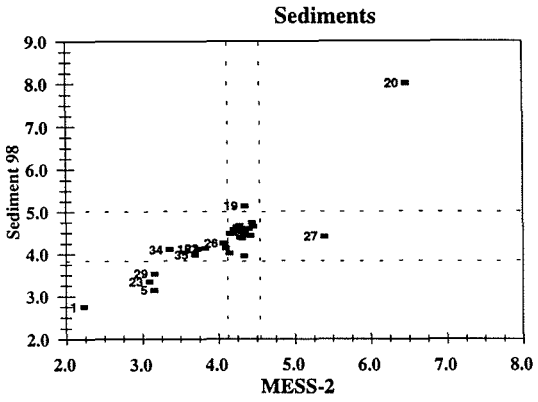
IRON

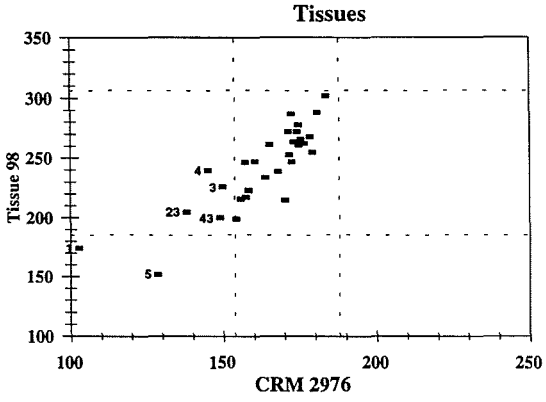
CRM 2976

Accepted value = 171 ± 5(17) mg/kg

Results: 31 Quantitative Results: 31 Rejections: 6





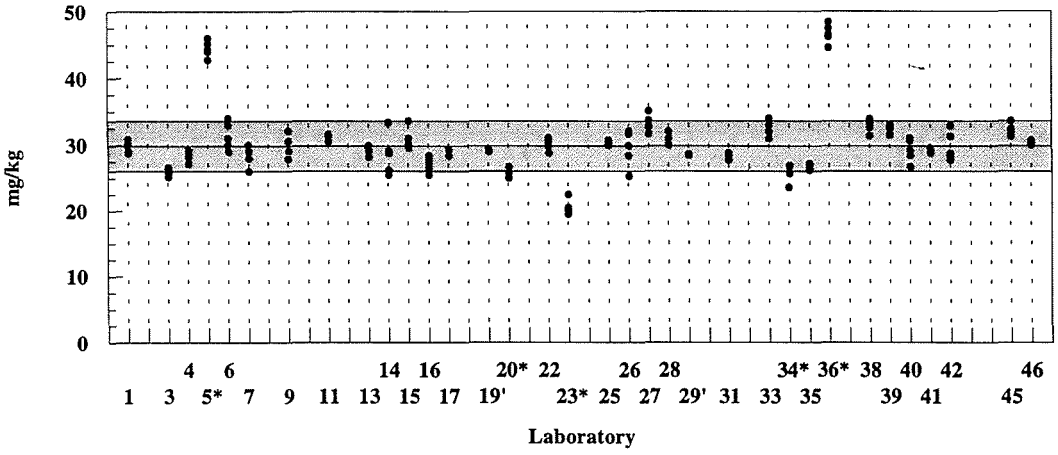


Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		XRF		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	11	2	19	4	3	1	3	1	7	1	17	3	32	3
Tissue	13	0	19	1	-	-	8	0	8	1	15	1	31	3

NICKEL

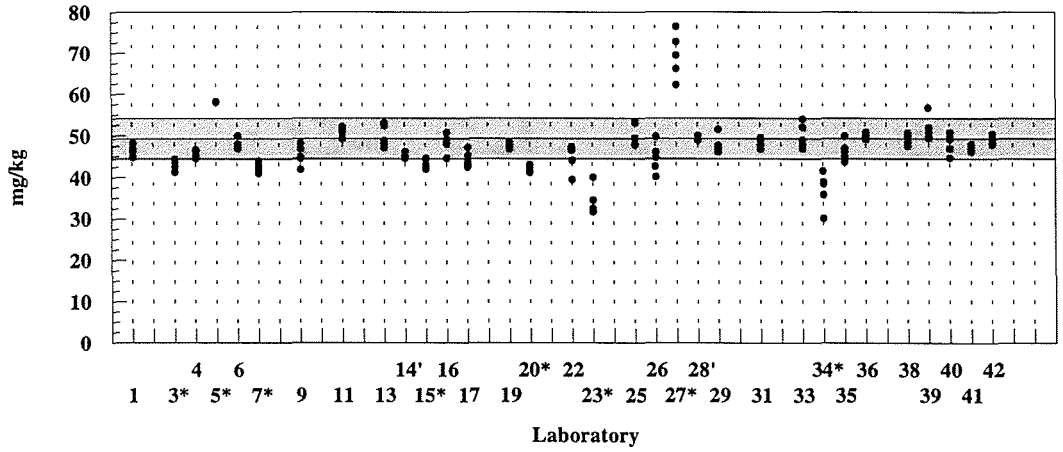
Sediment 98

Accepted value = 29.8 ± 3.8 mg/kg
Results: 34 Quantitative Results: 34 Rejections: 5



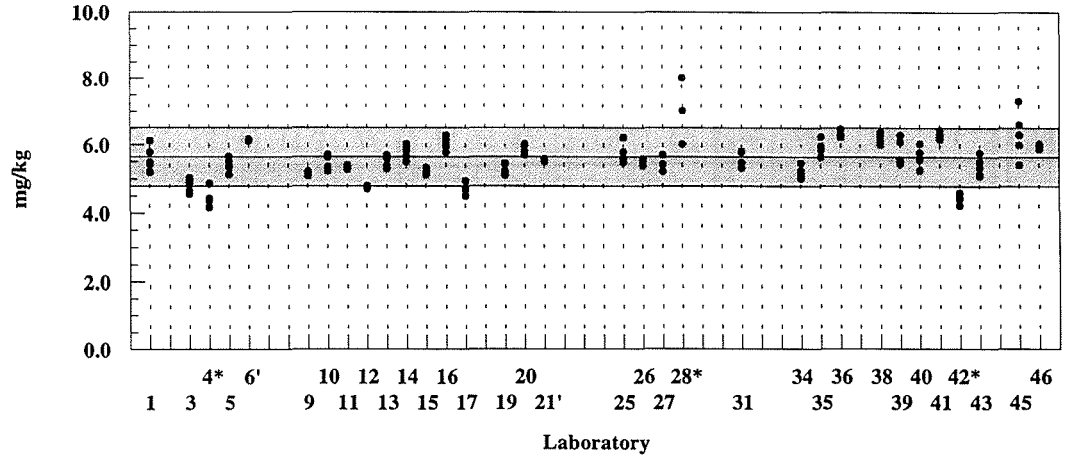
MESS-2

Certified value = 49.3 ± 3.8 (4.9) mg/kg
Results: 32 Quantitative Results: 32 Rejections: 8



Tissue 98

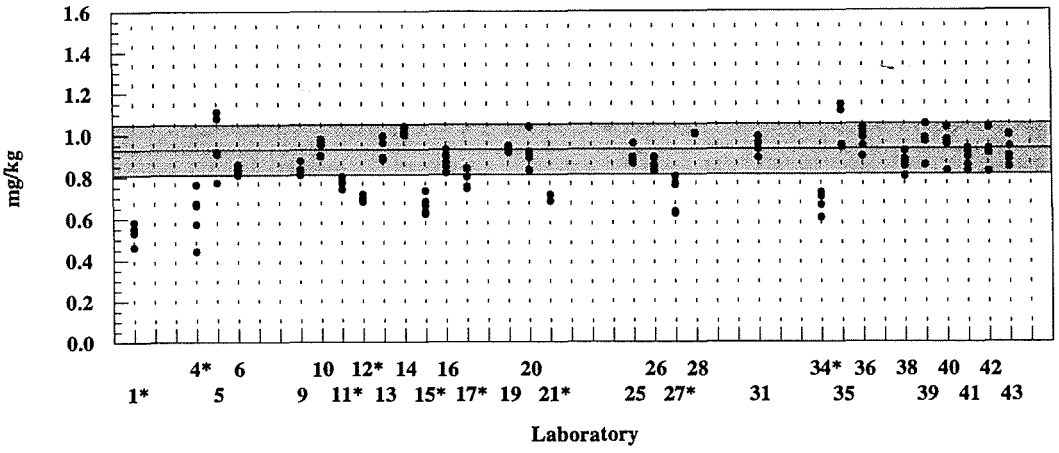
Accepted value = 5.65 ± 0.87 mg/kg
Results: 33 Quantitative Results: 33 Rejections: 3

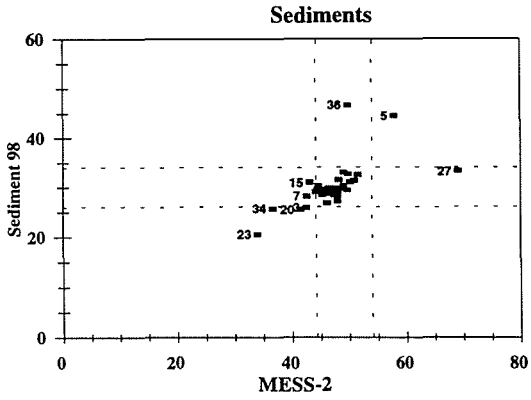


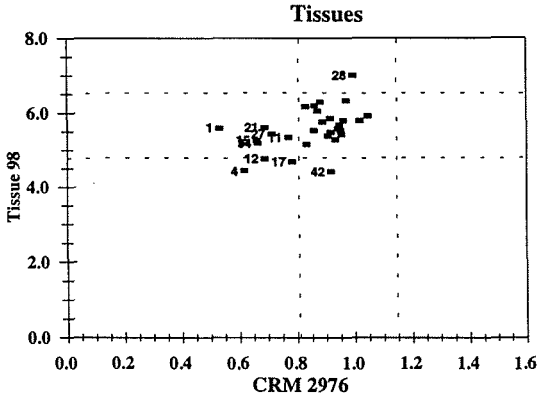
NICKEL

CRM 2976

Reference value = 0.93 ± 0.12 mg/kg
Results: 30 Quantitative Results: 30 Rejections: 9





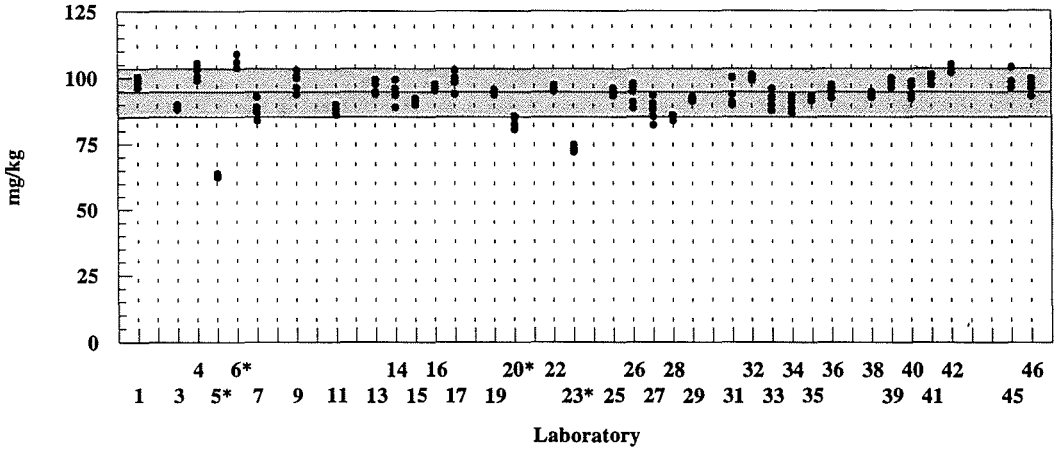


Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	10	2	23	3	4	0	9	1	2	1	15	3	32	3
Tissue	12	2	20	1	8	1	17	0	1	0	7	2	31	3

COPPER

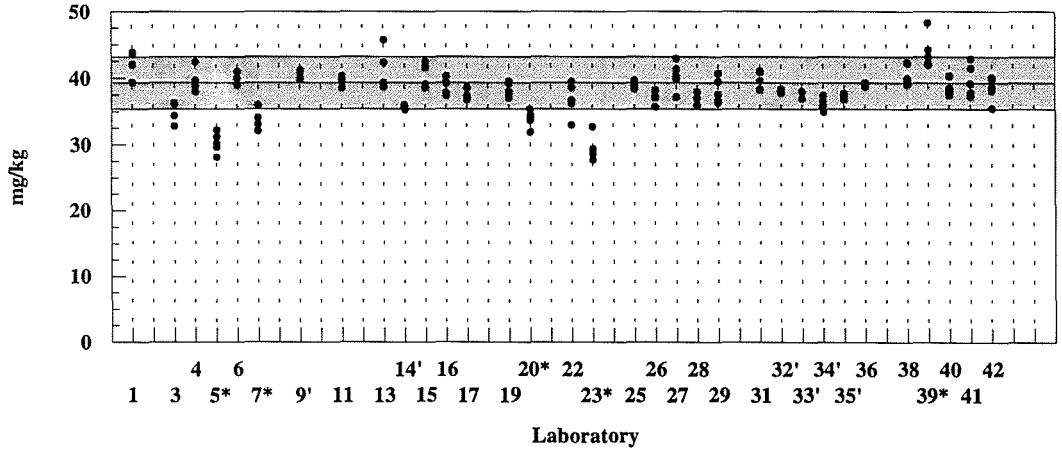
Sediment 98

Accepted value = 94.8 ± 8.2 (9.5) mg/kg
Results: 35 Quantitative Results: 35 Rejections: 4



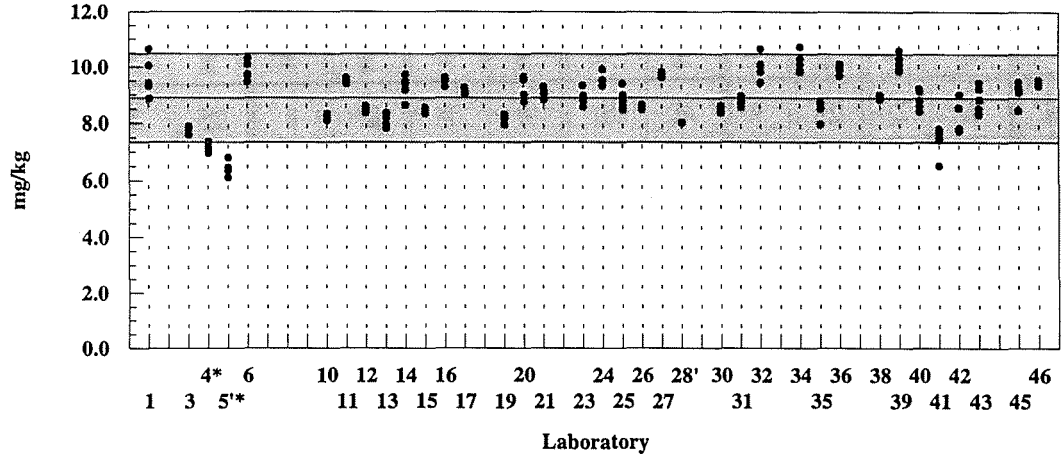
MESS-2

Certified value = 39.3 ± 2.0 (3.9) mg/kg
Results: 33 Quantitative Results: 33 Rejections: 5



Tissue 98

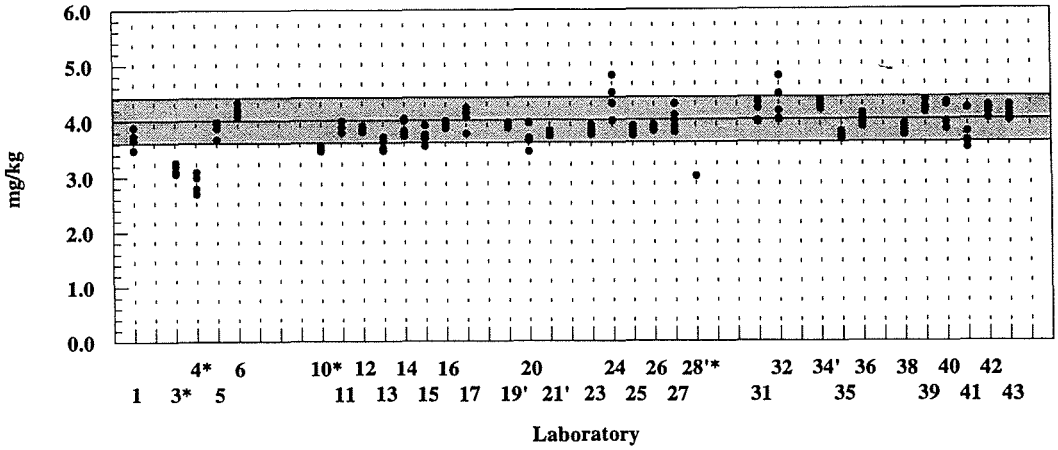
Accepted value = 8.90 ± 1.57 mg/kg
Results: 36 Quantitative Results: 36 Rejections: 2

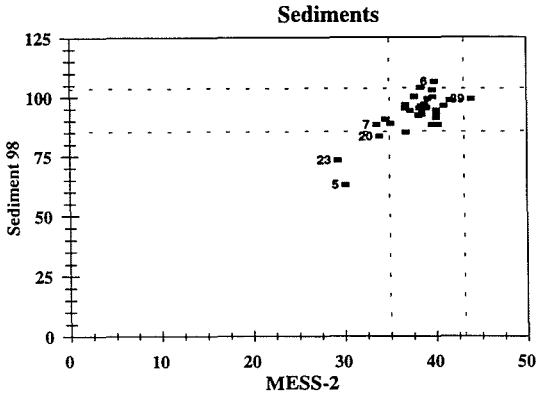


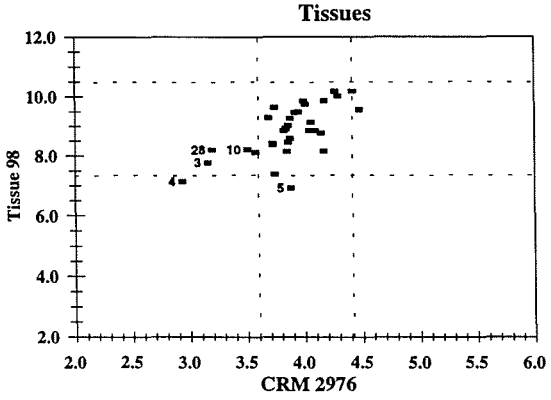
COPPER

CRM 2976

Certified value = 4.02 ± 0.33 (0.40) mg/kg
Results: 33 Quantitative Results: 33 Rejections: 4





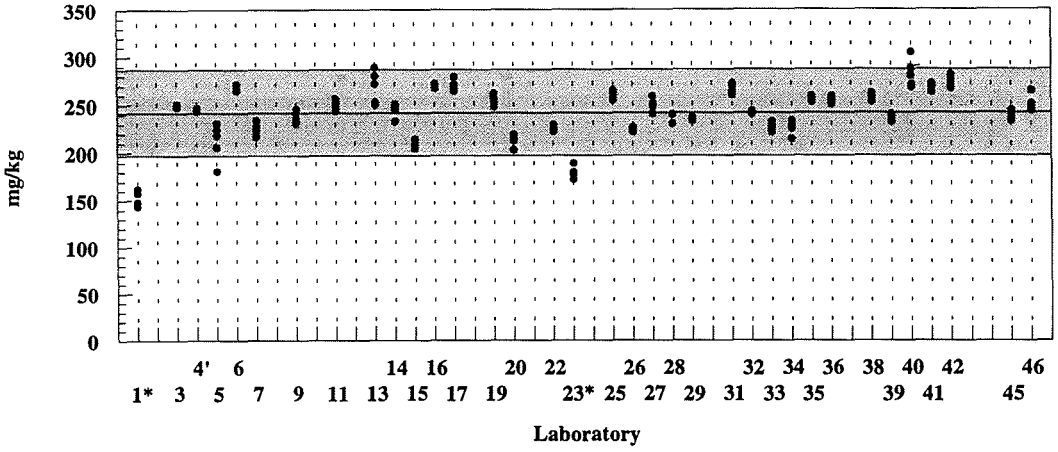


Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	11	1	23	3	0	-	7	0	6	1	18	3	33	2
Tissue	14	0	21	2	7	0	13	0	4	1	12	1	33	3

ZINC

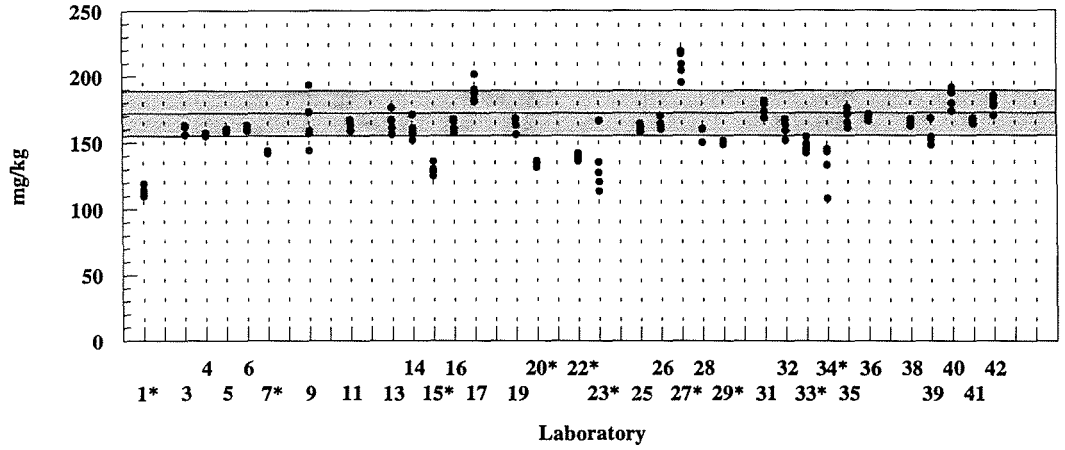
Sediment 98

Accepted value = 242 ± 45 mg/kg
Results: 35 Quantitative Results: 35 Rejections: 2



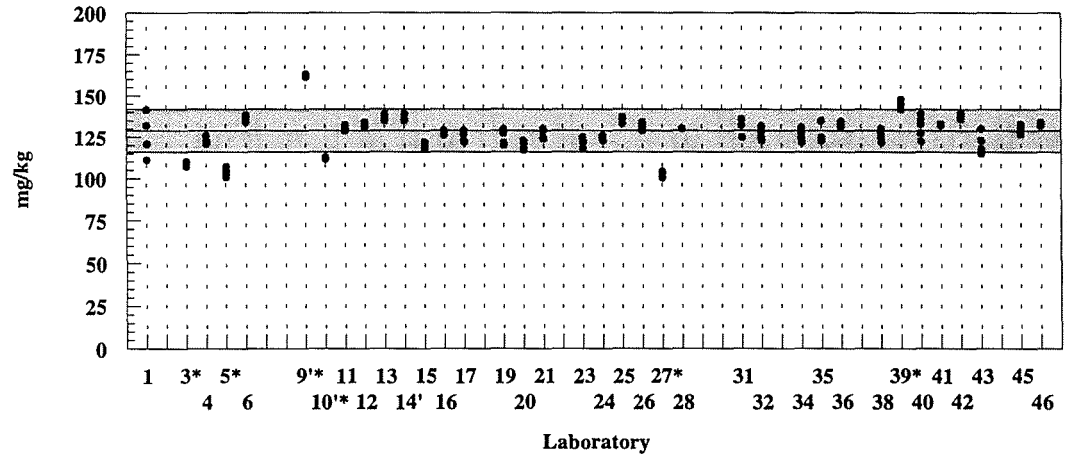
MESS-2

Certified value = 172 ± 16 (17) mg/kg
Results: 33 Quantitative Results: 33 Rejections: 10

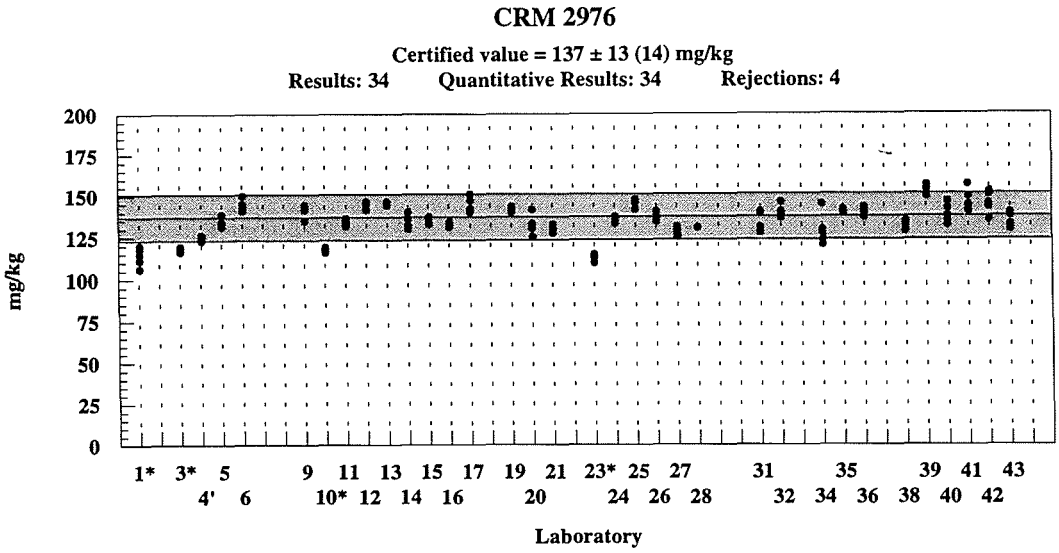


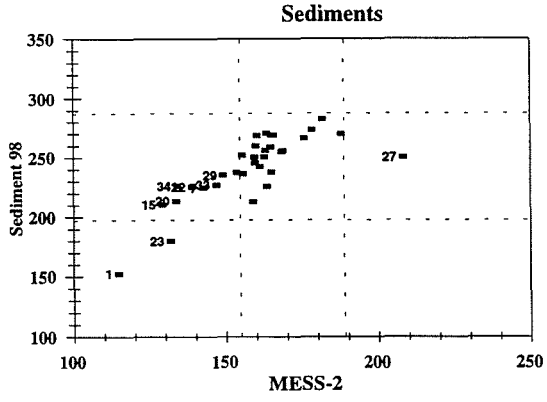
Tissue 98

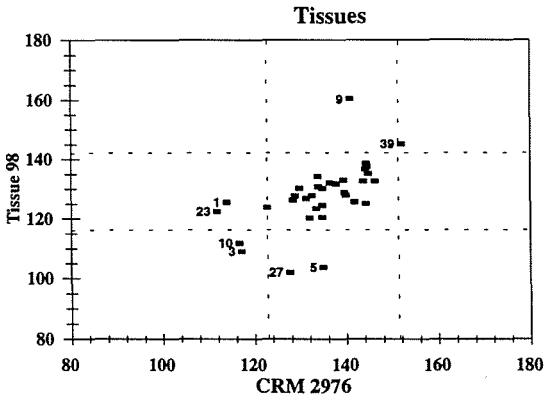
Accepted value = 129 ± 13 mg/kg
Results: 36 Quantitative Results: 36 Rejections: 6



ZINC





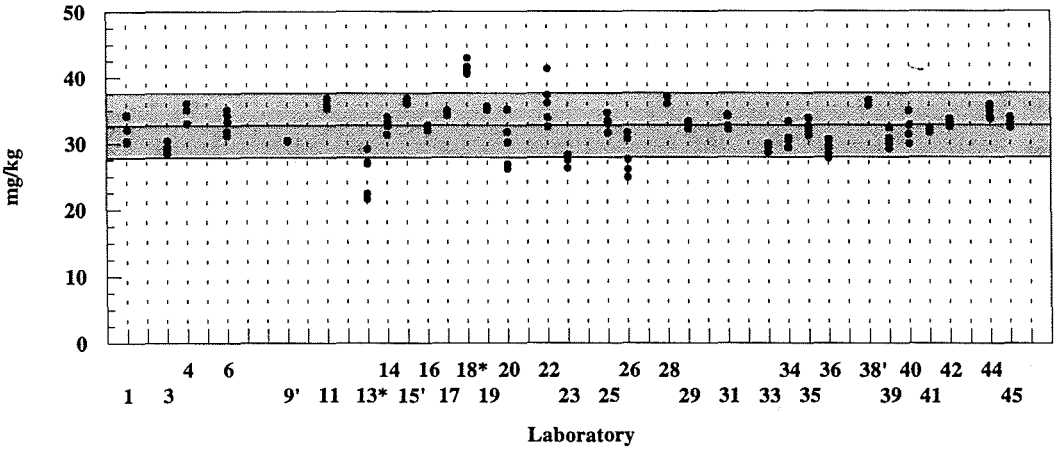


Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		XRF		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	11	1	23	1	1	0	8	1	7	0	18	1	35	6
Tissue	15	0	19	6	1	0	10	2	7	1	17	3	32	5

ARSENIC

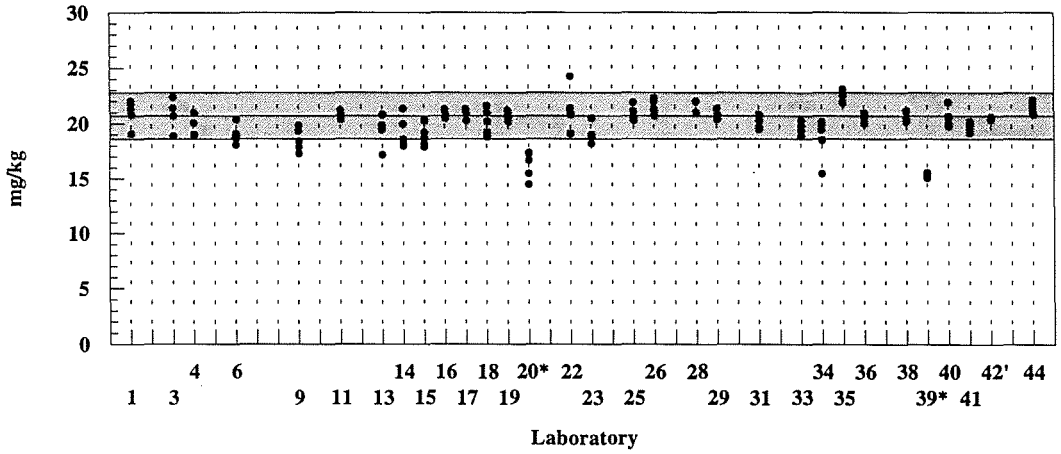
Sediment 98

Accepted value = 32.7 ± 4.9 mg/kg
Results: 32 Quantitative Results: 32 Rejections: 2



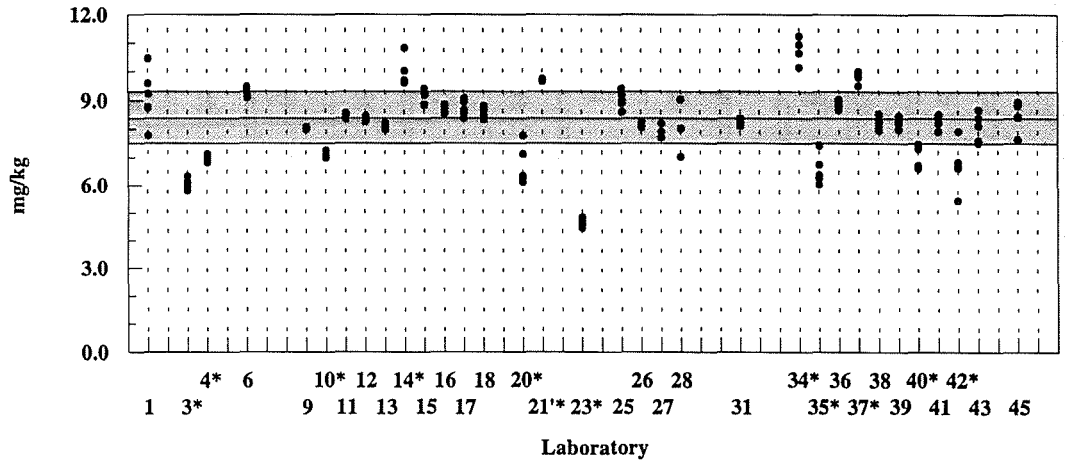
MESS-2

Certified value = 20.7 ± 0.8 (2.1) mg/kg
Results: 31 Quantitative Results: 31 Rejections: 2



Tissue 98

Accepted value = 8.37 ± 0.84 mg/kg
Results: 33 Quantitative Results: 33 Rejections: 12

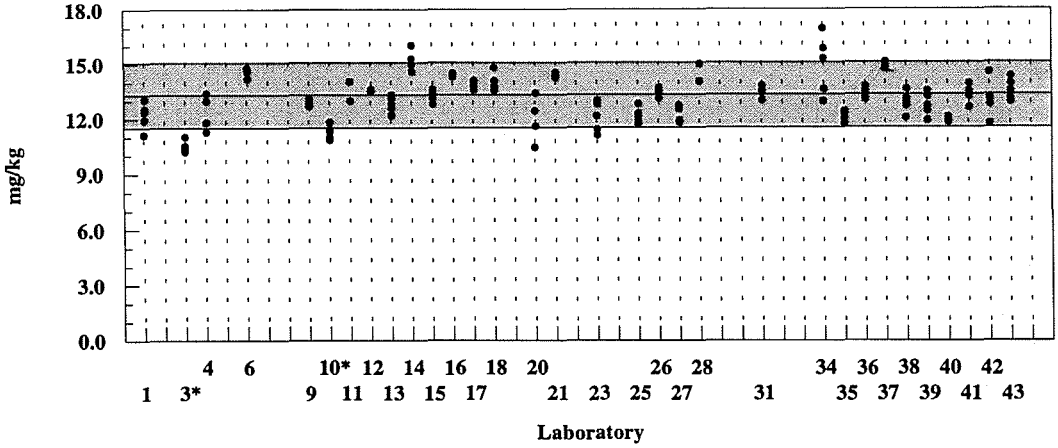


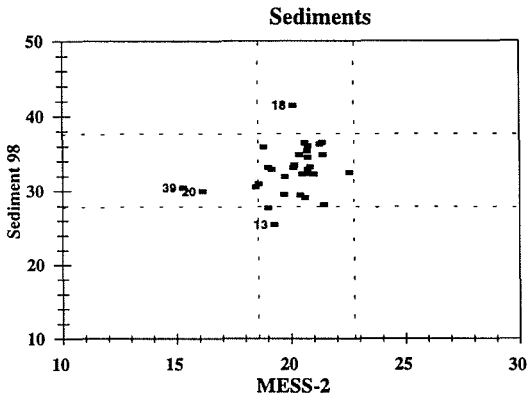
ARSENIC

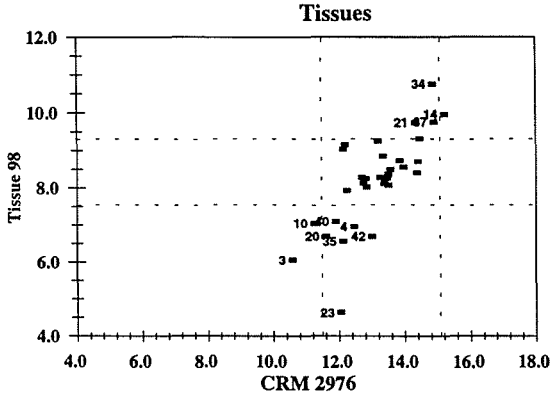
CRM 2976

Certified value = 13.3 ± 1.8 mg/kg

Results: 32 Quantitative Results: 32 Rejections: 2





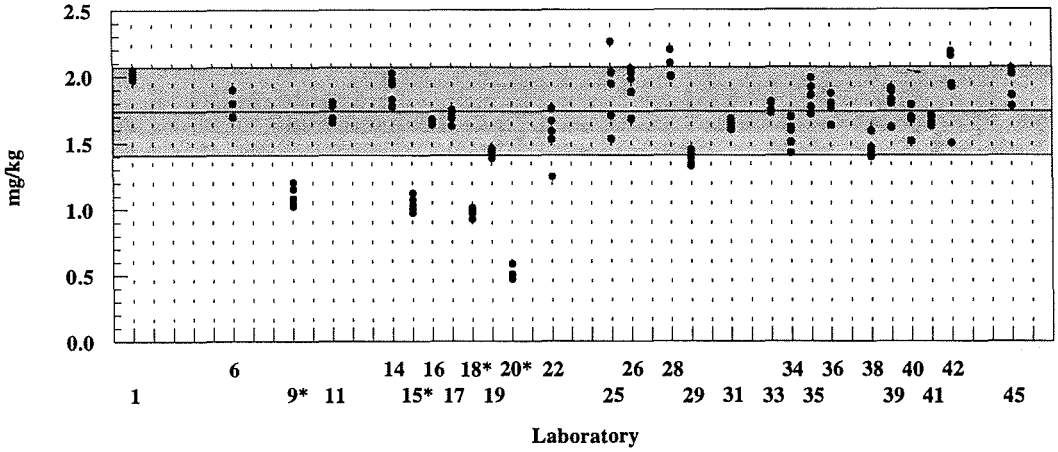


Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		HG		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	14	1	17	1	10	1	10	1	6	0	4	0	32	7
Tissue	11	3	20	8	9	3	16	4	3	1	5	4	29	3

SELENIUM

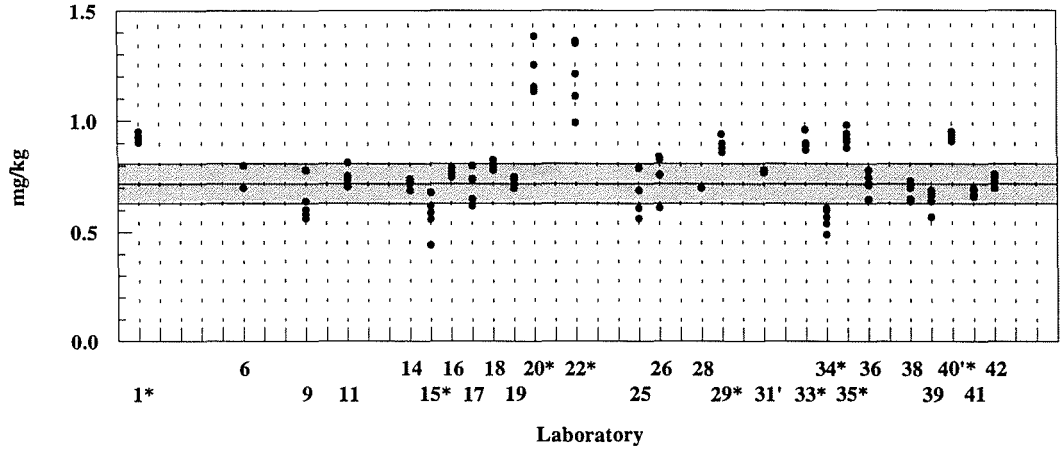
Sediment 98

Accepted value = 1.74 ± 0.33 mg/kg
Results: 27 Quantitative Results: 27 Rejections: 4



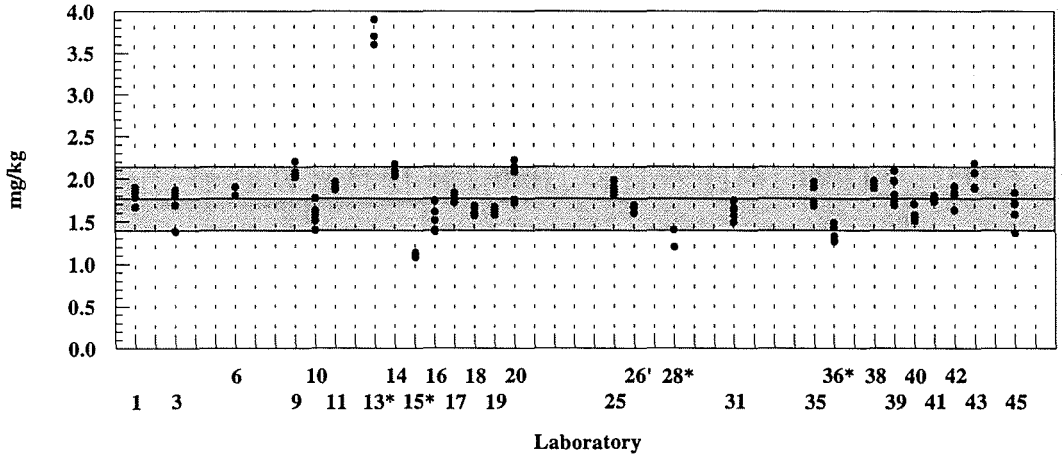
MESS-2

Certified value = 0.72 ± 0.09 mg/kg
Results: 26 Quantitative Results: 26 Rejections: 9



Tissue 98

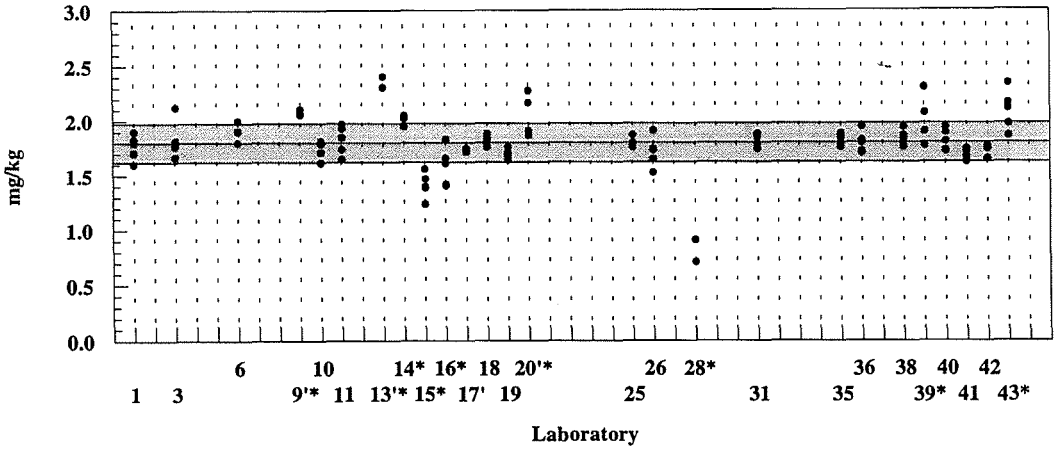
Accepted value = 1.77 ± 0.38 mg/kg
Results: 27 Quantitative Results: 27 Rejections: 4

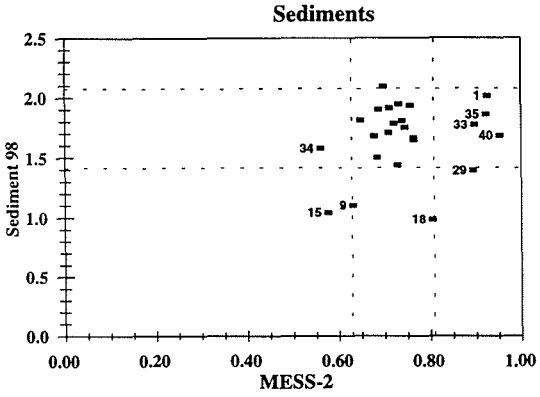


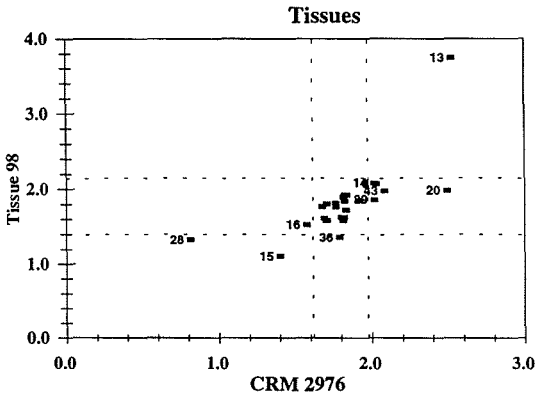
SELENIUM

CRM 2976

Certified value = 1.80 ± 0.15 (0.18) mg/kg
Results: 26 Quantitative Results: 26 Rejections: 9





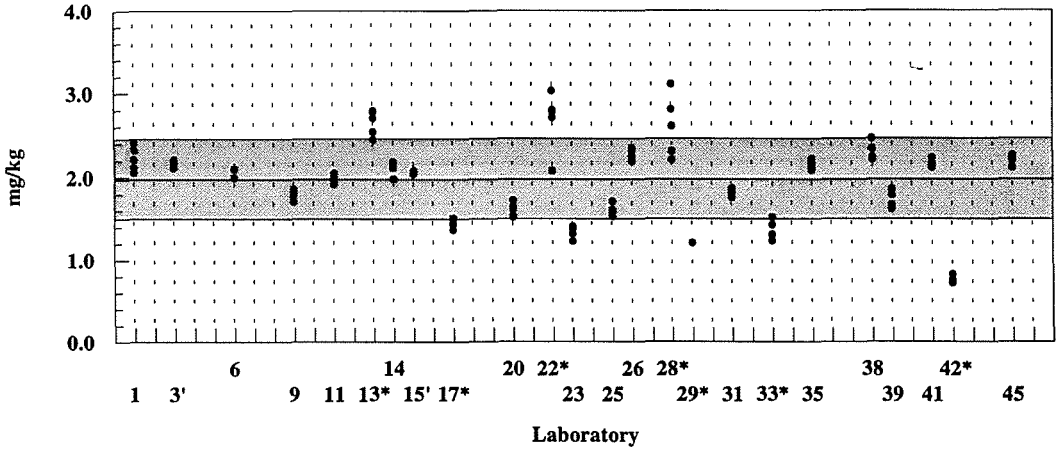


Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		HGAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	10	0	16	4	10	2	7	1	9	0	0	-	21	4
Tissue	9	2	16	2	8	1	14	2	5	1	0	-	27	2

SILVER

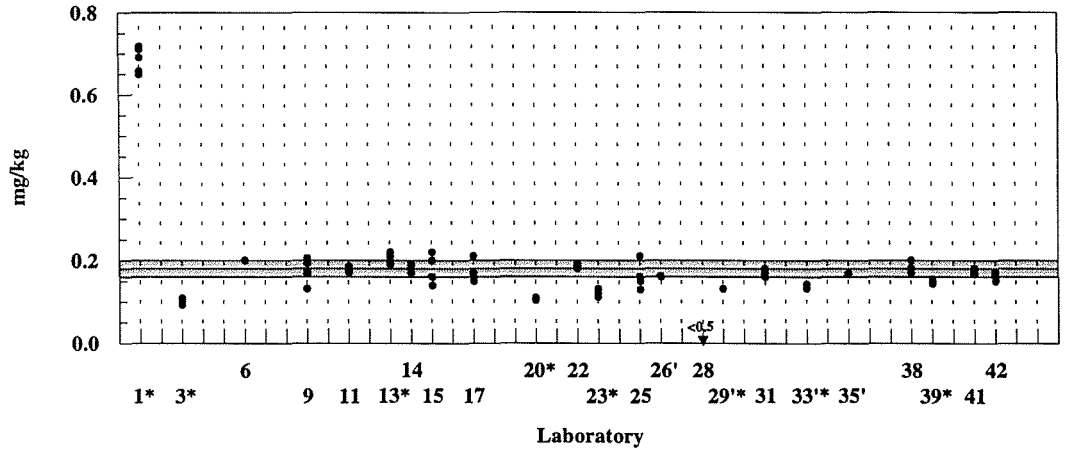
Sediment 98

Accepted value = 1.98 ± 0.48 mg/kg
Results: 24 Quantitative Results: 24 Rejections: 7



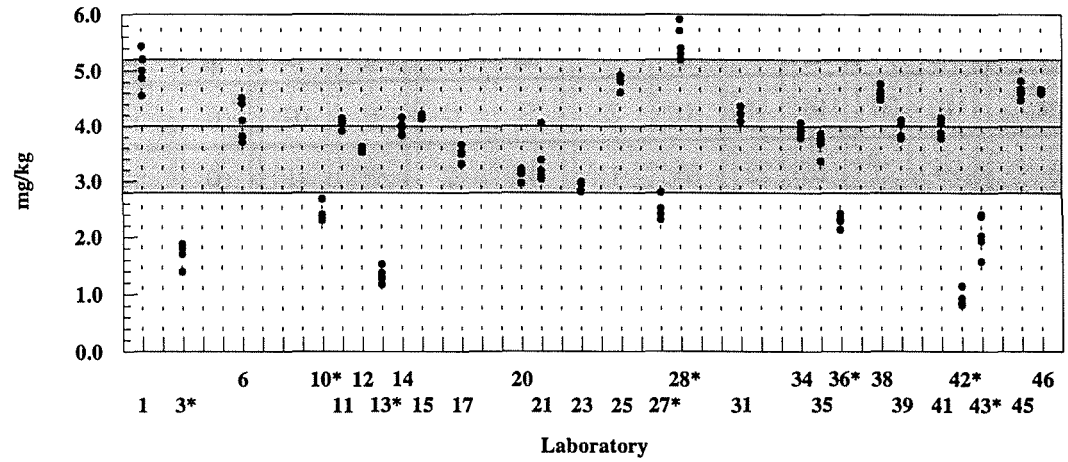
MESS-2

Certified value = 0.18 ± 0.02 mg/kg
Results: 23 Quantitative Results: 22 Rejections: 8



Tissue 98

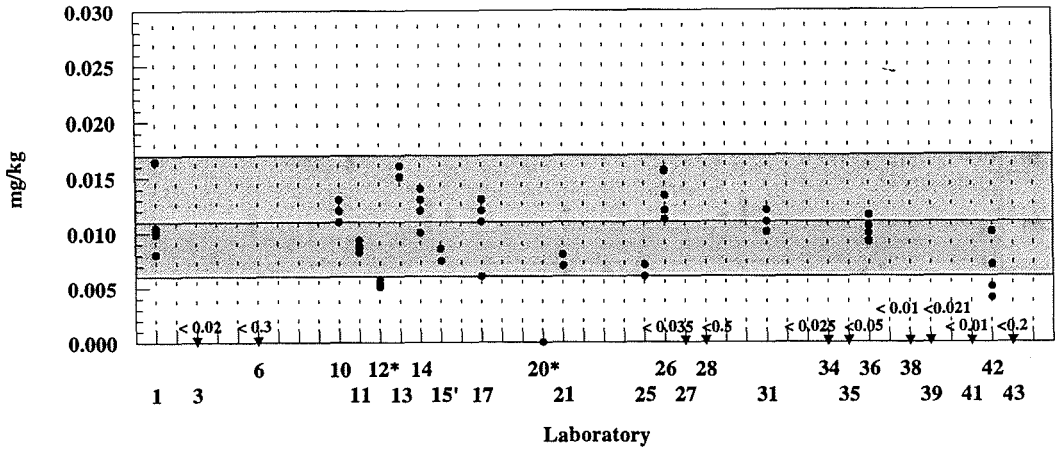
Accepted value = 4.00 ± 1.20 mg/kg
Results: 27 Quantitative Results: 27 Rejections: 8



SILVER

CRM 2976

Reference value = 0.011 ± 0.005 mg/kg
Results: 25 Quantitative Results: 15 Rejections: 2



No Youden Plot
for Ag in Sediments

No Youden Plot
for Ag in Tissues

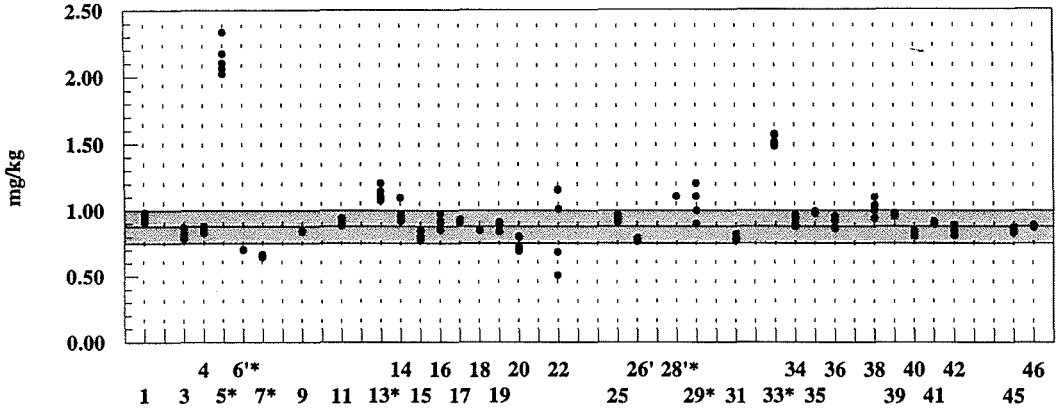
Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	9	4	15	3	14	5	8	1	2	1	0	-	24	5
Tissue	12	4	14	4	10	3	14	4	1	1	0	-	27	5

The abnormally high Ag concentration in Tissue 98 caused some problems. A paper that discusses some of these difficulties is "Evaluation of Digestion Procedures for Determining Silver in Mussels and Oysters" by K. Daskalakis, T. O'Connor and E. Crecelius , Environ. Sci. Technol. **1997**, 31, 2303-2306.

CADMIUM

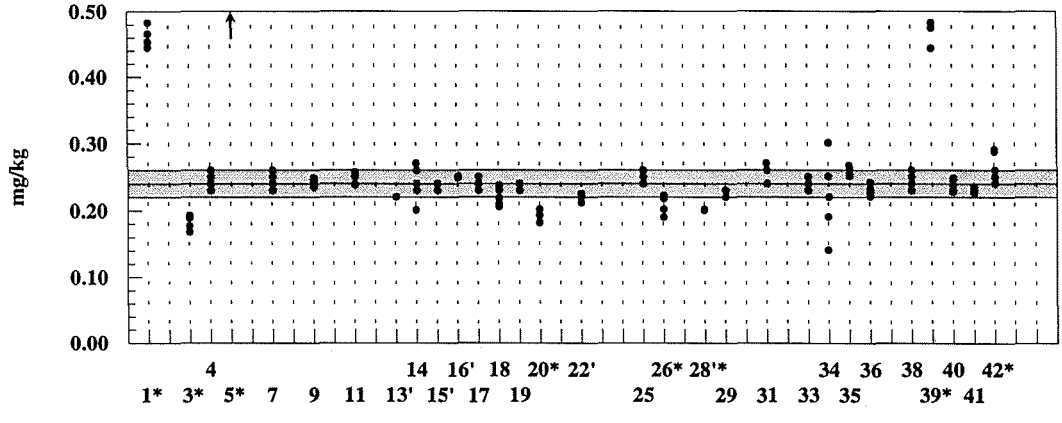
Sediment 98

Accepted value = 0.87 ± 0.13 mg/kg
Results: 33 Quantitative Results: 33 Rejections: 7



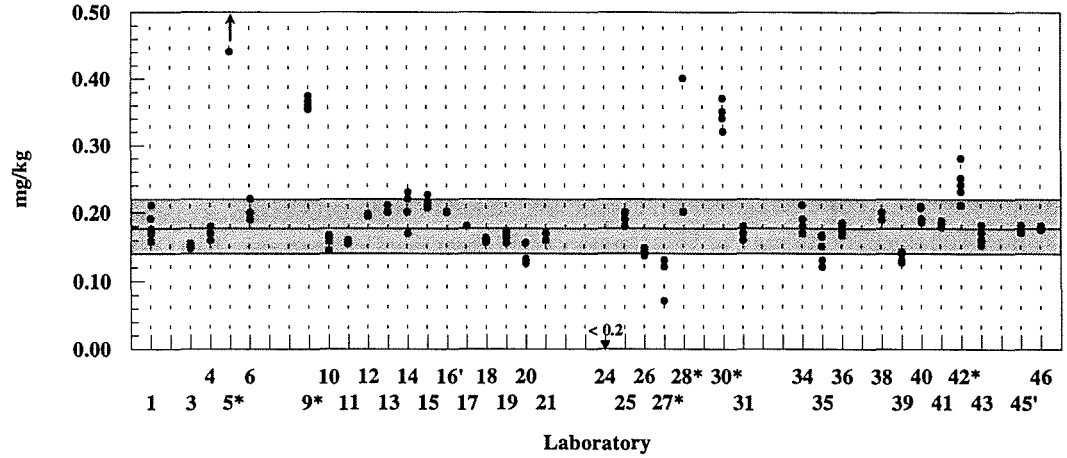
MESS-2

Certified value = 0.24 ± 0.01(0.02) mg/kg
Results: 31 Quantitative Results: 30 Rejections: 8

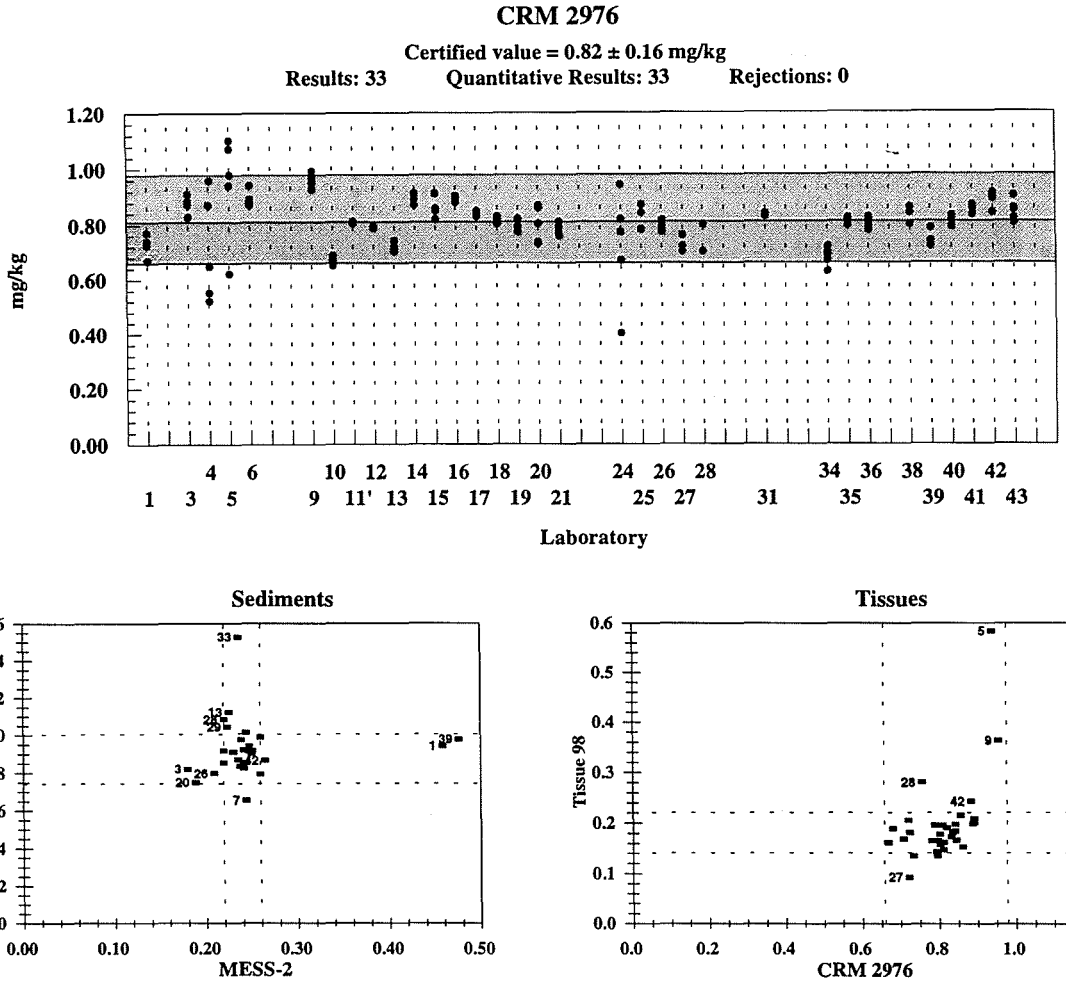


Tissue 98

Accepted value = 0.18 ± 0.04 mg/kg
Results: 36 Quantitative Results: 35 Rejections: 6



CADMIUM

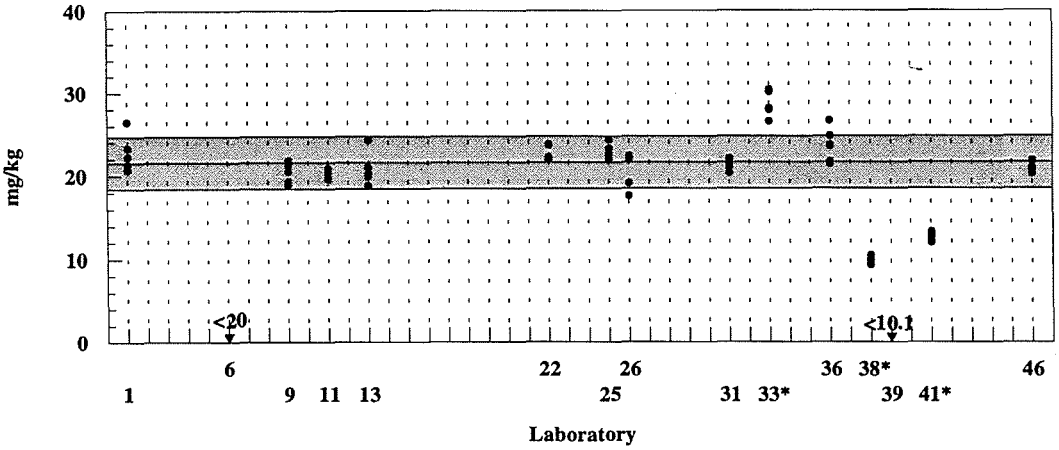


Unknown Sample	Digestion				Instrumentation								NOAA/11	
	HF		no HF		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	23	5	10	2	13	1	14	2	3	3	3	1	30	10
Tissue					12	4	17	2	2	2	2	0	34	4

TIN

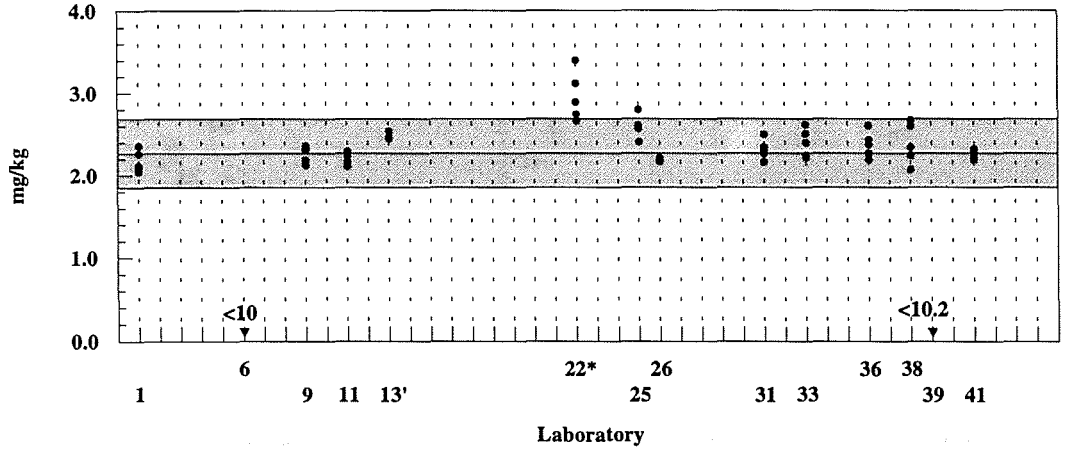
Sediment 98

Accepted value = 21.6 ± 3.2 mg/kg
Results: 15 Quantitative Results: 13 Rejections: 3



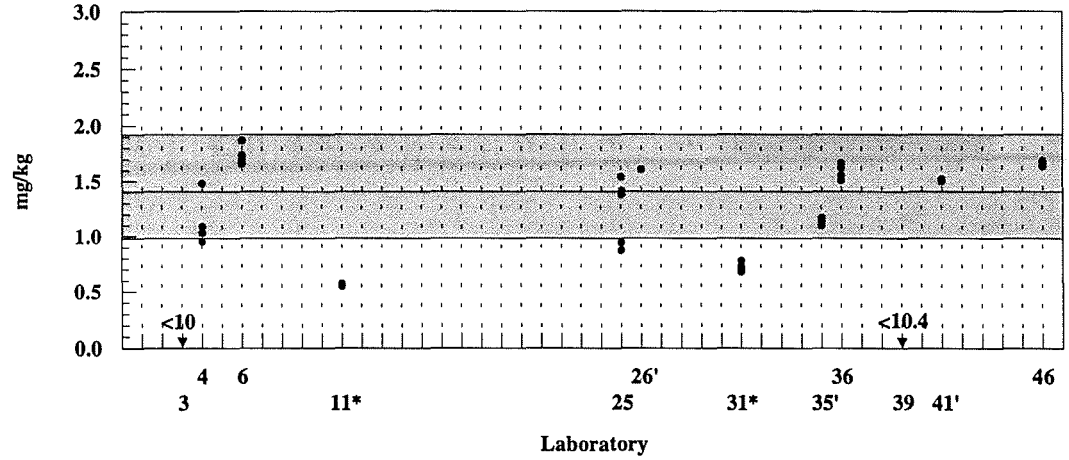
MESS-2

Certified value = 2.27 ± 0.42 mg/kg
Results: 14 Quantitative Results: 12 Rejections: 1

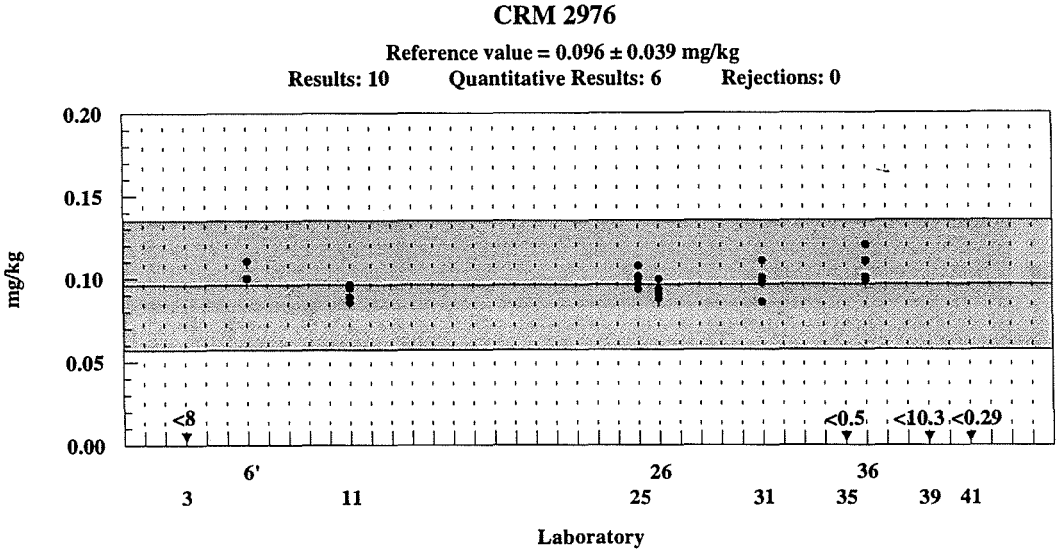


Tissue 98

Accepted value = 1.45 ± 0.47 mg/kg
Results: 12 Quantitative Results: 10 Rejections: 2



TIN



No Youden Plot
for Sn in Sediments

No Youden Plot
for Sn in Tissues

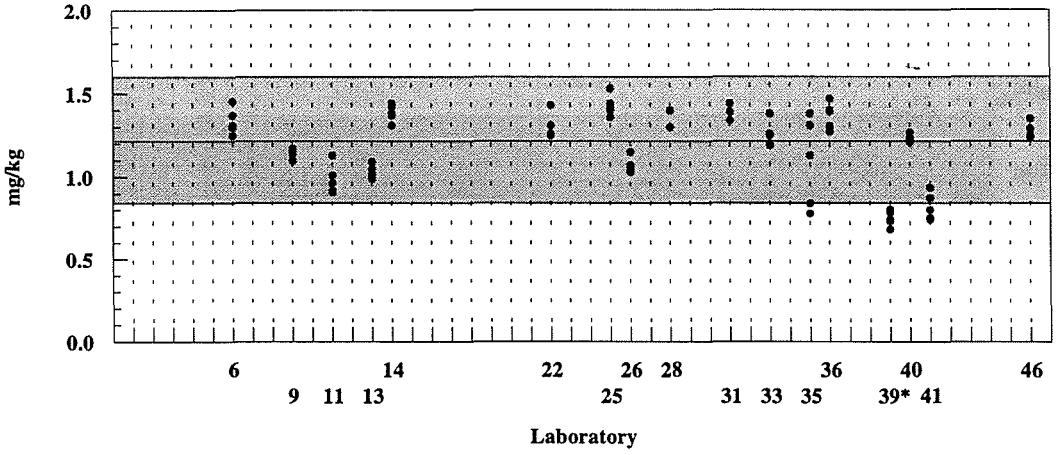
Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	5	2	9	1	2	1	10	1	0	-	1	1	19	3
Tissue	1	0	9	2	1	0	7	2	0	-	2	0	11	3

No Youden plots were prepared for Sn due to the disparities of the sample concentrations.

ANTIMONY

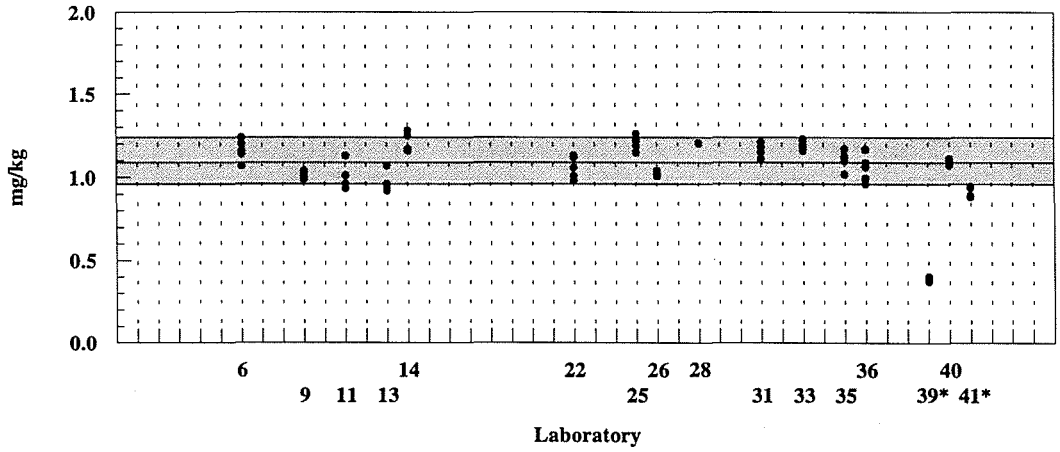
Sediment 98

Accepted value = 1.21 ± 0.38 mg/kg
Results: 17 Quantitative Results: 17 Rejections: 1

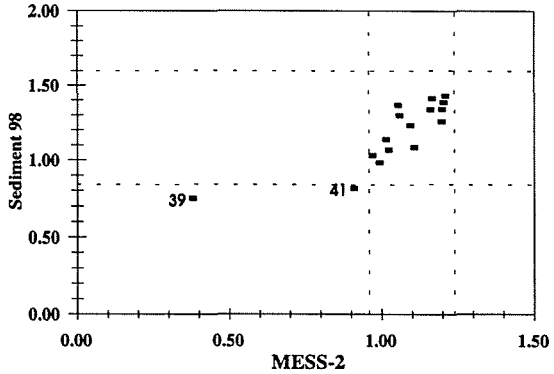


MESS-2

Certified value = 1.09 ± 0.13 mg/kg
Results: 16 Quantitative Results: 16 Rejections: 2



Sediments



ANTIMONY

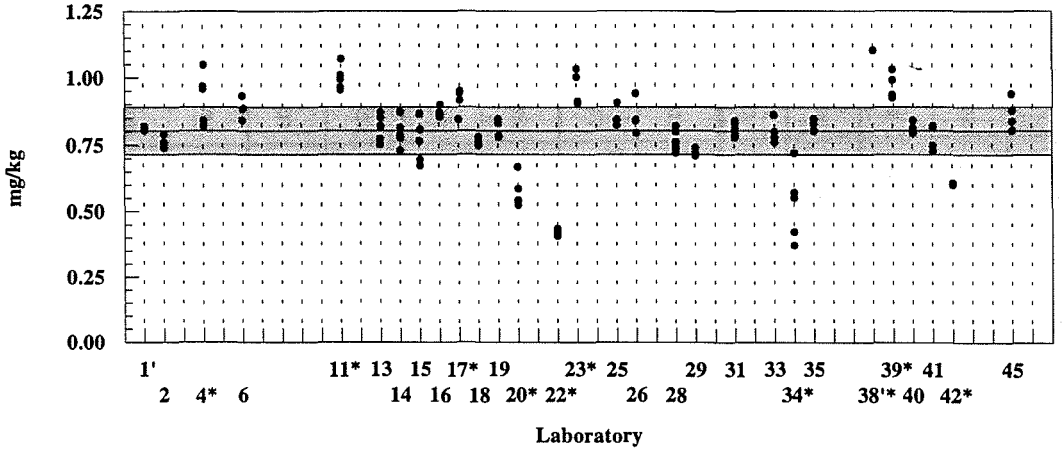
Unknown Sample	Digestion				Instrumentation								NOAA/11	
	open		closed		GFAAS		ICPMS		HGAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	16	0	1	1	3	0	12	1	2	0	0	-	19	6

The determination of antimony was not required in the biologicals.

MERCURY

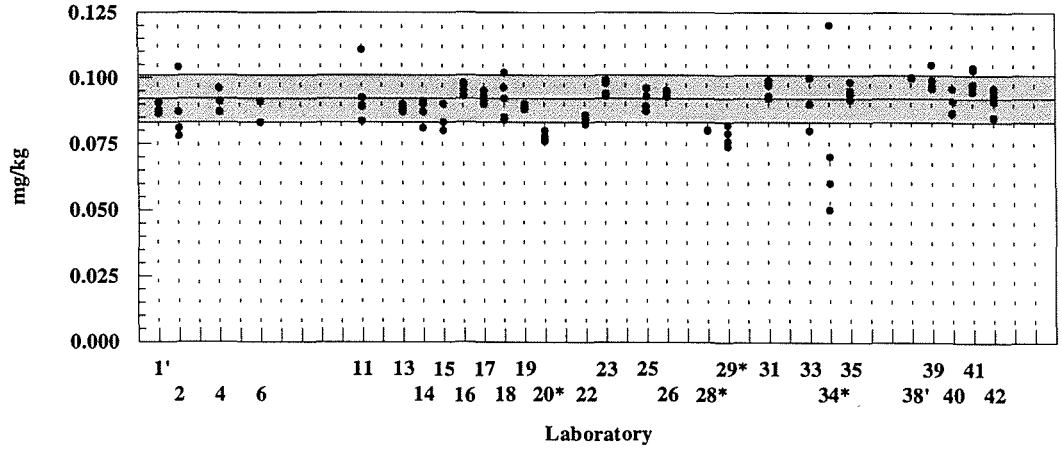
Sediment 98

Accepted value = 0.803 ± 0.089 mg/kg
Results: 29 Quantitative Results: 29 Rejections: 10



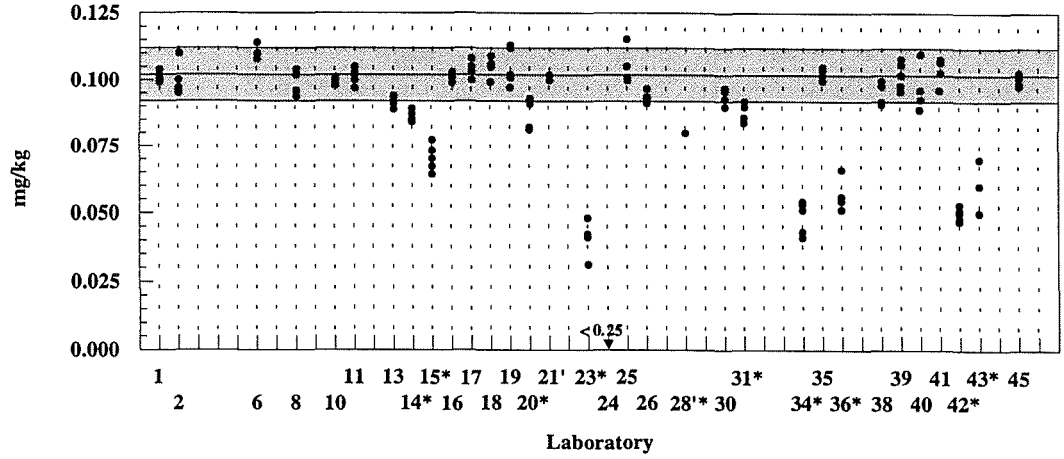
MESS-2

Certified value = 0.092 ± 0.009 mg/kg
Results: 28 Quantitative Results: 28 Rejections: 4



Tissue 98

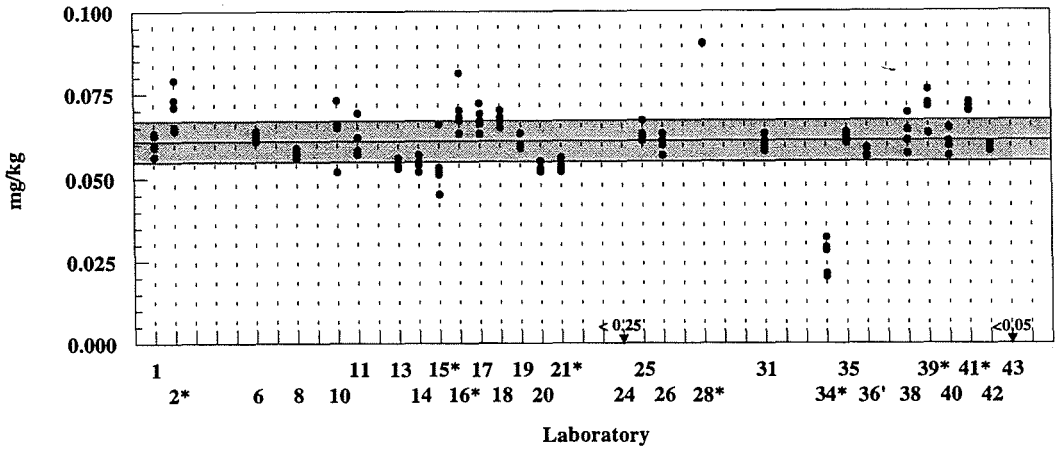
Accepted value = 0.102 ± 0.010 mg/kg
Results: 32 Quantitative Results: 31 Rejections: 10



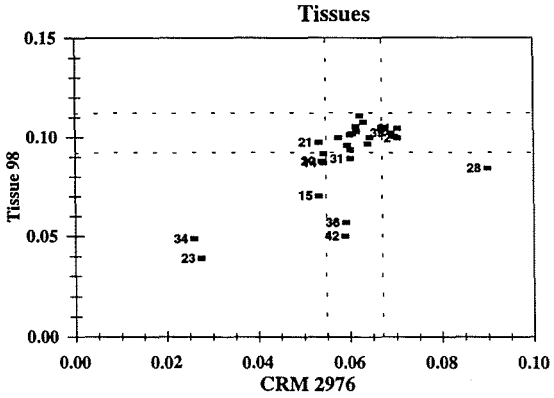
MERCURY

CRM 2976

Certified value = 0.061 ± 0.0036 (0.0061) mg/kg
Results: 31 Quantitative Results: 31 Rejections: 10



No Youden Plot
for Hg in Sediments

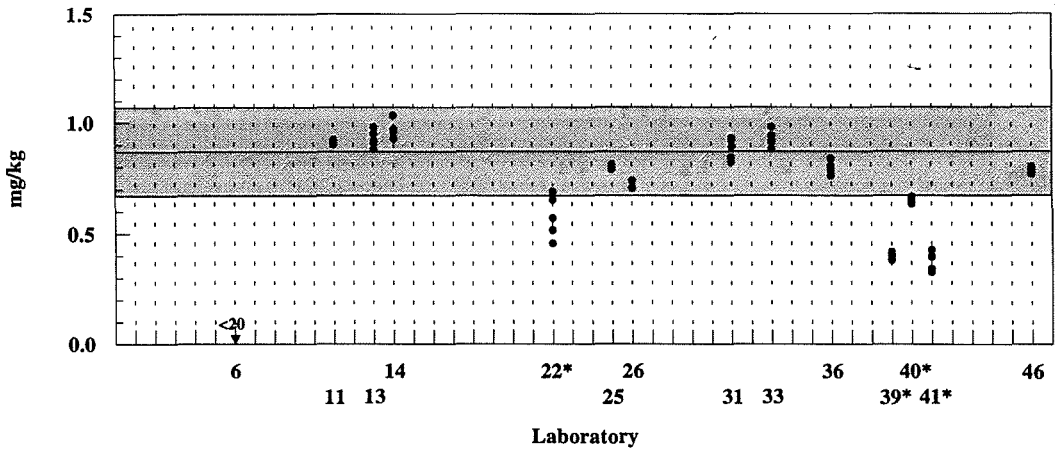


Unknown Sample	Same digest as for other elements		Instrumentation						NOAA/11	
			ICPMS		CVAAS		CVAFS			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	8	3	4	2	21	5	3	2	30	7
Tissue	11	3	4	1	24	9	3	0	26	7

THALLIUM

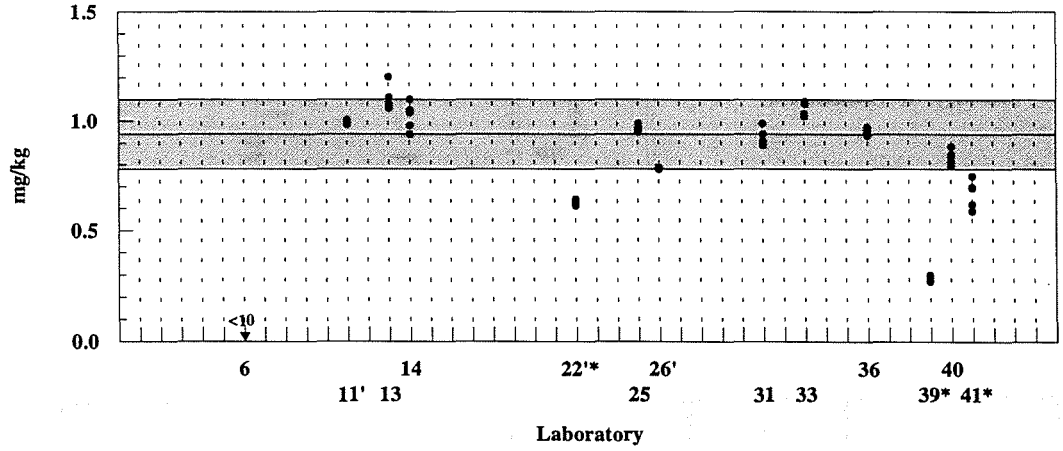
Sediment 98

Accepted value = 0.87 ± 0.20 mg/kg
Results: 14 Quantitative Results: 13 Rejections: 4

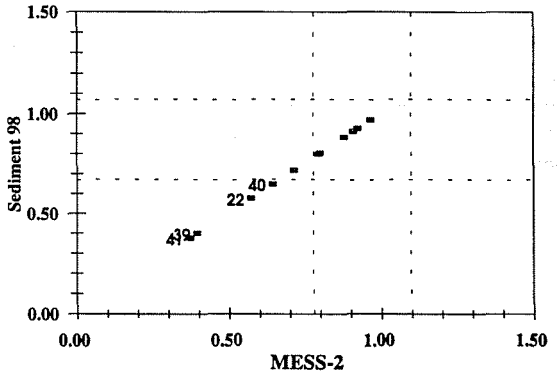


MESS-2

Accepted value = 0.94 ± 0.16 mg/kg
Results: 13 Quantitative Results: 12 Rejections: 3



Sediments



THALLIUM

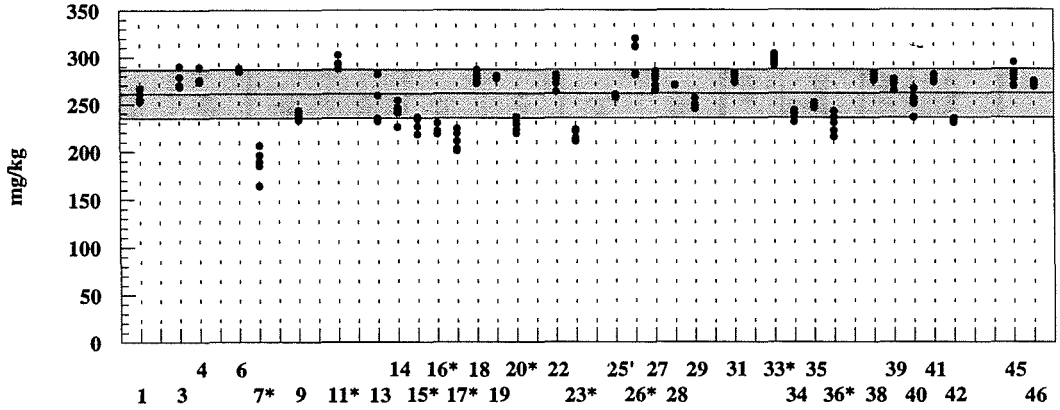
Unknown Sample	Digestion				Instrumentation								NOAA/11	
	HF		no HF		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	12	3	1	1	2	2	11	2	0	-	0	-	14	1

The determination of thallium was not required in the biological tissues.

LEAD

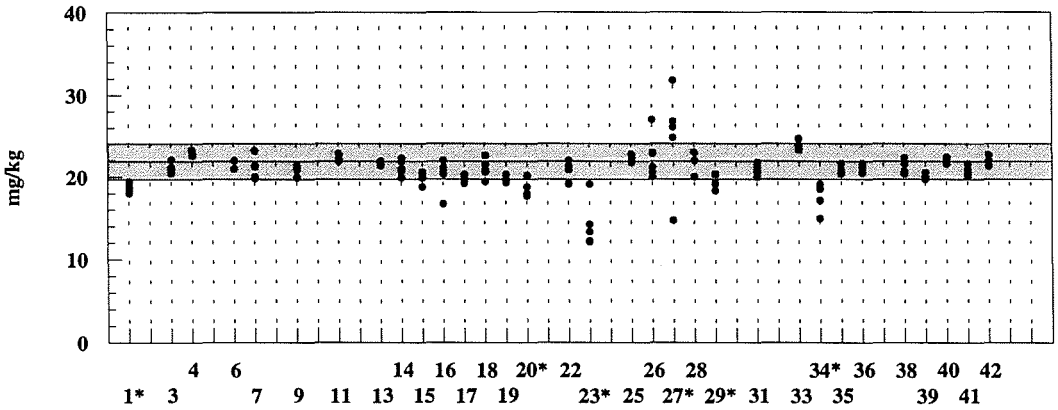
Sediment 98

Accepted value = 261 ± 26 mg/kg
Results: 34 Quantitative Results: 34 Rejections: 10



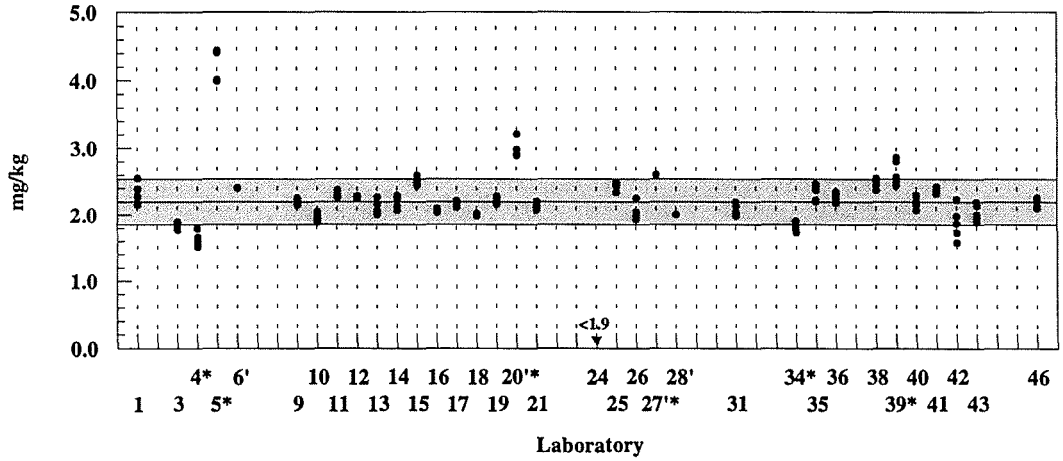
MESS-2

Certified value = 21.9 ± 1.2 (2.2) mg/kg
Results: 32 Quantitative Results: 32 Rejections: 6

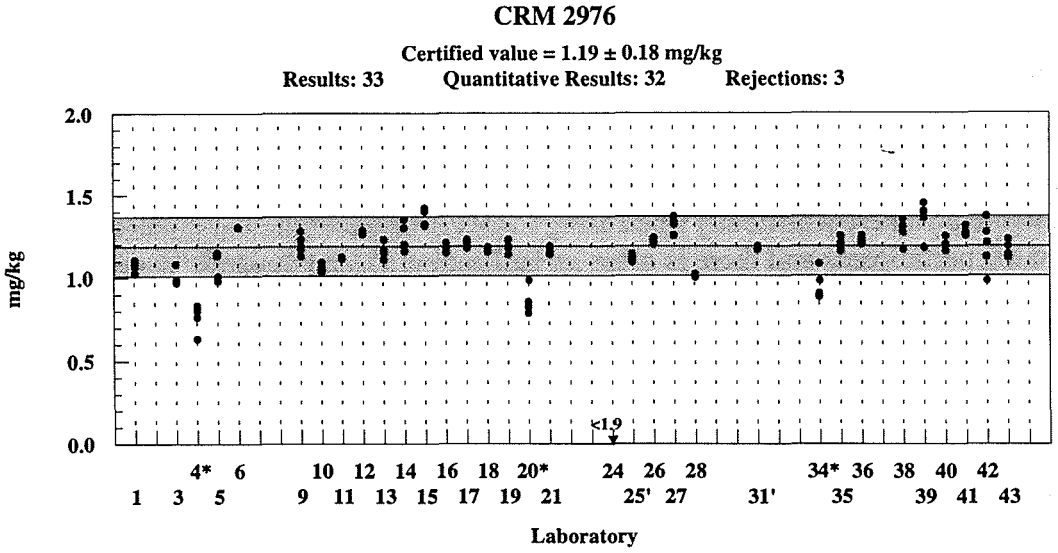


Tissue 98

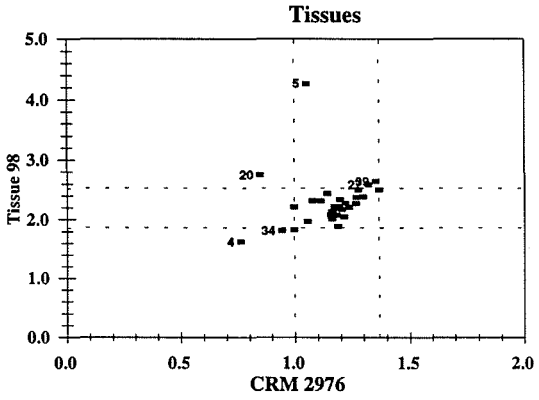
Accepted value = 2.19 ± 0.34 mg/kg
Results: 34 Quantitative Results: 33 Rejections: 6



LEAD



No Youden Plot
for Pb in Sediments



Unknown Sample	Digestion				Instrumentation								NOAA/11	
	HF		no HF		GFAAS		ICPMS		FAAS		ICPAES			
	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej	sets	rej
Sediment	27	7	9	3	9	3	12	3	2	0	8	2	33	7
Tissue					11	3	18	1	2	1	1	1	28	4

3. DISCUSSION

The intent of this exercise was to assess the capability of participating laboratories to determine selected trace metals in marine biological tissue and sediment samples. This is best measured through an evaluation of their accuracy and, through some extent, intralaboratory precision. Of the four samples, one sample of each type was a certified reference material (CRM). This knowledge, however, portends an inherent difficulty when using CRMs in intercomparison studies. The answers are known to the participants and there is often an inclination to tend towards "the right answer." However, our experience with the NOAA exercises has shown that if this is happening, it is not a serious factor.

For each of the two unknown samples an excluded mean and confidence interval for each analyte were calculated from the submitted data. An implication of this approach is that the accuracy evaluation of a laboratory's performance for a particular analyte in a particular matrix is relative to the performances of all accepted laboratories. Thus we get an indication of the type of comparability we may expect if the accepted group were to analyze similar materials. In all cases in this study the calculated mean was not much different and certainly not significantly different from the NRC means for all analytes in both matrices.

If we assume that NRC is competent, there also appears to always be a group of participating laboratories that are equally competent for various analytes in the particular matrices and, if there are sufficient data, an accurate mean can be established along with an appropriate 95 percent confidence interval. There was no instance where a mean could be calculated that the mean was significantly different from the NRC result.

The use of the CRMs is a great aid in this type of exercise because their 95 percent confidence intervals are generally much narrower than those defined in the exercise for the unknowns. Laboratories which produce results within the confidence intervals of both the CRM and the unknown are obvious demonstrators of reliability and comparability for that analyte in the particular matrix at the concentration range in question. Of equal importance is the ability to use the CRMs to discern general trends which might otherwise be lost in the relatively wider confidence intervals calculated for the unknowns.

The overall assessment is based on the total number of data sets submitted to the number of sets outside the acceptable ranges. This evaluation allowed four categories of accuracy performance to be discernible. These are shown in Table II (page 42) for the sediments and in Table V (page 46) for the biological tissues. In general, **Superior** laboratories submitted results for most analytes within the 95 percent confidence intervals; **Good** laboratories submitted many results within the accepted range with a minimum number of outliers; **Fair** laboratories had some problems with certain elements or did not report results for a number of elements. Laboratories with a higher proportion of outliers or "less thans" compared to the number of acceptable results were categorized as **Others**. It should be noted that the dividing lines between the categories, especially between good and fair,

are somewhat diffuse. The last three columns in Tables II and IV compare the number of laboratories in each category for the last seven exercises.

We have also adopted the IUPAC guidelines for assessing accuracy in intercomparison exercises. This is accomplished by comparing the bias estimate for each analyte with a target value for standard deviation. The bias estimate is calculated from the difference between the laboratory mean (x) and the accepted (or assigned) mean (X). The z-score is calculated by dividing the bias estimate by the target value for standard deviation (σ), these scores are listed in Appendix C.

$$z = \frac{(x - X)}{\sigma_{target}}$$

For this NOAA exercise the target value for the standard deviation is set at ± 10% (± 5 % for Al, Si and Fe in the sediments). Using these criteria, z-scores can be classified into three categories.

$\|z\| \leq 2$	satisfactory
$2 \leq \|z\| \leq 3$	questionable
$\|z\| \geq 3$	unsatisfactory

An assessment for intralaboratory precision (p-score) is based on the criteria of Table 1 and listed in Appendix C.

$$p = \frac{\sigma_{lab}}{\sigma_{target}}$$

Table I
Criteria for Intralaboratory Precision Evaluation

Sample	Target RSD
Tissues	± 10 percent
Sediments	± 10 percent (± 5 percent Al, Si and Fe)

When evaluating precision we cannot ignore that there is some probability that the sample is inhomogeneous. We assume that this would generally be more prevalent in the unknown samples which are not as rigorously processed as the CRMs.

Sediments

Table II shows the overall assessment for the sediments based on the number of quantitative results submitted and the number of rejected means. A listing of this evaluation over the past seven years (using this years laboratory designation) is tabulated in Table III on page 43.

Five laboratories reported sediment results for the first time. Of the twenty-eight laboratories that submitted sediment data for both NOAA/12 and NOAA/11, seven improved their ratings and three slipped to a lower rating. Remember that the rating is relative, and as the group as a whole improves, an individual laboratory also must improve in order to retain its former position.

Table II

Accuracy Evaluation for the Sediments*

	Laboratory Number	NOAA Intercomparison							
		/12	/11	/10	/9	/8	/7	/6	/5
Superior	4,6,9,11,13,14,16, 19,25,26,28,31, 33,35,36,38,40, 41,42	19	15	15	8	11	8	5	3
Good	3,15,17,18,22,32, 44	7	10	12	15	13	12	11	7
Fair	1,2,7,29,34,39	6	7	6	10	8	12	5	7
Others	5,20,23,27	4	3	3	7	8	10	7	6
Total		36	34	36	40	40	42	28	23

*Laboratories 8,10,12,21,24,30,37 and 43 did not report results for the sediments

There were 942 sets of results evaluated for the sediments for NOAA/12 compared to 865 for NOAA/11 and 922 sets for NOAA/10. The rejection rates were respectively 168 (18%), 202 (23%) and 185 (20%) sets.

Table III

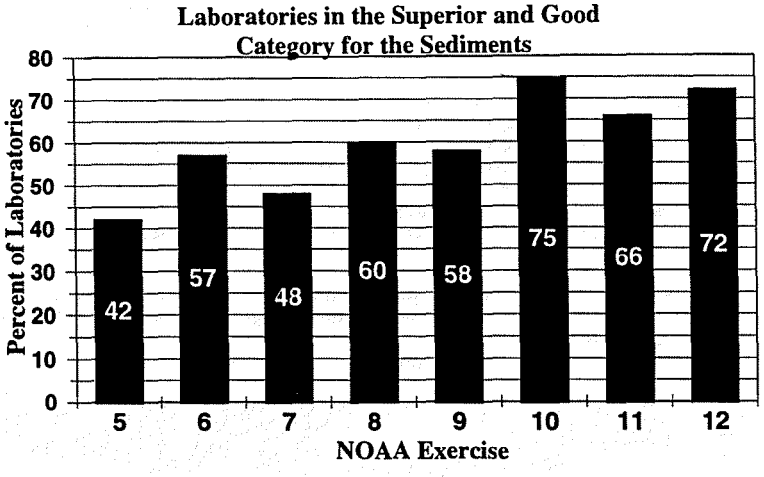
Comparison of Laboratory Performance for Sediments In Previous NOAA Intercomparisons

LAB	NOAA/12		NOAA/11		NOAA/10		NOAA/9		NOAA/8		NOAA/7		NOAA/6		NOAA/5	
	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out
1	26	11	16	5												
2	2	0	2	0	2	0	2	0					26	7	22	15
3	15	3	20	16	22	14	24	16								
4	26	1	26	5	24	3	24	3	18	8						
5	12	9														
6	38	3	34	2	34	6	34	9	31	3	18	4				
7	18	7														
9	30	3	20	1	30	1	20	1	30	13	32	4	32	6	16	10
11	36	2	36	0	36	0	36	1	30	7	32	19	30	10		
13	32	4	32	4	34	3	34	7	30	5						
14	32	1	17	5	18	1	22	8								
15	18	5	18	5	26	2	22	6	28	11	10	4				
16	26	2	26	2	26	1	26	3	26	1	24	3	26	2	20	4
17	22	4	24	9	24	6	24	3	22	4	22	4	18	4		
18	10	2														
19	26	1	26	5	21	0										
20	18	14														
22	36	10	36	13												
23	14	10	14	5	20	9	14	6	14	10	20	8	12	7		
25	34	0														
26	36	6	36	5	36	3	36	2	36	0	36	1	31	2	23	3
27	16	9	22	12	18	5	16	6	26	16	24	9	22	4	20	10
28	31	5	32	4	32	6	30	2	15	0	15	2	14	1	11	0
29	18	7	30	12	27	9	32	14								
31	32	0	32	0	32	1	32	1	32	0	30	3				
32	12	2														
33	32	7	30	5	30	5	30	7	32	5						
34	16	7			27	11	36	18								
35	28	4	28	5	34	22	32	21	24	14	24	13				
36	32	2	22	3	22	3							28	2	24	0
38	30	3	30	3	32	3	32	6	36	10	24	3				
39	26	10														
40	26	2	24	12	24	3	20	4	14	9	2	0	16	7	16	7
41	36	4	34	4	34	3	34	3	30	2	30	2	28	1	24	2
42	28	4	28	8	36	6	36	3	18	4	28	6	28	4		
44	6	0	6	0												

SUPERIOR GOOD FAIR OTHERS

The overall categorization for the past eight exercises is indicated in Figure 1. Although it appears no significant change has occured over the past few years, again it must be stressed that there is a general improvement in performance. This is evident by the smaller confidence intervals that are calculated from the raw data making it more difficult for a laboratory to remain within the accepted limits.

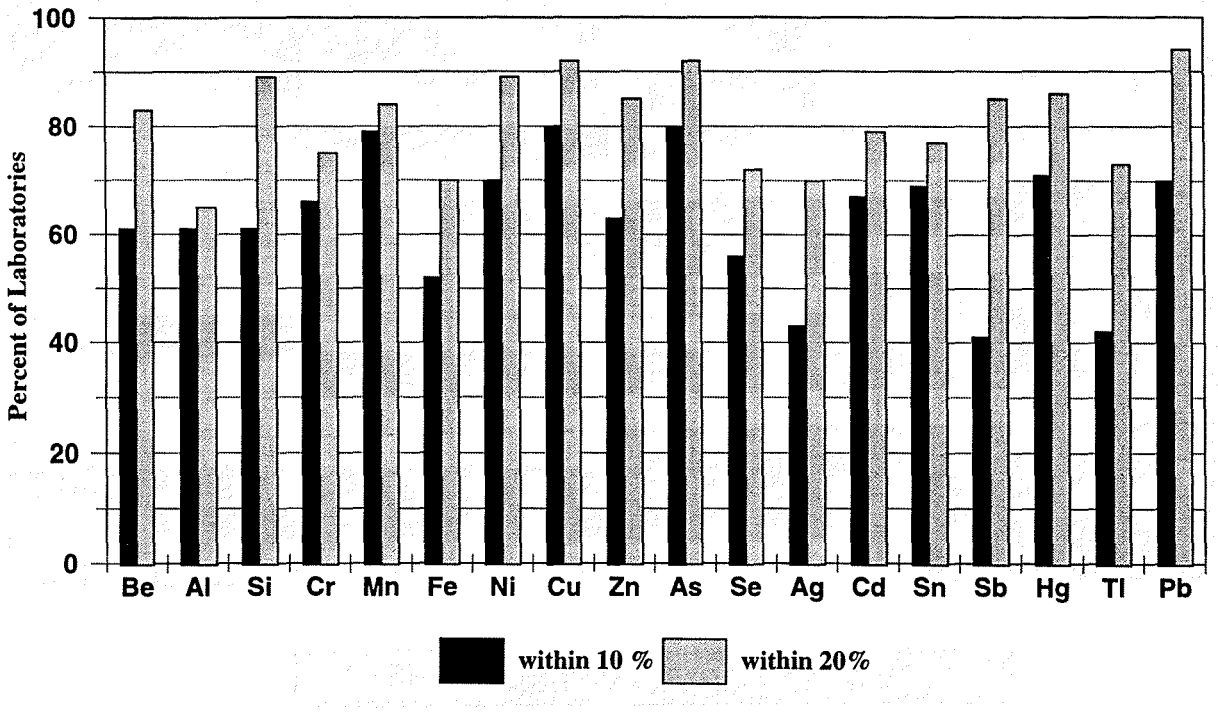
Figure 1



The analytical capability of the group as demonstrated in this exercise is shown in Figure 2 . This diagram shows the percentage of laboratories reporting values within 10 and 20 percent (5 and 10 percent for Al, Si and Fe)of the accepted value for each analyte in Sediment 98.

Figure 2

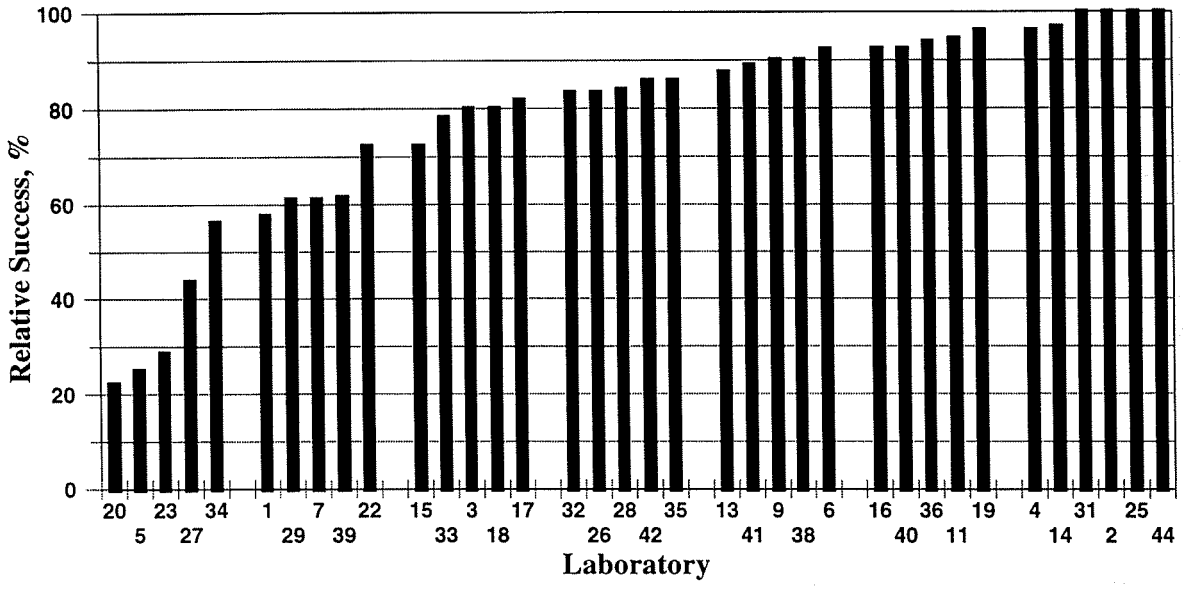
Analytical Capability for Sediment 98



It is acknowledged the evaluation criteria described on pages 40-41 is not representative for the laboratories that only participate for a few elements. An alternative method of discerning competency in terms of analyses attempted is shown in Figure 3.

Figure 3

Laboratory Success



Twelve laboratories (6,11,13,16,17,26,28,31,33,38,41 and 42) have performed well over the past five years. Several laboratories (3 and 35) have significantly improved their rating over past exercises.

There are still a few problems concerning the analysis of marine sediments for trace metals. At least twenty-five percent of the participants who submitted results for aluminum, iron, silver, selenium, tin and thallium produced a value more than ± 20% (10% for Al and Fe) from the accepted value.

It is difficult to state that for any one element there has been a noticeable improvement in performance for NOAA/12 compared to NOAA/11. Instead we must look over the past few years to see calculated confidence intervals for the unknowns decrease from ±27% (Cr NOAA/9) to ± 13% (Cr NOAA/12), ± 35% (Se NOAA/9) to ± 19% (Se NOAA/12) and ± 26% (Sn NOAA/9) to ±15% (Sn NOAA/12). As previously stated, more laboratories have improved their rating than decreased, another indication of general improvement and a good demonstration of the benefits of these exercises.

Biological Tissues

Thirty-four of the thirty-nine laboratories which submitted data for the tissues are in the superior and good categories. Two of the laboratories were rated fair only because less that five sets of data were submitted. Also, as in the past four years, there were no laboratories in the "other" category. Eight laboratories reported tissue data for the first time. One of these was rated "superior" and six were "good." A listing of the overall assessment is shown in Table IV.

Table V (page 47) shows the number of submitted sets and the number of rejected means for the biological tissue samples over the eight exercises from NOAA/5 to NOAA/12. Of the thirty laboratories that submitted tissue data for both NOAA/11 and NOAA/12 seven improved their ratings and three have worse ratings (one from good to fair and two from superior to good). Particular notice should go to laboratories 6,11,12,13,16,17,21,26,28,30,40,41 and 42 with a consistent superior or good record over the last five years.

There were 769 sets of results evaluated for the tissues for NOAA/12, compared to 696 for NOAA/11 and 712 for NOAA/10. The rejection rates were respectively 118 (15%), (101 (15%) and 118(17%) sets.

Table IV
Accuracy Evaluation for the Biological Tissues*

	Laboratory Number	NOAA Intercomparison							
		/12	/11	/10	/9	/8	/7	/6	/5
Superior	6,11,12,13,14,16,17, 21,25,26,30,31,35, 36,38,39,40,41	18	15	17	13	15	8	7	4
Good	1,3,9,10,15,18,19,20, 23,24,27,28,32,34, 42,43	16	14	11	15	13	14	9	8
Fair	2,4,5,8,37	5	5	8	10	8	8	9	9
Others		0	0	0	0	6	8	5	5
Total		39	34	36	38	42	38	30	26

*Laboratories7,22,29,33 and 44 did not report results for the tissues.

Table V

Comparison of Laboratory Performance for Tissues In Previous NOAA Intercomparisons

LAB	NOAA/12		NOAA/11		NOAA/10		NOAA/9		NOAA/8		NOAA/7		NOAA/6		NOAA/5	
	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out	Sets	Out
1	24	6	24	5												
2	2	1	2	0	22	7	-	-	18	5	-	-	23	9	10	0
3	23	8	16	6	18	7	14	5								
4	19	8	16	4												
5	14	6														
6	26	0	24	0	23	2	23	3	22	1	8	1				
8	2	0	2	0												
9	16	3	18	7	19	2	12	4	18	11	21	7				
10	26	6	24	9	23	9										
11	26	3	24	3	23	2	23	7	22	3	21	9				
12	18	2	24	7	21	2	20	4	18	5	20	4	22	6	23	14
13	24	3	24	8	23	3	23	2	22	3						
14	24	3	22	3	22	1	19	0								
15	22	5	20	2	20	4	20	2	22	9	8	2				
16	18	2	18	1	16	0	16	1	14	0						
17	22	1	20	5	22	0	22	5	19	3	19	5	16	1		
18	10	0														
19	16	0	16	0	8	2										
20	26	7														
21	22	4	22	4	23	2	23	7	24	3	24	4	20	2	17	1
23	11	5														
24	11	1														
25	26	0														
26	25	0	20	1	23	2	23	2	24	0	25	3	26	5	23	2
27	16	5	16	3	18	5	14	4	22	16	20	6	18	6	19	13
28	24	7	22	5	22	6	22	1	22	2	13	6	10	5	9	1
30	24	1	3	0												
31	26	2	24	0	23	0	23	2	24	0	26	1	26	4	10	0
32	8	0														
34	20	6														
35	26	1	22	2	23	7	16	4	10	4	12	3				
36	25	3	20	1	16	1	16	5					24	0		
37	2	1	20	1	20	2	18	3	4	0	19	1				
38	24	0	22	1	22	2	22	4	23	5						
39	23	4			23	2	23	2	24	2	23	4	26	7		
40	24	2	16	3	18	0	18	1	12	1	2	1	16	6	16	7
41	26	1	24	0	23	0	23	1	24	1	26	5	24	1	23	0
42	24	6	19	4	23	3	23	3	10	1	20	7	24	8		
43	24	5	24	7	22	10	22	9	18	1	19	7				

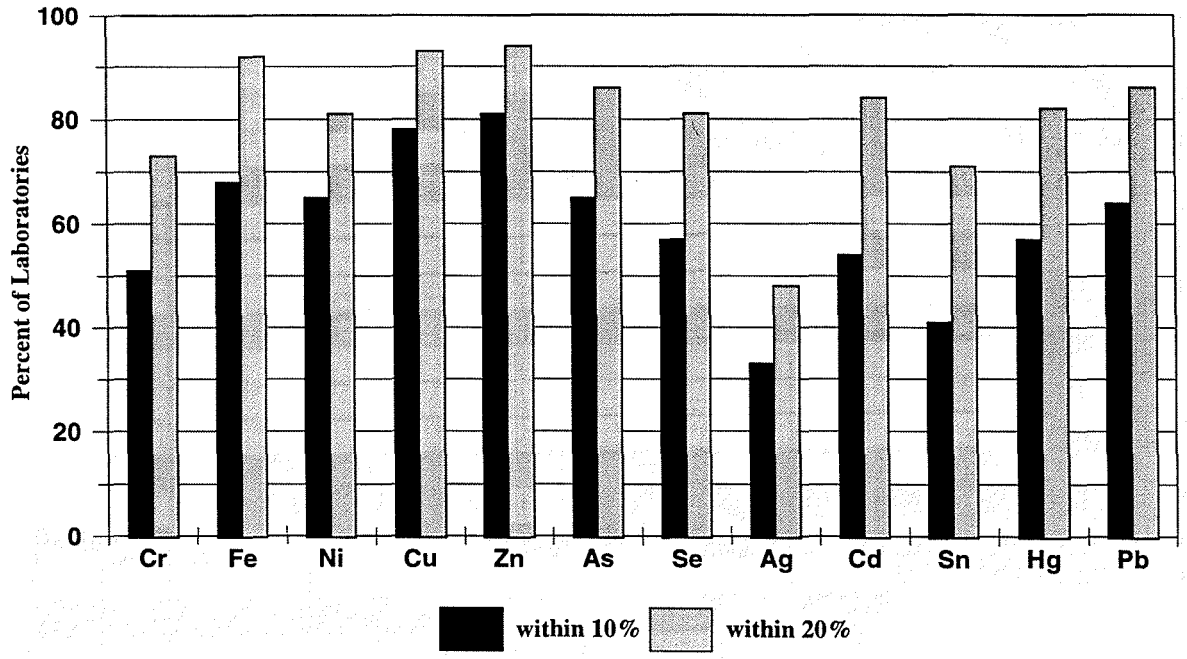
SUPERIOR GOOD FAIR OTHERS

The majority of the laboratories satisfied the precision criteria of Table I. But while it is apparent that it is necessary to have acceptable precision in order to have good accuracy, it is obvious that even outstanding precision is not a guarantee of good accuracy.

The analytical capability of the group for the analysis of Tissue 98 as demonstrated in this exercise is shown below in Figure 4. This diagram shows the percentage of laboratories reporting values within 10 and 20 percent of the accepted value for the analyte. There is improvement for two (Cr,Sn) of the twelve analytes compared to NOAA/11. This year, performance for Ag has deteriorated even though the concentration is higher than NOAA/11. This can probably be attributed to digestion problems.

Figure 4

Analytical Capability for Tissue 98



A few problems remain concerning the analysis of marine tissues for trace metals. The following three analytes in Tissue 98 presented difficulties to at least twenty-five percent of the participants that submitted results: chromium, silver and tin. The percentage of accepted results submitted is presented in Figure 5. Fifteen of thirty-nine laboratories were in the top 10%.

Figure 5

Laboratory Success

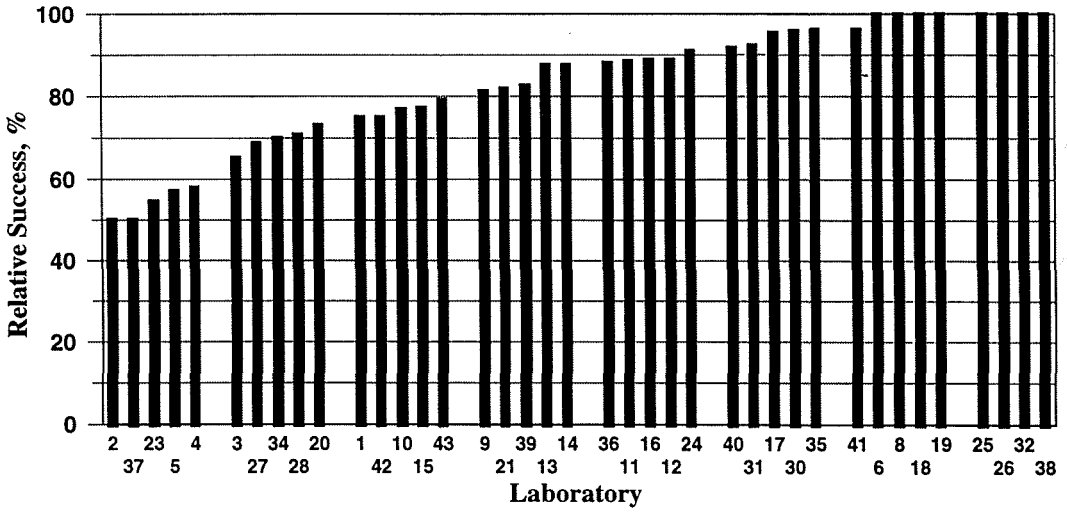
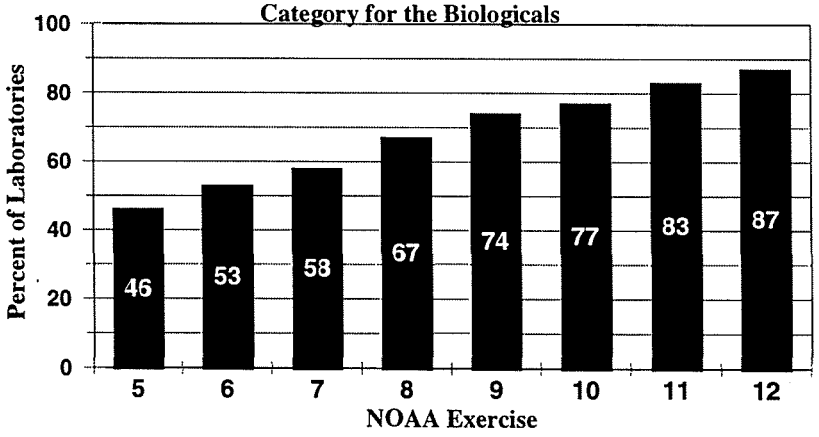


Figure 6 shows that eighty-seven of the participants are in the superior and good categories this year. This is a continuation of the steady increase of laboratories into these categories from the first exercises. It will be interesting to see how long this trend can continue before a levelling off occurs.

Figure 6

Laboratories in the Superior and Good Category for the Biologicals



Thirty-one laboratories that were in the good or superior category for the tissues also analyzed the sediments. All but five of these were also in the good or superior category for the sediments. In general, a laboratory with capabilities for one matrix appears to also do well for another.

Appendix C summarizes the digestion methods and instrumental techniques used for the determination of the metals. The great majority of laboratories used more than one instrumental method for this exercise. The importance of using the right tool for the job is obviously

recognized by the participants. The use of inductively coupled plasma mass spectrometry (ICPMS) is increasing rapidly, and is responsible for the improvement for some of the analytes such as silver, tin, antimony and thallium. There were seventeen laboratories that used ICPMS in this study. Graphite furnace atomic absorption spectrometry (GFAAS) and inductively coupled plasma (ICPAES) are used slightly more frequently whereas flame atomic absorption (FAAS) is reported by only a few. It should be noted that with the exception of Cd, the FAAS results were not significantly worse than the other results.

The predominate method of calibration was through the use of a calibration curve. Three laboratories used standard additions for all or some of the elements for the biologicals. Only one laboratory used standard additions for the As and Se in the sediments.

The majority of the laboratories also report using closed vessel digestion procedures with microwave heating. The popularity of this decomposition technique has risen steadily over the last few exercises and is certainly a partial cause for the continued improvements.

4. CONCLUSIONS

In general, we continue to see the overall performance improve for both matrices. Although conspicuous changes are not always evident on a year to year basis, over the past seven years we have seen the percentage of laboratories in the top groups almost double.

The performance for copper, zinc and lead in both matrices has reached a level where we cannot expect to see more improvement. Silver, selenium, tin and thallium are still problematic in the sediments; chromium silver and tin in the tissues.

The laboratories that took part in previous exercises generally improved or maintained their ratings for both the sediments and biological tissues.

Kudos go to laboratories 6,11,13,14,16,25,26,31,35,36,38,40 and 41 for achieving a superior rating for both matrices this year. Another eight laboratories (3,9,15,18,19,28,32,42) were in the superior or good category for both tissues and sediments. Laboratory 25 reported sixty sets of data, all within the accepted limits.

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Appendix A

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Appendix B

BERYLLIUM
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	5	2.33	2.19	2.41	2.27	2.28	2.30	0.08	3.5
5	0								
6	5	2	2	2	2	2	2	0	0.0
7	0								
8	0								
9	0								
10	0								
11	5	2.43	2.4	2.4	2.36	2.47	2.41	0.04	1.7
12	0								
13	5	2.05	2.14	2.11	2.18	2.08	2.11	0.05	2.4
14	5	1.78	2.14	1.98	2.15	2.15	2.04	0.16	8.0
15	5	1.65	1.67	1.64	1.69	1.65	1.66	0.02	1.2
16	0								
17	0								
18	0								
19	5	1.79	2.12	1.84	1.81	2.04	1.92	0.15	7.8
20	5	1.19	1.24	1.26	1.27	1.34	1.26	0.05	4.3
21	0								
22	5	2.4	2.4	2.3	2.4	2.3	2.4	0.1	2.3
23	0								
24	0								
25	5	2.24	2.33	2.36	2.18	2.23	2.27	0.07	3.3
26	5	2.16	1.93	1.87	1.91	1.88	1.95	0.12	6.1
27	0								
28	5	2.2	2.1	2.1	2.1	2.1	2.1	0.0	2.1
29	5	1.42	1.42	1.42	1.44	1.42	1.42	0.01	0.6
30	0								
31	5	2.25	2.32	2.28	2.26	2.39	2.30	0.06	2.5
32	5	2.76	2.76	2.87	2.90	2.76	2.81	0.07	2.5
33	0								
34	0								
35	5	2.21	2.24	2.19	2.24	2.21	2.22	0.02	1.0
36	5	1.721	1.892	1.822	1.646	1.669	1.750	0.104	6.0
37	0								
38	5	2.16	2.21	2.23	2.25	2.17	2.20	0.04	1.7
39	5	1.21	1.20	1.23	1.25	1.23	1.22	0.02	1.6
40	5	2.181	2.072	2.007	2.100	2.123	2.097	0.064	3.1
41	5	2.44	2.54	2.46	2.53	2.45	2.48	0.05	1.9
42	5	1.95	2.01	1.82	2.03	1.86	1.93	0.09	4.7
43	0								
44	0								
45	5	2.40	2.28	2.31	2.48	2.30	2.35	0.08	3.6
46									

BERYLLIUM
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	5	2.24	2.5	2.38	2.22	2.21	2.31	0.13	5.5
5	0								
6	5	2	2	2	2	2	2	0	0.0
7	0								
8	0								
9	0								
10	0								
11	5	2.12	2.34	2.43	2.27	2.25	2.28	0.11	5.0
12	0								
13	5	2.21	2.16	2.29	2.16	2.31	2.23	0.07	3.1
14	5	2.15	2.25	2.13	2.25	2.22	2.20	0.06	2.6
15	5	2.17	2.23	1.85	2.04	1.87	2.03	0.17	8.4
16	0								
17	0								
18	0								
19	5	1.98	2.34	2.27	2.28	2.53	2.28	0.20	8.7
20	5	0.971	0.910	1.140	0.986	1.010	1.003	0.085	8.5
21	0								
22	5	2.6	2.5	2.5	2.3	2	2.4	0.2	10.0
23	0								
24	0								
25	5	2.22	2.21	2.04	2.15	2.24	2.17	0.08	3.7
26	5	2.13	2.00	2.01	2.02	2.00	2.03	0.06	2.8
27	0								
28	5	2.2	2.3	2.3	2.2	2.1	2.2	0.1	3.8
29	5	1.40	1.38	1.35	1.36	1.36	1.37	0.02	1.5
30	0								
31	5	2.18	2.17	2.22	2.20	2.18	2.19	0.02	0.9
32	5	1.93	1.91	1.87	1.96	1.97	1.93	0.04	2.1
33	0								
34	0								
35	5	2.26	2.20	2.22	2.16	2.20	2.21	0.04	1.6
36	5	2.435	2.417	2.344	2.299	2.217	2.342	0.089	3.8
37	0								
38	5	2.36	2.44	2.37	2.30	2.41	2.38	0.05	2.2
39	5	1.22	1.39	1.25	1.21	1.26	1.27	0.07	5.7
40	5	2.204	2.352	2.277	2.301	2.380	2.303	0.069	3.0
41	5	2.49	2.48	2.44	2.53	2.41	2.47	0.05	1.9
42	5	2.47	2.37	2.51	2.27	2.26	2.38	0.11	4.8
43	0								
44	0								
45	0								
46	0								

The determination of beryllium was not required in the biologicals

ALUMINUM
Sediment 98
%

Lab							Mean	SD	RSD
1	5	1.712	2.115	1.972	1.725	1.413	1.787	0.270	15.1
2	0								
3	0								
4	5	6.43	6.59	6.48	6.73	6.56	6.56	0.12	1.8
5	0								
6	5	6.71	6.62	6.81	6.64	6.82	6.72	0.09	1.4
7	5	5.92	6.17	5.24	5.34	5.08	5.55	0.47	8.5
8	0								
9	5	6.43	6.40	6.41	6.37	6.34	6.39	0.04	0.6
10	0								
11	5	6.55	6.53	6.59	6.59	6.44	6.54	0.06	0.9
12	0								
13	5	6.70	6.71	6.58	6.72	6.72	6.69	0.06	0.8
14	5	3.65	4.82	5.79	4.88	5.11	4.85	0.77	15.9
15	0								
16	5	6.53	6.63	6.61	6.84	6.78	6.68	0.13	1.9
17	0								
18	0								
19	5	6.43	6.29	6.24	6.25	6.28	6.30	0.08	1.2
20	5	1.67	1.65	1.72	1.76	2.02	1.76	0.15	8.5
21	0								
22	5	5.45	5.64	6.23	5.10	3.97	5.28	0.84	15.9
23	5	1.60	1.54	1.60	1.58	1.53	1.57	0.03	2.1
24	0								
25	5	6.76	6.81	6.86	6.84	6.86	6.83	0.04	0.6
26	5	5.55	5.38	5.99	5.88	5.61	5.68	0.25	4.4
27	5	3.88	4.33	4.12	4.55	4.54	4.28	0.29	6.7
28	5	6.1	6.1	6.1	6.1	6.1	6.1	0.0	0.0
29	5	2.35	2.31	2.33	2.38	2.38	2.35	0.03	1.3
30	0								
31	0								
32	0								
33	5	6.48	6.3	6.25	6.48	6.28	6.36	0.11	1.8
34	5	2.40	2.00	2.34	2.38	2.38	2.30	0.17	7.4
35	0								
36	5	6.639	6.656	6.674	6.692	6.708	6.674	0.027	0.4
37	0								
38	5	6.66	6.75	6.74	6.88	6.75	6.76	0.08	1.2
39	0								
40	0								
41	5	6.57	6.53	6.54	6.46	6.46	6.51	0.05	0.8
42	5	6.40	6.40	6.34	6.90	6.55	6.52	0.23	3.5
43	0								
44	5	6.55	6.54	6.55	6.47	6.43	6.51	0.05	0.8
45	5	6.55	6.51	6.54	6.53	7.17	6.66	0.29	4.3
46	0								

ALUMINUM
MESS-2
%

Lab							Mean	SD	RSD
1	5	2.184	2.300	2.047	2.400	1.914	2.169	0.194	8.9
2	0								
3	0								
4	5	8.79	8.47	8.62	8.77	8.73	8.68	0.13	1.5
5	0								
6	5	8.69	8.85	8.77	8.78	8.94	8.81	0.09	1.1
7	5	8.45	7.97	8.07	8.22	8.26	8.19	0.18	2.3
8	0								
9	5	8.43	8.44	8.40	8.44	8.45	8.43	0.02	0.2
10	0								
11	5	8.53	8.67	8.52	8.56	8.47	8.55	0.07	0.9
12	0								
13	5	8.63	8.68	9.04	8.75	8.76	8.77	0.16	1.8
14	5	9.14	8.80	6.51	7.83	8.55	8.17	1.04	12.8
15	0								
16	5	8.10	8.14	8.30	7.88	8.24	8.13	0.16	2.0
17	0								
18	0								
19	5	8.04	8.04	8.09	8.13	8.26	8.11	0.09	1.1
20	5	1.89	1.57	2.36	1.83	1.98	1.93	0.29	14.9
21	0								
22	5	6.36	8.05	7.96	7.76	7.37	7.50	0.69	9.2
23	5	1.84	1.74	1.72	1.67	1.74	1.74	0.06	3.5
24	0								
25	5	8.65	8.71	8.61	8.67	8.58	8.64	0.05	0.6
26	5	7.24	7.42	7.72	7.36	7.94	7.54	0.29	3.8
27	5	2.00	1.68	2.66	2.11	2.10	2.11	0.36	16.9
28	5	8.6	8.5	8.5	8.6	8.5	8.5	0.1	0.6
29	5	3.24	3.18	3.05	3.06	3.14	3.13	0.08	2.6
30	0								
31	0								
32	0								
33	5	9.06	8.24	8.9	8.4	8.31	8.58	0.37	4.3
34	5	3.57	3.81	2.58	2.62	2.75	3.07	0.58	18.9
35	0								
36	5	8.503	8.592	8.620	8.648	8.675	8.607	0.066	0.8
37	0								
38	5	8.42	8.45	8.59	8.70	8.60	8.55	0.12	1.4
39	0								
40	0								
41	5	8.55	8.42	8.38	8.38	8.29	8.40	0.09	1.1
42	5	8.74	8.49	8.31	8.58	8.49	8.52	0.16	1.8
43	0								
44	5	8.32	8.33	8.30	8.44	8.46	8.37	0.07	0.9
45	0								
46	0								

ALUMINUM
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	134.6	124.1	103.4	120.7	123.2	121.2	11.3	9.3
2	0								
3	5	224	235	234	241	230	233	6	2.7
4	5	205	202	202	209	206	205	3	1.4
5	0								
6	5	248	248	246	241	241	245	4	1.5
7	0								
8	0								
9	5	253	244	236	251	247	246	7	2.7
10	5	203.1	201.8	214.8	208.2	202.5	206.1	5.5	2.7
11	5	141	141	137	140	138	139	2	1.3
12	5	156	154	159	156	159	157	2	1.4
13	5	239	215	223	204	209	218	14	6.2
14	5	249	223	237	244	235	238	10	4.2
15	0								
16	0								
17	0								
18	0								
19	0								
20	5	111	145	87	108	115	113	21	18.4
21	5	223	227	196	216	215	215	12	5.5
22	0								
23	0								
24	0								
25	5	230	235	221	229	217	226	7	3.2
26	5	236	244	235	230	216	232	10	4.5
27	0								
28	5	360	370	370	370	370	368	4	1.2
29	0								
30	0								
31	5	207	221	209	218	200	211	9	4.0
32	0								
33	0								
34	5	190	173	199	192	198	190	10	5.5
35	5	216	203	204	215	221	212	8	3.7
36	0								
37	0								
38	5	175	181	183	176	190	181	6	3.3
39	0								
40	0								
41	5	259	254	261	255	253	256	3	1.3
42	5	115	117	91	122	128	115	14	12.3
43	5	176	109	124	301	104	163	82	50.6
44	0								
45	5	255	279	295	340	361	306	44	14.3
46	5	411	402	414	398	411	407	7	1.7

ALUMINUM
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	78.5	78.7	89.6	94.0	101.1	88.4	9.8	11.1
2	0								
3	5	127	120	122	122	145	127	10	8.1
4	5	113	112	112	115	115	113	2	1.3
5	0								
6	5	155	133	156	152	147	149	9	6.3
7	0								
8	0								
9	5	109	111	110	112	113	111	2	1.4
10	5	121.1	121.9	130.4	129.4	124.0	125.4	4.3	3.4
11	5	120	130	140	130	130	130	7	5.4
12	5	127	130	129	129	129	129	1	0.9
13	5	133	153	123	121	114	129	15	11.8
14	5	127	125	134	133	136	131	5	3.6
15	0								
16	0								
17	0								
18	0								
19	0								
20	5	126	103	113	118	102	112	10	9.0
21	5	127	131	132	133	133	131	2	1.9
22	0								
23	0								
24	0								
25	5	135	139	147	145	153	144	7	4.9
26	5	154	155	164	158	163	158.80	4.55	2.9
27	0								
28	5	130	120	120	120	120	122	4	3.7
29	0								
30	0								
31	5	140	140	134	143	135	138	4	2.7
32	0								
33	0								
34	5	161	116	98.1	136	109	124	25	20.0
35	5	122	123	126	122	128	124	3	2.2
36	0								
37	0								
38	5	133	135	139	162	139	142	12	8.3
39	0								
40	0								
41	5	148	140	147	150	143	146	4	2.8
42	5	103	106	104	108	109	106	3	2.4
43	5	89	108	87.9	124	93.3	100.4	15.4	15.4
44	0								
45	0								
46	0								

SILICON
Sediment 978
%

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	5	21.9	22.2	22.1	22.7	22.6	22.3	0.3	1.5
5	0								
6	0								
7	0								
8	0								
9	5	21.2	21.1	21.1	21	20.9	21.1	0.1	0.5
10	0								
11	5	22.76	22.49	22.85	22.61	22.43	22.63	0.18	0.8
12	0								
13	0								
14	0								
15	0								
16	5	23.11	23.08	22.99	23.24	22.68	23.02	0.21	0.9
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	22.47	21.89	21.90	22.06	21.46	21.96	0.36	1.7
23	0								
24	0								
25	0								
26	5	23.5	22.4	23.0	23.5	22.5	23.0	0.5	2.3
27	0								
28	0								
29	0								
30	0								
31	0								
32	0								
33	0								
34	0								
35	5	17.9	17.9	18.4	18.0	18.2	18.1	0.2	1.2
36	5	21.69	21.87	22.53	22.82	23.06	22.40	0.60	2.7
37	0								
38	0								
39	0								
40	0								
41	5	22.1	23.8	23.3	22.7	23.7	23.1	0.7	3.1
42	0								
43	0								
44	0								
45	0								
46	0								

SILICON
MESS-2
%

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	5	25.8	25.8	26.1	26.3	26.8	26.2	0.4	1.6
5	0								
6	0								
7	0								
8	0								
9	5	25.6	25.6	25.3	25.3	25.2	25.4	0.2	0.7
10	0								
11	5	26.76	26.89	26.26	26.19	26	26.42	0.38	1.5
12	0								
13	0								
14	0								
15	0								
16	5	25.98	25.59	25.73	24.45	25.46	25.44	0.59	2.3
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	25.87	26.47	26.39	25.82	26.17	26.14	0.29	1.1
23	0								
24	0								
25	0								
26	5	27.1	27.7	27.7	27.5	28.5	27.7	0.5	1.8
27	0								
28	0								
29	0								
30	0								
31	0								
32	0								
33	0								
34	0								
35	5	21.9	21.1	22.2	22.8	23.0	22.2	0.8	3.4
36	5	26.68	26.75	26.84	27.67	28.60	27.31	0.82	3.0
37	0								
38	0								
39	0								
40	0								
41	5	26.9	27.8	26.2	28.0	27.8	27.3	0.8	2.8
42	0								
43	0								
44	0								
45	0								
46	0								

The determination of silicon was not required in the biologicals

CHROMIUM
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	69.17	67.75	68.68	71.3	69.14	69.21	1.30	1.9
2	0								
3	5	66.3	62.8	59.6	61.3	59.4	61.9	2.8	4.6
4	5	75	75	73	71	71	73	2	2.7
5	5	66.9	72	69.45	70.73	71.37	70.09	2.02	2.9
6	5	80	80	83	79	80	80	2	1.9
7	5	66	67	73	69	68	69	3	3.9
8	0								
9	5	72.8	70.9	72.6	70.3	73.4	72.0	1.3	1.8
10	0								
11	5	77.66	77.55	77.4	75.67	75.05	76.67	1.22	1.6
12	0								
13	5	76.1	79.9	78.2	77.4	83.6	79.0	2.9	3.6
14	5	74.4	73.2	73.7	70.2	69.8	72.3	2.1	2.9
15	5	60	56	58	60	58	58	2	2.9
16	5	80.7	81.2	83.7	82.5	82.2	82.1	1.2	1.4
17	0								
18	0								
19	5	83	82	84	82	83	83	1	1.0
20	5	33.1	34.3	34.9	34.8	36.7	34.8	1.3	3.7
21	0								
22	5	78.3	76.8	77.7	78.6	76.7	77.6	0.9	1.1
23	5	30.5	30.9	28.9	31.3	30.8	30.5	0.9	3.0
24	0								
25	5	77.7	73.5	74.1	78.6	78.8	76.5	2.5	3.3
26	5	76.9	74.2	72.9	73.2	73.2	74.1	1.7	2.2
27	5	117	125	127	125	117	122	5	4.0
28	5	80	79	80	78	79	79	1	1.1
29	5	41.5	41.1	41.6	41.9	41.9	41.6	0.3	0.8
30	0								
31	5	73.9	79.1	79.8	81.6	79.6	78.8	2.9	3.7
32	5	88.61	81.71	81.71	74.80	74.8	80.33	5.78	7.2
33	5	81	79	77	79	74	78	3	3.4
34	5	38.6	35.7	38.7	40.1	38.0	38.2	1.6	4.2
35	5	71.0	70.4	71.0	72.1	71.4	71.2	0.6	0.9
36	5	74.26	75.04	82.80	83.22	84.31	79.92	4.86	6.1
37	0								
38	5	95.3	86.4	89.8	84.4	87.4	88.7	4.2	4.7
39	5	37.8	37.4	38.3	38.7	38.5	38.1	0.5	1.4
40	5	68.90	71.68	69.68	69.76	69.52	69.91	1.05	1.5
41	5	77.3	80.0	78.2	79.9	78.0	78.7	1.2	1.5
42	5	99.8	92.7	93.2	95.4	97.3	95.7	2.9	3.1
43	0								
44	0								
45	5	81.9	81.3	81	82.4	78.2	81.0	1.6	2.0
46	5	79.4	78.1	78.5	77.3	77.5	78.2	0.8	1.1

CHROMIUM
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	87.76	85.23	85.38	92.6	82.44	86.68	3.81	4.4
2	0								
3	5	92.1	92.9	91	93.3	85.3	90.9	3.3	3.6
4	5	102	99	107	100	99	101	3	3.3
5	5	115.17	111.61	114.08	113.39	120.33	114.92	3.29	2.9
6	5	106	110	110	107	109	108	2	1.7
7	5	89	89	89	88	88	89	1	0.6
8	0								
9	5	100.9	93.9	100.6	105	91.7	98.4	5.5	5.6
10	0								
11	5	102.2	102.6	103	103.7	105.1	103.3	1.1	1.1
12	0								
13	5	107	112	114	106	103	108	5	4.2
14	5	103	94.5	98.6	95.3	93.1	96.8	3.8	4.0
15	5	70	70	62	68	62	66	4	6.2
16	5	113.3	113.0	112.9	109.0	113.8	112.4	1.9	1.7
17	0								
18	0								
19	5	107	107	109	107	108	108	1	0.8
20	5	29.8	26.7	36.6	29.6	31.3	30.8	3.6	11.8
21	0								
22	5	103.1	103.7	100.7	99.8	105.2	102.5	2.2	2.2
23	5	29.1	25.9	25.9	25.2	26.6	26.5	1.5	5.7
24	0								
25	5	110	107	102	112	111	108	4	3.7
26	5	99.1	96.4	98.1	100.0	97.9	98.3	1.3	1.4
27	5	187	182	180	183	183	183	2	1.2
28	5	106	103	104	104	104	104	1	1.1
29	5	49.7	48.7	48.3	48	49.4	48.8	0.7	1.5
30	0								
31	5	98.8	106	100	105	100	102	3	3.2
32	5	105.53	121.57	105.53	113.55	109.54	111.14	6.71	6.0
33	5	111	105	109	107	103	107	3	3.0
34	5	48.3	50.6	36.3	36.1	39.9	42.2	6.8	16.1
35	5	99.7	97.0	97.5	97.7	95.6	97.5	1.5	1.5
36	5	101.6	101.9	102.9	103.2	104.0	102.7	1.0	1.0
37	0								
38	5	106	106	112	108	106	108	3	2.4
39	5	41.7	47.7	43.1	41.7	43.4	43.5	2.5	5.7
40	5	105.65	96.18	110.16	115.10	102.77	105.97	7.20	6.8
41	5	105	105	104	104	101	104	2	1.6
42	5	105	114	110	111	115	111	4	3.5
43	0								
44	0								
45	0								
46	0								

CHROMIUM
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	4.345	4.008	3.604	3.211	3.352	3.704	0.469	12.7
2	0								
3	5	3.69	3.61	3.71	3.01	3.15	3.43	0.33	9.6
4	5	3.21	3.32	2.39	2.42	3.00	2.87	0.44	15.3
5	5	3.71	2.95	3.33	3.52	3.61	3.42	0.30	8.8
6	5	3.66	3.80	3.59	3.84	3.88	3.75	0.12	3.3
7	0								
8	0								
9	0								
10	5	3.183	3.446	3.750	3.254	3.254	3.377	0.230	6.8
11	5	2.11	2.29	2.12	2.08	2.1	2.14	0.09	4.0
12	0								
13	5	3.04	3.21	3.16	4.42	4.59	3.68	0.76	20.5
14	5	3.19	3.31	3.27	3.44	3.32	3.31	0.09	2.7
15	5	3.47	3.43	3.46	3.46	3.50	3.46	0.03	0.7
16	5	3.77	3.30	3.72	3.71	4.07	3.71	0.27	7.4
17	5	2.93	3.26	3.44	2.91	3.33	3.17	0.24	7.6
18	0								
19	0								
20	5	0.480	0.592	0.414	0.459	0.501	0.489	0.066	13.5
21	5	4.12	4.13	4.21	4.37	4.10	4.19	0.11	2.7
22	0								
23	5	2.37	2.26	2.48	2.29	2.28	2.34	0.09	3.9
24	5	2.3	2.5	3.1	2.6	2.6	2.6	0.3	11.3
25	5	3.87	3.28	3.64	3.60	4.09	3.70	0.30	8.2
26	5	4.02	3.86	3.49	3.58	3.45	3.68	0.25	6.8
27	0								
28	5	4	4	3	4	4	4	0	11.8
29	0								
30	5	3.98	3.94	3.87	3.68	3.77	3.85	0.12	3.2
31	5	3.16	3.58	3.28	3.37	3.11	3.30	0.19	5.7
32	5	4.23	4.23	4.18	4.27	4.18	4.22	0.04	0.9
33	0								
34	0								
35	5	3.04	3.23	3.12	3.16	3.19	3.15	0.07	2.3
36	5	4.119	4.080	4.037	3.980	4.045	4.052	0.052	1.3
37	0								
38	5	4.03	3.91	4.00	3.99	4.08	4.00	0.06	1.6
39	5	3.90	3.53	3.84	3.90	3.95	3.82	0.17	4.4
40	5	2.834	2.749	2.850	2.772	2.664	2.774	0.074	2.7
41	5	3.99	3.88	4.11	4.05	4.11	4.03	0.10	2.4
42	5	0.85	0.95	0.88	0.93	0.98	0.92	0.05	5.7
43	5	2.78	2.74	3.07	3.06	2.62	2.85	0.20	7.1
44	0								
45	5	3.9	3.9	3.9	3.8	3.7	3.8	0.1	2.3
46	0								

CHROMIUM
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	1.199	1.002	0.990	0.988	1.108	1.057	0.094	8.9
2	0								
3	5	0.706	0.516	0.533	0.443	0.582	0.556	0.098	17.5
4	5	0.44	0.77	0.67	0.42	0.47	0.55	0.16	28.3
5	5	0.46	0.45	0.44	0.45	0.47	0.45	0.01	2.5
6	5	0.52	0.47	0.54	0.50	0.53	0.51	0.03	5.4
7	0								
8	0								
9	0								
10	5	0.617	0.635	0.780	0.460	0.667	0.632	0.115	18.2
11	5	0.451	0.452	0.461	0.439	0.45	0.451	0.008	1.7
12	0								
13	5	0.67	0.62	0.58	0.66	0.65	0.63	0.04	5.8
14	5	0.46	0.46	0.43	0.42	0.42	0.44	0.02	4.7
15	5	0.46	0.48	0.46	0.51	0.47	0.48	0.02	4.4
16	5	0.53	0.47	0.48	0.58	0.69	0.55	0.09	16.3
17	5	0.39	0.44	0.42	0.44	0.47	0.43	0.03	6.8
18	0								
19	0								
20	5	0.547	0.403	0.495	0.494	0.428	0.473	0.058	12.2
21	5	0.78	0.76	0.80	0.71	0.85	0.78	0.05	6.6
22	0								
23	0								
24	5	0.34	0.55	0.29	0.29	0.25	0.34	0.12	34.7
25	5	0.50	0.50	0.51	0.51	0.50	0.50	0.01	1.1
26	5	0.625	0.593	0.588	0.566	0.598	0.594	0.021	3.6
27	0								
28	5	0.6	0.3	0.4	0.4	0.5	0.4	0.1	25.9
29	0								
30	0								
31	5	0.46	0.51	0.47	0.53	0.47	0.49	0.03	6.2
32	5	0.43	0.47	0.50	0.57	0.50	0.49	0.05	10.4
33	0								
34	0								
35	5	0.560	0.522	0.551	0.569	0.487	0.538	0.033	6.2
36	5	0.4893	0.4800	0.4853	0.5144	0.4736	0.4885	0.0156	3.2
37	0								
38	5	0.47	0.54	0.51	0.50	0.51	0.51	0.03	5.0
39	5	< 2.56	< 2.56	< 2.56	< 2.56	< 2.56			
40	5	0.573	0.539	0.565	0.536	0.571	0.557	0.018	3.2
41	5	0.468	0.490	0.482	0.472	0.470	0.476	0.009	2.0
42	5	0.42	0.52	0.45	0.35	0.53	0.45	0.07	16.3
43	5	0.562	0.795	0.615	0.585	0.505	0.612	0.110	17.9
44	0								
45	0								
46	0								

MANGANESE
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	5	436	438	423	442	432	434	7	1.7
5	5	282.72	258.62	270.67	276.70	265.30	270.80	9.43	3.5
6	5	449	446	461	451	461	454	7	1.5
7	5	431	441	407	431	418	426	13	3.1
8	0								
9	5	428	435	443	432	448	437	8	1.9
10	0								
11	5	388.46	384.74	393.9	396.45	396.17	391.94	5.15	1.3
12	0								
13	5	469	458	457	460	458	460	5	1.1
14	5	400	413	411	418	386	406	13	3.2
15	0								
16	5	433.8	439.7	437.0	438.8	435.1	436.9	2.5	0.6
17	5	469	451	452	447	452	454	9	1.9
18	0								
19	5	408	421	409	434	428	420	11	2.7
20	5	237	248	251	252	261	250	9	3.5
21	0								
22	5	416.5	406.4	408.2	418.7	416.1	413.2	5.5	1.3
23	5	228	228	226	219	239	228	7	3.1
24	0								
25	5	460	448	459	465	458	458	6	1.4
26	5	403	429	419	407	381	408	18	4.4
27	5	472	457	465	467	456	463	7	1.5
28	5	470	460	460	460	470	464	5	1.2
29	5	316	312	319	324	322	319	5	1.5
30	0								
31	5	448	439	459	445	459	450	9	2.0
32	5	393.9	391.99	390.39	387.84	387.25	390.27	2.79	0.7
33	5	416	419	409	414	421	416	5	1.1
34	5	310	287	321	313	304	307	13	4.2
35	0								
36	5	451.8	456.9	459.0	459.3	462.2	457.9	3.9	0.8
37	0								
38	5	457	459	471	465	456	462	6	1.4
39	5	273	269	277	279	278	275	4	1.5
40	5	446.12	407.53	397.55	399.77	390.00	408.19	22.10	5.4
41	5	481	479	473	473	461	473	8	1.6
42	5	438	438	441	419	443	436	10	2.2
43	0								
44	5	435	432	430	425	422	429	5	1.2
45	5	437	423	425	434	421	428	7	1.7
46	5								

MANGANESE
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	5	336	338	329	341	348	338	7	2.1
5	5	332.53	318.13	328.00	318.03	324.17	324.17	6.30	1.9
6	5	354	360	359	358	365	359	4	1.1
7	5	346	342	336	343	334	340	5	1.5
8	0								
9	5	367.4	356.9	356.4	368	346.6	359	9	2.5
10	0								
11	5	353.5	361.1	356.6	357.8	360.9	358.0	3.2	0.9
12	0								
13	5	372	381	390	380	381	381	6	1.7
14	5	351	332	311	331	324	330	15	4.4
15	0								
16	5	350.0	342.7	349.7	331.3	348.7	344.5	7.9	2.3
17	5	340	344	345	349	365	349	10	2.8
18	0								
19	5	355	334	351	349	352	348	8	2.4
20	5	286	292	290	290	289	289	2	0.8
21	0								
22	5	336.5	326.6	326.6	317.7	333.1	328.1	7.2	2.2
23	5	243	245	237	235	239	240	4	1.7
24	0								
25	5	362	360	366	369	365	364	4	1.0
26	5	341	356	339	358	343	347	9	2.6
27	5	487	477	460	471	460	471	11	2.4
28	5	360	350	360	360	350	356	5	1.5
29	5	313	306	312	309	306	309	3	1.1
30	0								
31	5	365	351	350	352	356	355	6	1.7
32	5	326.25	321.53	326.65	324.07	323.21	324.34	2.13	0.7
33	5	353	334	352	339	327	341	11	3.3
34	5	310	299	232	285	307	287	32	11.2
35	0								
36	5	350.1	351.8	359.0	362.3	363.9	357.4	6.2	1.7
37	0								
38	5	348	355	363	362	364	358	7	1.9
39	5	322	368	332	323	337	336	19	5.6
40	5	339.8	314.57	336.49	326.97	329.44	329.45	9.80	3.0
41	5	365	355	363	365	363	362	4	1.1
42	5	386	379	386	364	367	376	10	2.8
43	0								
44	5	334	333	338	346	333	337	6	1.6
45	0								
46	0								

The determ The determination of manganese was not required in the biologicals

IRON
Sediment 98
%

Lab							Mean	SD	RSD
1	5	2.722	2.821	2.766	2.784	2.621	2.743	0.077	2.8
2	0								
3	0								
4	5	4.51	4.46	4.46	4.51	4.49	4.49	0.03	0.6
5	3	3.14	3.09	3.20	3.11	3.17	3.14	0.04	1.4
6	5	4.65	4.57	4.74	4.62	4.69	4.65	0.07	1.4
7	5	4.14	4.28	4.13	4.41	4.31	4.25	0.12	2.8
8	0								
9	5	4.16	4.16	4.18	4.14	4.07	4.14	0.04	1.0
10	0								
11	5	4.56	4.49	4.58	4.53	4.49	4.53	0.04	0.9
12	0								
13	5	4.41	4.41	4.49	4.64	4.42	4.47	0.10	2.2
14	5	3.79	4.22	4.17	3.97	3.96	4.02	0.17	4.3
15	5	4.05	4.15	4.15	4.10	4.05	4.10	0.05	1.2
16	5	4.46	4.52	4.50	4.49	4.47	4.49	0.02	0.5
17	5	4.51	4.49	4.45	4.29	4.46	4.44	0.09	2.0
18	0								
19	5	5.04	4.85	5.13	5.25	5.40	5.13	0.21	4.1
20	5	6.24	7.65	8.35	8.92	8.85	8.00	1.11	13.8
21	0								
22	5	4.24	4.10	4.11	4.10	4.05	4.12	0.07	1.7
23	5	3.38	3.31	3.28	3.40	3.34	3.34	0.05	1.5
24	0								
25	5	4.53	4.57	4.47	4.59	4.69	4.57	0.08	1.8
26	5	4.24	4.27	4.29	4.16	4.30	4.25	0.06	1.3
27	5	4.52	4.34	4.40	4.53	4.25	4.41	0.12	2.7
28	5	4.6	4.5	4.7	4.7	4.7	4.6	0.1	1.9
29	5	3.46	3.53	3.62	3.47	3.58	3.53	0.07	2.0
30	0								
31	5	4.52	4.56	4.67	4.61	4.65	4.60	0.06	1.4
32	5	3.93	3.92	4.10	3.93	3.86	3.95	0.09	2.3
33	5	4.46	4.46	4.40	4.32	4.34	4.40	0.07	1.5
34	5	4.10	3.97	4.13	4.03	4.26	4.10	0.11	2.7
35	5	3.90	3.94	4.03	3.99	3.96	3.96	0.05	1.2
36	5	4.591	4.696	4.742	4.819	4.872	4.744	0.109	2.3
37	0								
38	5	4.54	4.64	4.57	4.64	4.58	4.59	0.04	1.0
39	0								
40	0								
41	5	4.67	4.76	4.66	4.61	4.63	4.67	0.06	1.2
42	5	4.53	4.37	4.37	4.27	4.35	4.38	0.09	2.2
43	0								
44	0								
45	5	4.61	4.57	4.55	4.70	4.84	4.65	0.12	2.6
46	0								

IRON
MESS-2
%

Lab							Mean	SD	RSD
1	5	2.281	2.245	2.280	2.254	2.147	2.241	0.055	2.5
2	0								
3	0								
4	5	4.20	4.16	4.12	4.18	4.11	4.15	0.04	0.9
5	3	3.28	3.15	3.02	3.21	3.15	3.16	0.10	3.0
6	5	4.42	4.47	4.45	4.45	4.53	4.46	0.04	0.9
7	5	4.07	4.05	4.11	4.15	3.97	4.07	0.07	1.7
8	0								
9	5	4.1	4.08	4.12	4.13	4.09	4.10	0.02	0.5
10	0								
11	5	4.32	4.33	4.3	4.29	4.28	4.30	0.02	0.5
12	0								
13	5	4.46	4.33	4.58	4.05	4.33	4.35	0.20	4.6
14	5	4.38	4.12	4.02	4.20	4.02	4.15	0.15	3.6
15	5	3.65	3.76	3.65	3.65	3.96	3.73	0.14	3.6
16	5	4.24	4.16	4.28	4.06	4.24	4.19	0.09	2.1
17	5	4.48	4.6	4.37	4.28	4.38	4.42	0.12	2.8
18	0								
19	5	4.41	4.34	4.36	4.32	4.35	4.36	0.03	0.8
20	5	5.53	7.87	5.54	5.71	7.71	6.47	1.21	18.6
21	0								
22	5	3.70	3.99	3.84	3.77	3.85	3.83	0.11	2.8
23	5	3.10	3.14	3.14	3.09	3.04	3.10	0.04	1.3
24	0								
25	5	4.14	4.11	4.19	4.31	4.27	4.20	0.08	2.0
26	5	4.00	4.23	3.87	4.18	4.16	4.09	0.15	3.7
27	5	5.61	5.58	5.19	5.40	5.20	5.40	0.20	3.7
28	5	4.3	4.2	4.3	4.2	4.2	4.2	0.1	1.3
29	5	3.26	3.12	3.21	3.11	3.13	3.17	0.07	2.1
30	0								
31	5	4.43	4.40	4.37	4.51	4.29	4.40	0.08	1.8
32	5	4.30	4.27	4.41	4.32	4.42	4.34	0.07	1.5
33	5	4.43	4.19	4.40	4.25	4.16	4.29	0.12	2.9
34	5	3.60	3.65	2.75	3.31	3.51	3.36	0.37	10.9
35	5	3.62	3.58	3.72	3.80	3.77	3.70	0.09	2.6
36	5	4.306	4.460	4.470	4.477	4.493	4.441	0.077	1.7
37	0								
38	5	4.25	4.34	4.40	4.34	4.41	4.35	0.06	1.5
39	0								
40	0								
41	5	4.26	4.22	4.28	4.30	4.35	4.28	0.05	1.1
42	5	4.34	4.34	4.22	4.21	4.48	4.32	0.11	2.5
43	0								
44	0								
45	0								
46	0								

IRON
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	203.1	183.3	158.6	152.2	172.3	173.9	20.3	11.7
2	0								
3	5	227	229	220	218	233	225	6	2.8
4	5	241	238	235	238	246	240	4	1.7
5	5	142.00	146.46	170.17	158.31	142.00	151.79	12.25	8.1
6	5	279	281	294	297	289	288	8	2.7
7	0								
8	0								
9	5	246	248	242	244	253	247	4	1.7
10	5	258.8	254.6	274.4	259.3	257.6	260.9	7.7	3.0
11	5	217	220	215	218	215	217	2	1.0
12	5	215	216	216	213	216	215	1	0.6
13	5	226	210	250	225	202	222	18	8.2
14	5	259	262	267	267	263	264	3	1.3
15	5	220	222	223	227	223	223	3	1.1
16	0								
17	5	259	246	257	255	247	253	6	2.3
18	0								
19	5	245.2	227.6	233.8	251.7	235.4	238.7	9.6	4.0
20	5	200	213	180	197	203	199	12	6.0
21	5	270	265	254	254	264	261	7	2.7
22	0								
23	5	203	212	203	207	198	205	5	2.6
24	0								
25	5	274	281	263	273	270	272	7	2.4
26	5	261	266	263	262	259	262	3	1.0
27	5	268	268	269	267	267	268	1	0.3
28	5	300	320	290	300	300	302	11	3.6
29	0								
30	0								
31	5	252	265	252	264	242	255	10	3.8
32	5	265.12	280.70	268.39	271.82	274.83	272.17	6.00	2.2
33	0								
34	5	235	239	245	250	261	246	10	4.1
35	5	238	238	240	257	261	247	11	4.6
36	5	281.0	290.2	286.2	289.6	286.8	286.8	3.7	1.3
37	0								
38	5	263	259	270	258	278	266	8	3.2
39	5	226	230	230	241	242	234	7	3.1
40	0								
41	5	281	286	274	272	275	278	6	2.1
42	5	214.1	215.3	216.1	213.6	215.7	215.0	1.1	0.5
43	5	194	196	210	212	185	199	11	5.7
44	0								
45	5	255	260	261	253	257	257	3	1.3
46	5	275	269	272	267	271	271	3	1.1

IRON
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	98.17	93.97	103.4	105.6	113.4	102.9	7.4	7.2
2	0								
3	5	148	149	149	153	151	150	2	1.3
4	5	139	144	147	149	147	145	4	2.7
5	5	125.12	128.67	126.64	142.00	121.06	128.70	7.94	6.2
6	5	183	181	185	176	180	181	3	1.9
7	0								
8	0								
9	5	158	159	160	167	159	161	4	2.3
10	5	173.9	169.6	185.3	169.9	176.2	175.0	6.4	3.7
11	5	155	157	160	155	161	158	3	1.8
12	5	154	156	157	157	156	156	1	0.8
13	5	166	168	150	161	147	159	10	6.0
14	5	175	172	172	173	174	173	1	0.8
15	5	162	157	161	155	158	159	3	1.8
16	0								
17	5	173	170	176	168	172	172	3	1.8
18	0								
19	5	166.2	166.3	165.3	167.9	175.4	168.2	4.1	2.5
20	5	147	152	153	158	162	154	6	3.7
21	5	161	164	171	167	164	165	4	2.3
22	0								
23	5	137	138	138	139	138	138	1	0.5
24	0								
25	5	173	174	175	175	175	174	1	0.5
26	5	175	176	176	179	177	177	2	0.9
27	5	179	181	177	179	177	179	2	0.9
28	5	190	180	190	180	180	184	5	3.0
29	0								
30	0								
31	5	177	182	182	176	180	179	3	1.6
32	5	172.22	164.45	168.66	182.21	169.54	171.42	6.65	3.9
33	0								
34	5	154	162	153	156	162	157	4	2.8
35	5	174	171	172	174	172	173	1	0.8
36	5	174.3	171.2	168.3	173.9	174.7	172.5	2.7	1.6
37	0								
38	5	175	176	183	175	169	176	5	2.8
39	5	148	159	174	172	167	164	11	6.5
40	0								
41	5	175	177	174	168	180	175	4	2.5
42	5	173.0	169.5	166.1	173.0	170.4	170.4	2.9	1.7
43	5	149	161	140	154	141	149	9	5.9
44	0								
45	0								
46	0								

COPPER
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	98.49	98.02	96.35	100.4	99.28	98.51	1.51	1.5
2	0								
3	5	89.8	89.1	88	88.5	88.1	88.7	0.8	0.8
4	5	103.1	100.6	99.1	105.6	104.6	102.6	2.7	2.6
5	5	63.64	62.16	62.9	62.53	63.09	62.86	0.56	0.9
6	5	106	104	106	109	106	106	2	1.7
7	5	84	87	89	93	88	88	3	3.7
8	0								
9	5	96.4	103	100.9	93.9	100	98.8	3.6	3.7
10	0								
11	5	90.04	87.99	88.4	86.55	86.23	87.84	1.54	1.7
12	0								
13	5	94.2	94.1	97.8	94.9	99.3	96.1	2.4	2.5
14	5	96.1	96.0	93.7	99.4	88.8	94.8	3.9	4.1
15	5	92.2	89.8	91.1	90.1	90.9	90.8	0.9	1.0
16	5	95.80	96.80	95.40	97.60	97.60	96.64	1.01	1.0
17	5	103	103	98.4	94.1	100	99.7	3.7	3.7
18	0								
19	5	94.8	94.8	93.8	95.0	95.6	94.8	0.6	0.7
20	5	80.7	85.0	85.7	82.6	82.5	83.3	2.0	2.4
21	0								
22	5	96.7	97.4	96.2	96.5	95.1	96.4	0.8	0.9
23	5	71.9	73.3	72.7	73.0	74.7	73.1	1.0	1.4
24	0								
25	5	95.1	93.6	94.3	96.2	95.3	94.9	1.0	1.0
26	5	88.6	95.0	97.9	90.7	96.8	93.8	4.0	4.3
27	5	88.3	82.4	93.5	90.4	85.5	88.0	4.3	4.9
28	5	86	84	86	84	84	85	1	1.3
29	5	92.9	92.3	91.9	91.8	91.3	92.0	0.6	0.7
30	0								
31	5	89.9	91.1	100	90.6	93.9	93.1	4.1	4.5
32	5	99.65	99.77	101.07	98.89	100.14	99.90	0.79	0.8
33	5	93	96	90	92	88	92	3	3.3
34	5	92.2	86.9	88.8	90.9	93.6	90.5	2.7	3.0
35	5	92.0	91.7	93.3	91.7	93.4	92.4	0.9	0.9
36	5	92.58	94.66	95.39	96.38	97.40	95.28	1.83	1.9
37	0								
38	5	94.7	94.9	94.0	93.7	92.8	94.0	0.8	0.9
39	5	98.5	96.5	100	100	100	99.0	1.5	1.6
40	5	92.41	98.78	96.90	97.20	94.00	95.86	2.59	2.7
41	5	97.3	99.9	101	99.7	100	99.6	1.4	1.4
42	5	104.9	103.3	102.0	102.5	105	103.5	1.4	1.3
43	0								
44	0								
45	5	98.8	104	96.4	96.6	98.6	98.9	3.1	3.1
46	5	97.9	96.3	99.7	96.4	93.3	96.7	2.4	2.4

COPPER
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	43.6	39.34	41.95	43.83	39.36	41.62	2.19	5.3
2	0								
3	5	36.1	34.3	32.7	36.3	36.2	35.1	1.6	4.5
4	5	42.4	38.8	39.7	39.6	38.0	39.7	1.7	4.2
5	5	28.03	32.13	30.08	31.11	29.57	30.18	1.55	5.2
6	5	40	39	40	40	41	40	1	1.8
7	5	32	33	36	33	34	34	2	4.5
8	0								
9	5	39.8	40.1	33.8	41.2	40.9	39.2	3.1	7.8
10	0								
11	5	40.04	38.61	39.55	39.95	40.27	39.68	0.65	1.6
12	0								
13	5	38.9	45.6	42.2	38.7	39.3	41.0	3.0	7.2
14	5	41.2	36.0	35.8	35.4	35.3	36.7	2.5	6.8
15	5	39.1	42.4	41.6	38.9	38.6	40.1	1.7	4.4
16	5	39.40	37.80	37.40	39.20	40.30	38.82	1.20	3.1
17	5	37.1	38.5	38.6	36.8	37.4	37.7	0.8	2.2
18	0								
19	5	38.0	37.7	37.1	39.2	39.5	38.3	1.0	2.7
20	5	31.9	34.5	35.3	34.1	33.7	33.9	1.3	3.7
21	0								
22	5	39.5	38.6	36.7	36.2	32.9	36.8	2.6	6.9
23	5	27.6	28.6	32.6	29.3	28.6	29.3	1.9	6.5
24	0								
25	5	38.7	38.4	39.7	38.9	39.1	39.0	0.5	1.3
26	5	35.7	38.1	37.3	38.2	37.1	37.3	1.0	2.7
27	5	41.3	42.9	37.1	40.3	39.9	40.3	2.1	5.3
28	5	36	37	36	37	38	37	1	2.3
29	5	37.6	36.6	36.4	40.7	39.5	38.2	1.9	4.9
30	0								
31	5	40.9	39.6	38.3	40.9	41.0	40.1	1.2	2.9
32	5	36.21	38.33	38.12	38.26	37.86	37.76	0.88	2.3
33	5	38	37	41	38	37	38	2	4.3
34	5	35.9	35.0	27.7	37.4	36.6	34.5	3.9	11.3
35	5	37.7	43.1	36.9	37.6	37.4	38.5	2.6	6.7
36	5	38.78	38.88	39.08	39.18	39.28	39.04	0.21	0.5
37	0								
38	5	39.9	39.5	42.1	39.1	40.0	40.1	1.2	2.9
39	5	42.0	48.2	43.2	42.2	44.2	44.0	2.5	5.7
40	5	40.25	38.56	37.50	38.10	37.90	38.46	1.07	2.8
41	5	39.2	41.4	37.3	42.9	37.9	39.7	2.4	6.0
42	5	35.5	38.2	40.1	38.7	39.9	38.5	1.8	4.8
43	0								
44	0								
45	0								
46	0								

COPPER
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	10.64	10.01	9.38	8.86	9.28	9.63	0.70	7.2
2	0								
3	5	7.76	7.84	7.81	7.86	7.58	7.77	0.11	1.5
4	5	7.35	6.96	7.04	7.11	7.17	7.13	0.15	2.1
5	5	6.78	8.94	6.32	6.09	6.44	6.91	1.16	16.8
6	5	9.73	10.10	9.68	9.46	10.30	9.85	0.34	3.4
7	0								
8	0								
9	0								
10	5	8.052	8.277	8.270	8.234	8.115	8.190	0.101	1.2
11	5	9.58	9.37	9.46	9.41	9.48	9.46	0.08	0.8
12	5	8.34	8.59	8.42	8.48	8.45	8.46	0.09	1.1
13	5	7.94	8.15	8.34	7.81	8.26	8.10	0.22	2.7
14	5	9.38	8.61	9.45	9.15	9.70	9.26	0.41	4.4
15	5	8.5	8.4	8.4	8.5	8.3	8.4	0.1	1.0
16	5	9.46	9.51	9.26	9.59	9.58	9.48	0.13	1.4
17	5	9.05	9.02	9.18	9.14	9.25	9.13	0.09	1.0
18	0								
19	5	8.13	8.15	8.22	7.93	8.28	8.14	0.13	1.6
20	5	8.77	9.61	9.50	9.00	9.58	9.29	0.38	4.1
21	5	9.28	8.82	8.86	9.02	9.16	9.03	0.20	2.2
22	0								
23	5	8.79	8.98	8.87	9.31	8.59	8.91	0.27	3.0
24	5	9.9	9.5	9.3	9.5	9.5	9.5	0.2	2.3
25	5	8.49	9.00	8.63	9.36	8.78	8.85	0.34	3.9
26	5	8.61	8.62	8.62	8.55	8.46	8.57	0.07	0.8
27	5	9.6	9.8	9.8	9.7	9.8	9.7	0.1	0.9
28	5	8	8	8	8	9	8	0	5.5
29	0								
30	5	8.36	8.34	8.45	8.59	8.56	8.46	0.11	1.3
31	5	8.57	8.72	8.79	8.82	8.95	8.77	0.14	1.6
32	5	9.81	10.06	10.65	10.03	9.42	9.99	0.45	4.5
33	0								
34	5	9.83	10.30	9.90	10.10	10.70	10.17	0.35	3.4
35	5	7.95	7.94	8.74	8.71	8.52	8.37	0.40	4.8
36	5	9.657	9.667	10.089	9.938	9.888	9.848	0.185	1.9
37	0								
38	5	9.00	8.92	8.90	8.85	8.95	8.92	0.06	0.6
39	5	10.6	10.3	10.1	9.92	9.87	10.16	0.30	2.9
40	5	8.43	8.62	8.81	9.13	9.23	8.84	0.34	3.8
41	5	7.48	6.49	7.42	7.80	7.66	7.37	0.51	7.0
42	5	8.52	7.73	9.01	7.80	7.72	8.16	0.58	7.1
43	5	8.30	8.84	9.42	9.21	8.49	8.85	0.47	5.3
44	0								
45	5	8.44	9.28	9.47	9.22	9.10	9.10	0.39	4.3
46	5	9.52	9.31	9.37	9.42	9.37	9.40	0.08	0.8

COPPER
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	3.67	3.49	3.74	3.90	3.90	3.74	0.17	4.6
2	0								
3	5	3.06	3.2	3.2	3.1	3.26	3.16	0.08	2.6
4	5	3.1	2.8	3.0	2.7	3.1	2.9	0.2	6.2
5	5	3.89	3.97	3.68	3.89	3.99	3.88	0.12	3.2
6	5	4.11	4.13	4.22	4.33	4.09	4.18	0.10	2.4
7	0								
8	0								
9	0								
10	5	3.492	3.502	3.570	3.470	3.526	3.512	0.038	1.1
11	5	4	3.8	3.9	4	3.9	3.9	0.1	2.1
12	5	3.82	3.92	3.86	3.83	3.88	3.86	0.04	1.0
13	5	3.64	3.52	3.48	3.51	3.72	3.58	0.10	2.8
14	5	3.77	3.74	4.04	3.83	4.01	3.88	0.14	3.6
15	5	3.76	3.69	3.56	3.70	3.93	3.73	0.13	3.6
16	5	4.00	3.95	3.97	3.88	3.97	3.95	0.04	1.1
17	5	4.07	4.07	3.78	4.15	4.23	4.06	0.17	4.2
18	0								
19	5	3.97	3.52	3.89	3.98	3.90	3.85	0.19	4.9
20	5	3.46	3.69	3.67	3.65	3.97	3.69	0.18	4.9
21	5	3.76	4.19	3.82	3.79	3.74	3.86	0.19	4.8
22	0								
23	5	3.93	3.86	3.87	3.81	3.76	3.85	0.06	1.7
24	5	4.3	4.0	4.8	4.8	4.5	4.5	0.3	7.6
25	5	3.83	3.78	3.74	3.87	3.91	3.83	0.07	1.8
26	5	3.93	3.85	3.82	3.87	3.92	3.88	0.05	1.2
27	5	4.1	3.8	4.3	4.0	3.9	4.0	0.2	5.2
28	5	3	3	3	3	4	3	0	14.0
29	0								
30	0								
31	5	4.22	4.22	3.98	4.00	4.33	4.15	0.15	3.7
32	5	4.79	4.47	4.02	4.02	4.17	4.29	0.33	7.7
33	0								
34	5	4.36	4.34	4.20	4.93	4.27	4.42	0.29	6.6
35	5	3.74	3.8	3.75	3.69	3.67	3.73	0.05	1.4
36	5	3.952	3.897	3.982	4.036	4.119	3.997	0.084	2.1
37	0								
38	5	3.75	3.90	3.93	3.79	3.83	3.84	0.07	1.9
39	5	4.15	4.25	4.21	4.36	4.36	4.27	0.09	2.2
40	5	3.85	3.85	3.97	4.31	4.27	4.05	0.22	5.6
41	5	4.21	3.60	3.51	3.79	3.63	3.75	0.28	7.4
42	5	4.25	4.03	4.14	4.24	4.20	4.17	0.09	2.2
43	5	4.06	4.26	4.01	4.16	4.00	4.10	0.11	2.7
44	0								
45	0								
46	0								

ZINC
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	148.0	143.6	148	161.9	157.6	151.8	7.6	5.0
2	0								
3	5	250	251	250	251	248	250	1	0.5
4	5	247	246	245	276	244	252	14	5.4
5	5	231.15	181.08	206.12	218.64	224.90	212.38	19.79	9.3
6	5	265	267	267	271	271	268	3	1.0
7	5	217	234	218	228	224	224	7	3.2
8	0								
9	5	231	242	246	233	236	237	6	2.6
10	0								
11	5	256.6	253	250.4	247.4	243.9	250.3	4.9	2.0
12	0								
13	5	250	253	289	280	272	269	17	6.2
14	5	245	249	248	251	233	245	7	2.9
15	5	204	208	210	213	214	210	4	1.9
16	5	269.1	270.1	272.0	272.1	267.4	270.1	2.0	0.7
17	5	265	279	268	271	265	270	6	2.2
18	0								
19	5	248	257	253	259	262	256	5	2.1
20	5	203	219	216	213	214	213	6	2.8
21	0								
22	5	225.4	222.6	229.2	223.2	223.8	224.8	2.7	1.2
23	5	178	180	172	189	177	179	6	3.5
24	0								
25	5	265	261	262	255	256	260	4	1.6
26	5	225	226	227	222	227	225	2	0.9
27	5	251	249	250	259	241	250	6	2.6
28	5	230	230	240	240	240	236	5	2.3
29	5	237	234	234	234	236	235	1	0.6
30	0								
31	5	265	260	272	263	270	266	5	1.9
32	5	240.22	242.46	243.66	241.24	242.37	241.99	1.31	0.5
33	5	232	227	228	225	221	227	4	1.8
34	5	225	214	228	227	233	225	7	3.1
35	5	259	254	257	253	254	255	3	1.0
36	5	252.7	250.5	255.0	256.6	258.5	254.7	3.1	1.2
37	0								
38	5	259	262	262	257	253	259	4	1.5
39	5	236	232	238	240	239	237	3	1.3
40	5	280.23	267.55	270.50	303.89	287.69	281.97	14.63	5.2
41	5	268	270	272	269	263	268	3	1.3
42	5	281	272	268	267	277	273	6	2.2
43	0								
44	0								
45	5	241	237	233	242	244	239	4	1.8
46	5	251	245	248	264	244	250	8	3.2

ZINC
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	112.0	109.9	114.3	119.3	119.0	114.9	4.2	3.6
2	0								
3	5	163	162	156	162	156	160	3	2.2
4	5	157	157	155	155	155	156	1	0.7
5	5	160.35	157.76	159.05	159.70	159.22	159.22	0.96	0.6
6	5	159	161	163	159	161	161	2	1.0
7	5	142	143	143	142	144	143	1	0.6
8	0								
9	5	157	173	144	193	159	165	19	11.3
10	0								
11	5	158.5	159.5	163.5	167	166.1	162.9	3.8	2.3
12	0								
13	5	161	167	156	176	166	165	7	4.5
14	5	171	161	159	152	157	160	7	4.4
15	5	128	128	125	136	130	129	4	3.2
16	5	166.0	160.6	167.5	157.4	167.3	163.8	4.5	2.8
17	5	181	201	190	182	187	188	8	4.3
18	0								
19	5	163	168	167	156	163	163	5	2.9
20	5	131	135	136	134	134	134	2	1.4
21	0								
22	5	141.9	139.5	139	136.3	138.9	139.1	2.0	1.4
23	5	120	135	127	166	113	132	21	15.6
24	0								
25	5	159	158	164	162	158	160	3	1.7
26	5	170	163	163	164	160	164	4	2.2
27	5	219	217	195	209	204	209	10	4.7
28	5	150	160	160	160	150	156	5	3.5
29	5	151	148	150	150	148	149	1	0.9
30	0								
31	5	181	173	168	179	179	176	5	3.1
32	5	167.34	151.65	163.43	166.94	158.85	161.64	6.55	4.0
33	5	154	145	149	146	142	147	5	3.1
34	5	143	145	108	133	143	134	15	11.5
35	5	172	176	165	171	161	169	6	3.5
36	5	165.9	168.3	168.5	169.5	170.8	168.6	1.8	1.1
37	0								
38	5	167	165	167	164	162	165	2	1.3
39	5	148	168	152	148	154	154	8	5.4
40	5	179.01	179.17	173.40	191.13	187.31	182.00	7.11	3.9
41	5	164	165	166	167	168	166	2	1.0
42	5	170	179	182	185	177	179	6	3.2
43	0								
44	0								
45	0								
46	0								

ZINC
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	141.5	132	121	111.2	120.6	125.3	11.7	9.3
2	0								
3	5	110	109	109	107	109	109	1	1.0
4	5	126	122	123	126	121	124	2	1.9
5	5	100.33	106.93	103.63	101.98	104.45	103.46	2.50	2.4
6	5	138	135	138	134	137	136	2	1.3
7	0								
8	0								
9	5	162	161	161	163	154	160	4	2.3
10	5	107.7	112.9	111.7	112.8	112.7	111.6	2.2	2.0
11	5	132.3	130.1	128.9	132.1	129.6	130.6	1.5	1.2
12	5	131	131	133	134	133	132	1	1.0
13	5	135	139	138	138	136	137	2	1.1
14	5	136	124	135	136	139	134	6	4.3
15	5	118	119	120	122	122	120	2	1.5
16	5	128.0	126.3	128.8	128.3	126.6	127.6	1.1	0.9
17	5	129	123	127	123	122	125	3	2.4
18	0								
19	5	127.4	121.5	129.6	120.1	128.3	125.4	4.3	3.4
20	5	123	121	117	118	121	120	2	2.0
21	5	129	124	129	125	130	127	3	2.1
22	0								
23	5	118	123	123	122	125	122	3	2.1
24	5	123	126	124	125	123	124	1	1.0
25	5	133	133	136	137	136	135	2	1.4
26	5	129	134	132	133	131	132	2	1.5
27	5	100	104	101	103	101	102	2	1.6
28	5	130	130	130	130	130	130	0	0.0
29	0								
30	0								
31	5	125	125	132	132	136	130	5	3.7
32	5	124.71	127.93	131.82	123.14	130.99	127.72	3.79	3.0
33	0								
34	5	122	124	125	128	131	126	4	2.8
35	5	125	123	125	135	135	129	6	4.6
36	5	131.0	132.2	132.5	133.8	134.6	132.8	1.4	1.1
37	0								
38	5	122	130	125	127	129	127	3	2.5
39	5	145	148	145	145	142	145	2	1.5
40	5	122.6	127.5	132.8	135.7	139.0	131.5	6.5	5.0
41	5	132	133	133	132	132	132	1	0.4
42	5	138	139	136	140	139	138	2	1.1
43	5	115	123	130	130	118	123	7	5.5
44	0								
45	5	130	133	131	127	127	130	3	2.0
46	5	134	133	134	133	132	133	1	0.6

ZINC
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	111.4	106.4	114.8	118.1	120.1	114.2	5.5	4.8
2	0								
3	5	117	118	116	117	119	117	1	1.0
4	5	115	126	125	123	126	123	5	3.8
5	5	138.4	138.58	131.55	133.14	133.79	135.09	3.21	2.4
6	5	143	143	145	150	141	144	3	2.4
7	0								
8	0								
9	5	144	141	142	144	135	141	4	2.6
10	5	116.5	115.6	117.6	116.2	118.6	116.9	1.2	1.0
11	5	136	132.6	131.7	135.7	134.2	134.0	1.9	1.4
12	5	144	141	144	146	144	144	2	1.2
13	5	144	146	144	144	146	145	1	0.6
14	5	132	132	136	130	140	134	4	3.0
15	5	133	133	136	137	136	135	2	1.4
16	5	134.1	131.4	133.6	133.5	131.1	132.7	1.3	1.0
17	5	147	142	142	140	151	144	5	3.1
18	0								
19	5	142.8	141.6	142.4	143.1	140.0	142.0	1.2	0.9
20	5	125	130	133	132	141	132	6	4.4
21	5	128	132	130	127	128	129	2	1.6
22	0								
23	5	112	114	112	113	109	112	2	1.7
24	5	133	134	136	135	137	135	2	1.2
25	5	145	147	145	141	147	145	2	1.7
26	5	137	134	140	136	136	137	2	1.6
27	5	131	125	127	129	127	128	2	1.8
28	5	130	130	130	130	130	130	0	0.0
29	0								
30	0								
31	5	140	127	139	130	139	135	6	4.5
32	5	138.89	140.14	136.3	139.42	145.79	140.11	3.49	2.5
33	0								
34	5	144	127	120	129	123	129	9	7.2
35	5	140	140	141	139	139	140	1	0.6
36	5	142.5	139.3	140.2	136.4	139.1	139.5	2.2	1.6
37	0								
38	5	128	134	134	129	132	131	3	2.1
39	5	149	154	156	149	153	152	3	2.0
40	5	133.9	131.5	136.9	141.7	145.8	138.0	5.8	4.2
41	5	149	156	144	143	140	146	6	4.3
42	5	135	150	152	144	142	145	7	4.7
43	5	131	139	129	137	132	134	4	3.2
44	0								
45	0								
46	0								

ARSENIC
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	30.26	30.04	32.12	34.09	34.22	32.15	2.00	6.2
2	0								
3	5	30.4	28.5	29.3	29.1	29.5	29.4	0.7	2.4
4	5	35	35	35	36	33	35	1	3.1
5	0								
6	5	34.3	31.6	31	35.1	33.3	33.06	1.74	5.3
7	0								
8	0								
9	5	30.3	30.2	30.2	31.2	30.3	30.4	0.5	1.5
10	0								
11	5	36.84	36.57	35.72	35.39	35.31	35.97	0.70	1.9
12	0								
13	5	27.1	29.0	22.3	21.5	26.9	25.4	3.3	13.0
14	5	32.6	34.0	31.2	32.9	33.2	32.8	1.0	3.1
15	5	33.9	36.0	36.8	36.2	36.1	35.8	1.1	3.1
16	5	32.72	32.16	32.16	32.19	31.98	32.24	0.28	0.9
17	5	34.9	34.4	34.1	34.7	34.1	34.4	0.4	1.0
18	5	41.2	42.83	40.41	40.6	41.52	41.31	0.96	2.3
19	5	35.0	35.5	35.0	35.3	35.4	35.2	0.2	0.7
20	5	30.0	35.0	31.6	26.7	26.0	29.9	3.7	12.3
21	0								
22	5	36.1	37.3	33.9	32.5	41.2	36.2	3.4	9.3
23	5	27.4	26.2	28.2	28.1	28.0	27.6	0.8	3.0
24	0								
25	5	31.6	32.9	33.2	34.6	33.4	33.1	1.1	3.2
26	5	27.5	26.0	24.8	30.6	31.5	28.1	2.9	10.3
27	0								
28	5	36	36	37	36	37	36	1	1.5
29	5	32.7	32.9	32.2	33.3	32.8	32.8	0.4	1.2
30	0								
31	5	32.6	34.2	34.0	32.1	34.1	33.4	1.0	2.9
32	0								
33	5	29.9	29.8	29.5	29.5	28.6	29.5	0.5	1.7
34	5	33.3	30.7	30.7	30.3	29.2	30.8	1.5	4.9
35	5	32.6	31.9	31.2	32.3	33.8	32.4	1.0	3.0
36	5	27.68	28.30	29.60	29.10	30.51	29.04	1.10	3.8
37	0								
38	5	35.6	35.6	36.4	38.6	35.6	36.4	1.3	3.6
39	5	29	32.3	29.8	30	30.6	30.3	1.2	4.1
40	5	34.75	31.13	32.65	29.75	32.68	32.19	1.88	5.8
41	5	31.7	32.2	31.6	31.6	32.2	31.9	0.3	1.0
42	5	33.62	32.46	32.81	33.28	33.16	33.07	0.45	1.3
43	0								
44	5	34.93	35.85	33.62	35.50	34.07	34.79	0.94	2.7
45	5	33.0	33.9	33.7	32.5	32.3	33.1	0.7	2.1
46	0								

ARSENIC
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	20.83	19.1	22.04	21.86	21.38	21.04	1.18	5.6
2	0								
3	5	20.7	21.4	18.9	22.4	18.9	20.5	1.5	7.6
4	5	21	21	21	19	20	20	1	4.4
5	0								
6	5	18.7	19.0	19.1	20.4	18.1	19.06	0.84	4.4
7	0								
8	0								
9	5	19.3	18.4	19.8	17.3	17.9	18.5	1.0	5.5
10	0								
11	5	20.39	20.63	20.69	20.95	21.22	20.78	0.32	1.5
12	0								
13	5	19.8	20.8	19.5	19.4	17.1	19.3	1.4	7.0
14	5	18.6	18.2	21.3	19.9	18.0	19.2	1.4	7.2
15	5	18.7	20.3	19.2	17.9	18.2	18.9	0.9	5.0
16	5	21.22	21.26	20.56	20.97	20.49	20.90	0.36	1.7
17	5	21.0	20.3	21.3	21.0	20.3	20.8	0.5	2.2
18	5	18.8	21.6	21	19.2	20.2	20.2	1.2	5.8
19	5	20.2	20.9	20.8	21.2	20.6	20.7	0.4	1.8
20	5	14.4	15.4	16.6	17.3	17.2	16.2	1.2	7.7
21	0								
22	5	20.8	21	21.4	19.1	24.2	21.3	1.8	8.7
23	5	19.0	20.5	18.2	18.8	18.8	19.1	0.9	4.5
24	0								
25	5	20.6	20.5	21.1	20.3	21.9	20.9	0.6	3.1
26	5	21.1	20.7	21.3	22.3	22.0	21.5	0.7	3.1
27	0								
28	5	21	21	22	21	22	21	1	2.6
29	5	20.5	21.4	20.8	20.8	20.4	20.8	0.4	1.9
30	0								
31	5	20.8	19.7	20.7	19.5	20.3	20.2	0.6	2.9
32	0								
33	5	20.3	19.4	20.3	19.8	18.9	19.7	0.6	3.1
34	5	20.1	19.4	15.4	18.5	19.8	18.6	1.9	10.2
35	5	23.1	22.5	22.8	22.7	21.9	22.6	0.4	2.0
36	5	20.56	20.97	20.81	20.05	20.89	20.66	0.37	1.8
37	0								
38	5	21.2	20.3	20.2	20.4	21.1	20.6	0.5	2.3
39	5	15	15.4	15.5	15.4	15.3	15.3	0.2	1.3
40	5	20.64	19.77	19.98	20.47	21.86	20.54	0.82	4.0
41	5	19.9	19.6	20.0	20.2	19.2	19.8	0.4	2.0
42	5	18.80	20.43	20.61	20.36	20.53	20.15	0.76	3.8
43	0								
44	5	21.45	20.84	22.13	21.75	21.00	21.43	0.53	2.5
45	0								
46	0								

ARSENIC
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	10.43	9.56	9.23	7.75	8.73	9.14	0.99	10.9
2	0								
3	5	6.06	5.78	6.31	5.90	6.12	6.0	0.2	3.4
4	5	6.9	7.0	7.1	6.8	6.9	6.9	0.1	1.6
5	0								
6	5	9.39	9.24	9.30	9.10	9.47	9.30	0.14	1.5
7	0								
8	0								
9	5	8.02	8.02	7.97	7.99	8.04	8.01	0.03	0.3
10	5	7.018	7.032	6.96	7.212	6.944	7.033	0.107	1.5
11	5	8.45	8.49	8.56	8.56	8.36	8.48	0.08	1.0
12	5	8.26	8.46	8.43	8.3	8.31	8.35	0.09	1.0
13	5	8.1	8.2	8.0	8.1	8.1	8.1	0.1	1.0
14	5	9.64	9.67	9.99	9.58	10.8	9.94	0.51	5.1
15	5	9.4	9.4	9.4	8.8	9.2	9.2	0.3	2.8
16	5	8.53	8.81	8.58	8.83	8.71	8.69	0.13	1.5
17	5	9.06	8.38	8.53	8.94	8.66	8.71	0.28	3.2
18	5	8.34	8.5	8.79	8.68	8.41	8.54	0.19	2.2
19	0								
20	5	6.24	7.74	6.30	6.08	7.08	6.69	0.70	10.5
21	5	9.94	9.66	9.63	9.71	9.68	9.72	0.12	1.3
22	0								
23	5	4.60	4.43	4.72	4.82	4.54	4.62	0.15	3.3
24	0								
25	5	9.0	8.9	9.4	9.2	8.6	9.0	0.3	3.4
26	5	8.10	8.12	8.25	8.06	8.05	8.12	0.08	1.0
27	5	7.7	7.9	7.9	8.2	7.9	7.9	0.2	2.6
28	5	8	9	9	9	7	8	1	10.6
29	0								
30	0								
31	5	8.22	8.2	8.35	8.11	8.37	8.25	0.11	1.3
32	0								
33	0								
34	5	10.1	10.9	10.6	11.2	10.9	10.7	0.4	3.9
35	5	6.24	6.01	6.72	7.41	6.35	6.55	0.55	8.4
36	5	8.787	8.650	8.998	8.802	8.938	8.835	0.137	1.5
37	5	9.5	10.0	9.9	9.5	9.8	9.7	0.2	2.4
38	5	7.97	8.10	8.22	8.33	8.53	8.23	0.21	2.6
39	5	8.00	8.31	8.21	8.36	8.47	8.27	0.18	2.1
40	5	7.31	7.46	7.44	6.59	6.70	7.10	0.42	5.9
41	5	8.21	8.51	8.43	7.92	8.26	8.27	0.23	2.8
42	5	6.60	5.43	6.81	7.90	6.66	6.68	0.88	13.1
43	5	7.60	8.12	8.67	8.39	7.52	8.06	0.50	6.2
44	0								
45	5	8.93	8.82	8.94	8.43	7.64	8.55	0.55	6.4
46	0								

ARSENIC
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	11.95	11.11	12.39	12.55	13.08	12.22	0.74	6.0
2	0								
3	5	11.0	10.2	10.5	10.3	11.0	10.6	0.4	3.6
4	5	11.3	11.8	13.0	13.0	13.4	12.5	0.9	7.2
5	0								
6	5	14.6	14.2	14.8	14.2	14.6	14.5	0.3	1.9
7	0								
8	0								
9	5	12.9	13.1	12.8	12.9	12.7	12.9	0.2	1.2
10	5	11.00	11.82	10.86	11.31	11.44	11.29	0.38	3.4
11	5	13	13	14	14	14	14	1	4.0
12	5	13.5	13.6	13.6	13.5	13.5	13.5	0.1	0.4
13	5	12.8	13.3	12.6	12.2	13.1	12.8	0.4	3.4
14	5	15.3	15.0	15.3	14.6	16.0	15.2	0.5	3.4
15	5	13.6	13.1	13.4	12.8	13.2	13.2	0.3	2.3
16	5	14.31	14.44	14.51	14.48	14.41	14.43	0.08	0.5
17	5	14.0	13.6	13.8	14.1	13.9	13.9	0.2	1.4
18	5	13.64	13.83	14.81	14.08	13.59	13.99	0.50	3.6
19	0								
20	5	10.4	10.4	11.6	12.4	13.4	11.6	1.3	11.2
21	5	14.3	14.2	14.5	14.3	14.4	14.3	0.1	0.8
22	0								
23	5	12.8	12.1	11.1	11.4	13.0	12.1	0.8	6.9
24	0								
25	5	12.3	11.9	12.1	11.7	12.8	12.2	0.4	3.5
26	5	13.4	13.1	13.5	13.7	13.4	13.4	0.2	1.6
27	5	11.8	12.5	12.7	11.9	12.5	12.3	0.4	3.3
28	5	14	14	15	15	14	14	1	3.8
29	0								
30	0								
31	5	13.5	13.0	13.8	13.8	13.4	13.5	0.3	2.5
32	0								
33	0								
34	5	12.9	13.6	15.3	16.9	15.8	14.9	1.6	11.0
35	5	12.4	11.7	12.4	12.0	12.3	12.2	0.3	2.5
36	5	13.10	13.56	13.42	13.74	13.05	13.37	0.30	2.2
37	5	14.8	15.0	15.0	15.1	14.7	14.9	0.2	1.1
38	5	12.9	12.7	13.6	13.1	12.0	12.9	0.6	4.6
39	5	11.9	12.4	12.7	13.2	13.5	12.7	0.6	5.0
40	5	12.07	12.05	11.79	11.91	11.86	11.94	0.12	1.0
41	5	12.6	13.2	13.3	13.5	13.9	13.3	0.5	3.6
42	5	14.53	13.04	11.72	12.77	13.16	13.04	1.01	7.7
43	5	13.5	14.3	12.9	13.9	13.1	13.5	0.6	4.2
44	0								
45	0								
46	0								

SELENIUM
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	1.978	2.027	1.977	1.997	2.049	2.006	0.032	1.6
2	0								
3	0								
4	0								
5	0								
6	5	1.8	1.8	1.8	1.9	1.7	1.8	0.1	3.9
7	0								
8	0								
9	5	1.20	1.08	1.02	1.04	1.15	1.10	0.08	6.9
10	0								
11	5	1.78	1.81	1.78	1.66	1.69	1.74	0.07	3.7
12	0								
13	0								
14	5	1.83	1.94	1.78	2.02	1.97	1.91	0.10	5.2
15	5	1.12	0.97	1.00	1.03	1.07	1.04	0.06	5.7
16	5	1.64	1.65	1.68	1.65	1.67	1.66	0.02	1.0
17	5	1.69	1.63	1.75	1.73	1.7	1.70	0.05	2.7
18	5	0.97	1.01	0.927	0.992	1.012	0.98	0.04	3.6
19	5	1.46	1.45	1.43	1.43	1.39	1.43	0.03	1.9
20	5	0.583	0.499	0.466	0.496	0.505	0.510	0.044	8.6
21	0								
22	5	1.53	1.59	1.76	1.67	1.25	1.56	0.19	12.4
23	0								
24	0								
25	5	1.53	1.94	1.71	2.26	2.03	1.89	0.28	15.0
26	5	2.06	1.88	1.68	2.03	1.98	1.93	0.15	8.0
27	0								
28	5	2.2	2.2	2.1	2.2	2	2.1	0.1	4.2
29	5	1.33	1.35	1.45	1.42	1.39	1.39	0.05	3.5
30	0								
31	5	1.65	1.62	1.66	1.60	1.68	1.64	0.03	1.9
32	0								
33	5	1.75	1.81	1.75	1.80	1.73	1.77	0.03	2.0
34	5	1.43	1.51	1.60	1.70	1.62	1.57	0.10	6.6
35	5	1.77	1.92	1.72	1.99	1.86	1.85	0.11	5.9
36	5	1.803	1.873	1.764	1.803	1.637	1.776	0.087	4.9
37	0								
38	5	1.43	1.59	1.59	1.40	1.47	1.50	0.09	6.0
39	5	1.62	1.89	1.91	1.83	1.80	1.81	0.12	6.4
40	5	1.699	1.700	1.677	1.788	1.516	1.676	0.099	5.9
41	5	1.71	1.66	1.70	1.66	1.63	1.67	0.03	2.0
42	5	1.50	1.92	2.15	2.18	1.94	1.94	0.27	14.0
43	0								
44	0								
45	0								
46	0								

SELENIUM
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	0.931	0.904	0.925	0.952	0.926	0.928	0.017	1.8
2	0								
3	0								
4	0								
5	0								
6	5	0.7	0.7	0.8	0.8	0.7	0.7	0.1	7.4
7	0								
8	0								
9	5	0.56	0.6	0.78	0.64	0.58	0.63	0.09	13.9
10	0								
11	5	0.706	0.715	0.736	0.754	0.815	0.745	0.043	5.8
12	0								
13	0								
14	5	0.69	0.69	0.74	0.73	0.72	0.71	0.02	3.1
15	5	0.59	0.56	0.62	0.68	0.44	0.58	0.09	15.4
16	5	0.79	0.77	0.75	0.76	0.75	0.76	0.02	2.3
17	5	0.65	0.62	0.74	0.74	0.80	0.71	0.07	10.3
18	5	0.82	0.804	0.826	0.80	0.78	0.81	0.02	2.2
19	5	0.74	0.70	0.75	0.72	0.74	0.73	0.02	2.7
20	5	1.14	1.38	1.25	1.13	1.15	1.21	0.11	8.8
21	0								
22	5	1.36	1.35	1.11	1.21	0.992	1.20	0.16	13.1
23	0								
24	0								
25	5	0.79	0.69	0.61	0.56	0.79	0.69	0.10	15.1
26	5	0.827	0.759	0.84	0.757	0.611	0.759	0.091	12.0
27	0								
28	5	0.7	0.7	0.7	0.7	0.7	0.7	0.0	0.0
29	5	0.90	0.88	0.94	0.86	0.90	0.90	0.03	3.3
30	0								
31	5	0.77	0.77	0.78	0.74	0.77	0.77	0.02	2.0
32	0								
33	5	0.87	0.90	0.87	0.89	0.96	0.90	0.04	4.1
34	5	0.61	0.6	0.49	0.57	0.54	0.56	0.05	8.7
35	5	0.905	0.877	0.940	0.918	0.978	0.924	0.038	4.1
36	5	0.6486	0.7788	0.7196	0.7139	0.7475	0.7217	0.0483	6.7
37	0								
38	5	0.64	0.71	0.73	0.65	0.70	0.69	0.04	5.7
39	5	0.677	0.690	0.664	0.641	0.570	0.648	0.047	7.3
40	5	0.921	0.949	1.056	0.907	0.936	0.954	0.059	6.2
41	5	0.694	0.675	0.664	0.698	0.663	0.679	0.016	2.4
42	5	0.76	0.70	0.75	0.73	0.73	0.73	0.02	3.1
43	0								
44	0								
45	0								
46	0								

SELENIUM
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	1.669	1.855	1.898	1.832	1.781	1.807	0.088	4.9
2	0								
3	5	1.69	1.38	1.79	1.87	1.84	1.71	0.20	11.6
4	0								
5	0								
6	5	1.8	1.8	1.9	1.9	1.8	1.8	0.1	3.0
7	0								
8	0								
9	5	2.02	2.07	2.20	2.01	2.06	2.07	0.08	3.7
10	5	1.580	1.628	1.394	1.511	1.77	1.577	0.139	8.8
11	5	1.87	1.95	1.91	1.96	1.88	1.91	0.04	2.1
12	0								
13	5	3.6	3.7	3.6	3.9	3.9	3.7	0.2	4.1
14	5	2.05	2.03	2.09	2.17	2.05	2.08	0.06	2.7
15	5	1.09	1.13	1.08	1.07	1.11	1.10	0.02	2.2
16	5	1.51	1.61	1.74	1.40	1.38	1.53	0.15	9.7
17	5	1.72	1.73	1.83	1.73	1.80	1.76	0.05	2.8
18	5	1.6	1.59	1.66	1.68	1.57	1.62	0.05	2.9
19	5	1.57	1.63	1.66	1.60	1.57	1.61	0.04	2.4
20	5	1.72	1.75	2.22	2.14	2.08	1.98	0.23	11.7
21	0								
22	0								
23	0								
24	0								
25	5	1.88	1.91	1.85	1.98	1.81	1.89	0.06	3.4
26	5	1.59	1.65	1.67	1.68	1.28	1.57	0.17	10.7
27	0								
28	5	1.2	1.4	1.4	1.4	1.2	1.3	0.1	8.3
29	0								
30	0								
31	5	1.57	1.66	1.64	1.49	1.74	1.62	0.09	5.8
32	0								
33	0								
34	0								
35	5	1.96	1.73	1.90	1.90	1.68	1.83	0.12	6.6
36	5	1.482	1.323	1.426	1.276	1.254	1.352	0.098	7.3
37	0								
38	5	1.89	1.89	1.97	1.89	1.93	1.91	0.04	1.9
39	5	1.74	1.69	1.81	2.09	1.97	1.86	0.17	8.9
40	5	1.506	1.54	1.57	1.57	1.70	1.58	0.07	4.7
41	5	1.76	1.73	1.73	1.80	1.79	1.76	0.03	1.9
42	5	1.62	1.91	1.80	1.84	1.82	1.80	0.11	6.1
43	5	1.88	1.89	2.18	2.06	1.88	1.98	0.14	6.9
44	0								
45	5	1.36	1.70	1.71	1.83	1.58	1.64	0.18	10.9
46	0								

SELENIUM
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	1.603	1.705	1.834	1.903	1.803	1.770	0.117	6.6
2	0								
3	5	2.12	1.82	1.80	1.67	1.77	1.84	0.17	9.2
4	0								
5	0								
6	5	1.9	1.8	1.9	2.0	2.0	1.9	0.1	4.4
7	0								
8	0								
9	5	2.10	2.10	1.87	2.06	2.05	2.03	0.10	4.7
10	5	1.613	1.817	1.617	1.707	1.790	1.709	0.095	5.5
11	5	1.65	1.74	1.97	1.93	1.85	1.83	0.13	7.3
12	0								
13	5	2.4	2.4	3.1	2.3	2.4	2.5	0.3	12.9
14	5	2.03	2.02	2.05	1.95	2.05	2.02	0.04	2.0
15	5	1.56	1.23	1.39	1.46	1.38	1.40	0.12	8.6
16	5	1.40	1.41	1.83	1.66	1.61	1.58	0.18	11.5
17	5	1.75	1.73	1.91	1.72	1.74	1.77	0.08	4.5
18	5	1.88	1.83	1.85	1.76	1.8	1.82	0.05	2.5
19	5	1.70	1.76	1.71	1.67	1.64	1.70	0.05	2.7
20	5	1.91	1.87	4.27	2.27	2.16	2.50	1.01	40.3
21	0								
22	0								
23	0								
24	0								
25	5	1.87	1.76	1.87	1.79	1.80	1.82	0.05	2.7
26	5	1.91	1.52	1.74	1.73	1.65	1.71	0.14	8.3
27	0								
28	5	0.7	0.9	0.9	0.7	0.9	0.8	0.1	13.4
29	0								
30	0								
31	5	1.79	1.85	1.74	1.78	1.88	1.81	0.06	3.1
32	0								
33	0								
34	0								
35	5	1.84	1.86	1.88	1.76	1.79	1.83	0.05	2.7
36	5	1.822	1.718	1.703	1.794	1.946	1.797	0.098	5.4
37	0								
38	5	1.76	1.80	1.94	1.84	1.86	1.84	0.07	3.7
39	5	1.77	1.90	2.07	2.07	2.30	2.02	0.20	9.9
40	5	1.72	1.94	1.81	1.89	1.73	1.82	0.10	5.3
41	5	1.74	1.62	1.71	1.67	1.66	1.68	0.05	2.8
42	5	1.65	1.65	1.74	1.75	1.77	1.71	0.06	3.5
43	5	1.86	2.34	1.97	2.16	2.11	2.09	0.18	8.8
44	0								
45	0								
46	0								

SILVER
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	2.206	2.412	2.110	2.328	2.049	2.221	0.150	6.8
2	0								
3	5	1.88	2.2	2.11	2.16	2.19	2.11	0.13	6.3
4	0								
5	0								
6	5	2	2.1	2.1	2.1	2	2.06	0.05	2.7
7	0								
8	0								
9	5	1.80	1.70	1.80	1.77	1.85	1.78	0.05	3.0
10	0								
11	5	2	1.92	2.05	1.99	1.95	1.98	0.05	2.5
12	0								
13	5	2.45	2.54	2.69	2.78	2.76	2.64	0.14	5.4
14	5	1.98	2.15	2.10	2.12	2.17	2.10	0.08	3.7
15	5	2.04	2.08	2.08	2.21	2.08	2.10	0.06	3.1
16	0								
17	5	1.45	1.37	1.43	1.50	1.51	1.45	0.06	3.9
18	0								
19	0								
20	5	1.52	1.54	1.62	1.64	1.72	1.61	0.08	5.0
21	0								
22	5	2.07	2.70	3.02	2.77	2.79	2.67	0.36	13.3
23	5	1.40	1.37	1.38	1.22	1.31	1.34	0.07	5.5
24	0								
25	5	1.53	1.59	1.58	1.71	1.61	1.60	0.07	4.1
26	5	2.34	2.31	2.25	2.18	2.20	2.26	0.07	3.0
27	0								
28	5	2.8	2.6	2.2	2.3	3.1	2.6	0.4	14.1
29	5	1.2	1.2	1.2	1.2	1.2	1.2	0.0	0.0
30	0								
31	5	1.84	1.86	1.81	1.79	1.75	1.81	0.04	2.4
32	0								
33	5	1.22	1.43	1.52	1.30	1.29	1.35	0.12	8.9
34	0								
35	5	2.16	2.20	2.07	2.13	2.09	2.13	0.05	2.5
36	0								
37	0								
38	5	2.46	2.34	2.24	2.33	2.21	2.32	0.10	4.2
39	5	1.61	1.85	1.78	1.84	1.66	1.75	0.11	6.2
40	0								
41	5	2.15	2.11	2.14	2.22	2.13	2.15	0.04	1.9
42	5	0.74	0.71	0.73	0.75	0.82	0.75	0.04	5.6
43	0								
44	0								
45	5	2.11	2.23	2.11	2.25	2.19	2.18	0.07	3.0
46	0								

SILVER
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	0.716	0.689	0.648	0.709	0.656	0.684	0.031	4.5
2	0								
3	5	0.101	0.0995	0.103	0.107	0.091	0.100	0.006	5.9
4	0								
5	0								
6	5	0.2	0.2	0.2	0.2	0.2	0.2	0.0	0.0
7	0								
8	0								
9	5	0.193	0.13	0.205	0.168	0.173	0.174	0.029	16.5
10	0								
11	5	0.184	0.183	0.172	0.186	0.181	0.181	0.005	3.0
12	0								
13	5	0.21	0.21	0.22	0.19	0.20	0.21	0.01	5.6
14	5	0.18	0.18	0.18	0.17	0.19	0.18	0.01	3.4
15	5	0.14	0.14	0.16	0.22	0.20	0.17	0.04	21.1
16	0								
17	5	0.15	0.17	0.16	0.21	0.16	0.17	0.02	13.8
18	0								
19	0								
20	5	0.102	0.107	0.103	0.108	0.107	0.105	0.003	2.6
21	0								
22	5	0.190	0.182	0.188	0.180	0.186	0.185	0.004	2.2
23	5	0.12	0.11	0.13	0.13	0.12	0.12	0.01	6.9
24	0								
25	5	0.13	0.15	0.21	0.16	0.15	0.16	0.03	18.7
26	5	0.160	0.161	0.173	0.161	0.161	0.163	0.005	3.4
27	0								
28	5	<0.5	<0.5	<0.5	<0.5	<0.5			
29	5	0.13	0.13	0.21	0.13	0.13	0.15	0.04	24.5
30	0								
31	5	0.17	0.17	0.16	0.18	0.17	0.17	0.01	4.2
32	0								
33	5	0.22	0.14	0.13	0.13	0.13	0.15	0.04	26.2
34	0								
35	5	0.167	0.168	0.171	0.167	0.167	0.168	0.002	1.0
36	0								
37	0								
38	5	0.17	0.18	0.20	0.18	0.18	0.18	0.01	6.0
39	5	0.149	0.154	0.144	0.152	0.148	0.149	0.004	2.6
40	0								
41	5	0.180	0.175	0.170	0.169	0.167	0.172	0.005	3.1
42	5	0.15	0.16	0.15	0.16	0.17	0.16	0.01	5.3
43	0								
44	0								
45	0								
46	0								

SILVER
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	5.423	5.202	4.855	4.537	4.985	5.000	0.337	6.7
2	0								
3	5	1.69	1.38	1.79	1.87	1.84	1.71	0.20	11.6
4	0								
5	0								
6	5	4.1	4.4	3.7	4.5	3.8	4.1	0.4	8.6
7	0								
8	0								
9	0								
10	5	2.282	2.675	2.392	2.666	2.342	2.471	0.186	7.5
11	5	4.09	4.11	4.14	4.05	3.91	4.06	0.09	2.2
12	5	3.51	3.56	3.57	3.61	3.55	3.56	0.04	1.0
13	5	1.35	1.25	1.50	1.15	1.28	1.31	0.13	9.9
14	5	3.83	3.85	4.16	4.03	3.97	3.96	0.14	3.4
15	5	4.13	4.11	4.20	4.14	4.17	4.15	0.04	0.9
16	0								
17	5	3.29	3.64	3.47	3.30	3.51	3.44	0.15	4.3
18	0								
19	0								
20	5	3.21	2.95	3.15	3.12	3.16	3.12	0.10	3.2
21	5	3.37	4.05	3.03	3.17	3.08	3.34	0.42	12.5
22	0								
23	5	2.81	2.83	2.99	2.81	2.95	2.88	0.09	3.0
24	0								
25	5	4.9	4.6	4.6	4.8	4.8	4.7	0.1	2.8
26	0								
27	5	2.8	2.3	2.8	2.4	2.5	2.6	0.2	9.0
28	5	5.4	5.3	5.2	5.7	5.9	5.5	0.3	5.3
29	0								
30	0								
31	5	4.36	4.23	4.35	4.22	4.09	4.25	0.11	2.6
32	0								
33	0								
34	5	3.79	3.86	3.92	3.94	4.06	3.91	0.10	2.6
35	5	3.35	3.69	3.74	3.86	3.78	3.68	0.20	5.3
36	5	2.398	2.308	2.265	2.278	2.110	2.272	0.104	4.6
37	0								
38	5	4.47	4.52	4.75	4.63	4.59	4.59	0.11	2.3
39	5	3.78	3.82	4.03	4.11	3.78	3.90	0.16	4.0
40	0								
41	5	4.05	3.88	4.15	3.78	4.14	4.00	0.16	4.1
42	5	0.850	0.805	0.847	0.916	1.128	0.909	0.129	14.1
43	5	2.36	2.01	1.56	2.39	1.92	2.05	0.34	16.7
44	0								
45	5	4.81	4.58	4.46	4.61	4.66	4.62	0.13	2.8
46	5	4.65	4.63	4.58	4.61	4.58	4.61	0.03	0.7

SILVER
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	0.0164	0.0102	0.0105	0.0099	0.0080	0.0110	0.0032	28.8
2	0								
3	5	<0.02	<0.02	<0.02	<0.02	<0.02			
4	0								
5	0								
6	5	<0.3	<0.3	<0.3	<0.3	<0.3			
7	0								
8	0								
9	0								
10	5	0.011	0.012	0.011	0.013	0.012	0.012	0.001	7.1
11	5	0.0082	0.0087	0.0088	0.0093	0.0086	0.0087	0.0004	4.5
12	5	0.00541	0.00577	0.00505	0.00545	0.00525	0.00539	0.00027	4.9
13	5	0.016	0.015	0.015	0.015	0.016	0.015	0.001	5.0
14	5	0.014	0.013	0.010	0.014	0.012	0.012	0.002	13.0
15	5	0.0074	0.012	0.0074	0.0074	0.0085	0.0085	0.0020	23.3
16	0								
17	5	0.013	0.012	0.006	0.011	0.012	0.011	0.003	25.7
18	0								
19	0								
20	5	0	0	0	0	0	0	0	
21	5	0.008	0.008	0.007	0.007	0.007	0.007	0.001	7.4
22	0								
23	0								
24	0								
25	5	0.006	0.006	0.007	0.007	0.007	0.007	0.001	8.3
26	5	0.012	0.0112	0.0133	0.0155	0.0156	0.0135	0.0020	14.8
27	5	<0.035	<0.035	<0.035	<0.035	<0.035			
28	5	<0.5	<0.5	<0.5	<0.5	<0.5			
29	0								
30	0								
31	5	0.010	0.012	0.010	0.010	0.011	0.011	0.001	9.0
32	0								
33	0								
34	5	<0.025	<0.025	<0.025	<0.025	<0.025			
35	5	<0.05	<0.05	<0.05	<0.05	<0.05			
36	5	0.01148	0.00915	0.00990	0.00918	0.01056	0.01006	0.00099	9.8
37	0								
38	5	<0.01	<0.01	<0.01	<0.01	<0.01			
39	5	< 0.021	<0.021	< 0.021	< 0.021	< 0.021			
40	0								
41	5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
42	5	0.007	0.010	0.004	0.005	0.005	0.006	0.002	38.5
43	5	<0.2	<0.2	<0.2	<0.2	<0.2			
44	0								
45	0								
46	0								

CADMIUM
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	0.908	0.912	0.922	0.961	0.985	0.938	0.034	3.6
2	0								
3	5	0.83	0.79	0.785	0.867	0.814	0.817	0.033	4.1
4	5	0.83	0.84	0.84	0.86	0.88	0.85	0.02	2.4
5	5	2.02	2.33	2.17	2.10	2.06	2.14	0.12	5.7
6	5	0.7	0.7	0.6	0.7	0.7	0.7	0.0	6.6
7	5	0.66	0.65	0.65	0.66	0.64	0.65	0.01	1.3
8	0								
9	5	0.839	0.849	0.843	0.847	0.843	0.844	0.004	0.5
10	0								
11	5	0.934	0.941	0.885	0.909	0.892	0.912	0.025	2.7
12	0								
13	5	1.07	1.20	1.10	1.14	1.09	1.12	0.05	4.5
14	5	0.94	0.92	0.96	1.09	0.97	0.98	0.07	7.0
15	5	0.84	0.78	0.84	0.85	0.80	0.82	0.03	3.7
16	5	0.975	0.852	0.905	0.919	0.917	0.914	0.044	4.8
17	5	0.91	0.91	0.91	0.93	0.93	0.92	0.01	1.2
18	5	0.85	0.853	0.851	0.848	0.849	0.850	0.002	0.2
19	5	0.89	0.91	0.84	0.84	0.84	0.86	0.03	3.9
20	5	0.690	0.802	0.796	0.730	0.716	0.747	0.050	6.7
21	0								
22	5	1.012	1.150	1.154	0.502	0.678	0.899	0.295	32.8
23	0								
24	0								
25	5	0.97	0.95	0.91	0.94	0.92	0.94	0.02	2.5
26	5	0.857	0.784	0.764	0.774	0.790	0.794	0.037	4.7
27	0								
28	5	1.0	1.1	1.1	1.1	1.1	1.1	0.0	4.1
29	5	1.1	1.0	1.0	0.9	1.2	1.0	0.1	11.0
30	0								
31	5	0.82	0.77	0.79	0.79	0.78	0.79	0.02	2.4
32	0								
33	5	1.57	1.56	1.48	1.51	1.50	1.52	0.04	2.6
34	5	0.94	0.90	0.96	0.88	0.89	0.91	0.03	3.8
35	5	0.980	0.978	0.994	0.984	0.986	0.984	0.006	0.6
36	5	0.8640	0.9214	0.9582	0.9255	0.8705	0.9079	0.0398	4.4
37	0								
38	5	1.04	0.94	1.10	1.03	1.00	1.02	0.06	5.7
39	5	0.98	0.954	0.98	0.98	0.97	0.97	0.01	1.2
40	5	0.844	0.844	0.806	0.811	0.838	0.829	0.019	2.2
41	5	0.915	0.910	0.906	0.912	0.895	0.908	0.008	0.9
42	5	0.89	0.81	0.88	0.88	0.85	0.86	0.03	3.8
43	0								
44	0								
45	5	0.85	0.85	0.83	0.85	0.87	0.85	0.01	1.7
46	5	0.87	0.87	0.89	0.89	0.88	0.88	0.01	1.1

CADMIUM
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	0.444	0.452	0.453	0.482	0.465	0.459	0.015	3.2
2	0								
3	5	0.193	0.189	0.177	0.168	0.177	0.181	0.010	5.6
4	5	0.23	0.24	0.23	0.25	0.26	0.24	0.01	5.4
5	5	1.38	1.59	1.49	1.44	1.52	1.48	0.08	5.4
6	5	<0.3	<0.3	<0.3	<0.3	<0.3			
7	5	0.24	0.23	0.25	0.24	0.26	0.24	0.01	4.7
8	0								
9	5	0.242	0.248	0.239	0.244	0.235	0.242	0.005	2.0
10	0								
11	5	0.253	0.25	0.238	0.239	0.257	0.247	0.009	3.4
12	0								
13	5	0.22	0.22	0.22	0.25	0.22	0.23	0.01	6.5
14	5	0.24	0.27	0.26	0.20	0.23	0.24	0.03	10.5
15	5	0.24	0.24	0.23	0.23	0.27	0.24	0.02	6.8
16	5	0.257	0.250	0.249	0.250	0.251	0.251	0.003	1.3
17	5	0.25	0.24	0.23	0.24	0.25	0.24	0.01	3.5
18	5	0.210	0.218	0.237	0.206	0.230	0.220	0.013	6.0
19	5	0.24	0.24	0.23	0.24	0.23	0.24	0.01	2.3
20	5	0.181	0.201	0.182	0.193	0.192	0.190	0.008	4.4
21	0								
22	5	0.221	0.374	0.225	0.22	0.212	0.250	0.069	27.7
23	0								
24	0								
25	5	0.24	0.24	0.25	0.26	0.25	0.25	0.01	3.4
26	5	0.222	0.218	0.202	0.218	0.190	0.210	0.014	6.6
27	0								
28	5	0.2	0.3	0.2	0.2	0.2	0.2	0.0	20.3
29	5	0.22	0.22	0.23	0.22	0.23	0.22	0.01	2.4
30	0								
31	5	0.26	0.26	0.24	0.27	0.27	0.26	0.01	4.7
32	0								
33	5	0.25	0.23	0.23	0.24	0.23	0.24	0.01	3.8
34	5	0.30	0.19	0.14	0.25	0.22	0.22	0.06	27.5
35	5	0.252	0.254	0.266	0.267	0.262	0.260	0.007	2.6
36	5	0.2270	0.2214	0.2327	0.2316	0.2420	0.2309	0.0076	3.3
37	0								
38	5	0.23	0.25	0.26	0.24	0.24	0.24	0.01	4.7
39	5	0.506	0.481	0.482	0.443	0.474	0.477	0.023	4.7
40	5	0.228	0.248	0.246	0.238	0.230	0.238	0.009	3.8
41	5	0.228	0.226	0.232	0.230	0.235	0.230	0.003	1.5
42	5	0.24	0.287	0.25	0.26	0.29	0.27	0.02	8.4
43	0								
44	0								
45	0								
46	0								

CADMIUM
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	0.211	0.190	0.170	0.158	0.176	0.181	0.020	11.2
2	0								
3	5	0.155	0.148	0.155	0.152	0.150	0.152	0.003	2.0
4	5	0.18	0.16	0.16	0.17	0.17	0.17	0.01	5.0
5	5	0.64	0.65	0.44	0.55	0.63	0.58	0.09	15.2
6	5	0.20	0.22	0.19	0.19	0.20	0.20	0.01	6.1
7	0								
8	0								
9	5	0.354	0.374	0.366	0.357	0.361	0.362	0.008	2.2
10	5	0.145	0.158	0.167	0.164	0.167	0.160	0.009	5.8
11	5	0.159	0.157	0.158	0.154	0.157	0.157	0.002	1.2
12	5	0.195	0.197	0.194	0.195	0.195	0.195	0.001	0.6
13	5	0.20	0.21	0.20	0.21	0.20	0.20	0.00	2.4
14	5	0.22	0.20	0.17	0.22	0.23	0.21	0.02	11.4
15	5	0.214	0.226	0.210	0.215	0.207	0.21	0.01	3.4
16	5	0.190	0.200	0.200	0.200	0.200	0.198	0.005	2.4
17	5	0.18	0.18	0.18	0.18	0.18	0.18	0.00	0.0
18	5	0.16	0.162	0.157	0.163	0.163	0.161	0.003	1.6
19	5	0.168	0.156	0.163	0.163	0.173	0.165	0.006	3.9
20	5	0.155	0.132	0.125	0.132	0.129	0.135	0.012	8.7
21	5	0.17	0.16	0.16	0.16	0.17	0.16	0.01	3.3
22	0								
23	0								
24	5	<0.2	<0.2	<0.2	0.35	<0.2			
25	5	0.20	0.19	0.19	0.19	0.18	0.19	0.01	3.7
26	5	0.137	0.141	0.143	0.142	0.148	0.142	0.004	2.8
27	5	0.07	0.12	0.07	0.13	0.07	0.09	0.03	33.0
28	5	0.2	0.4	0.2	0.4	0.2	0.3	0.1	39.1
29	0								
30	5	0.34	0.35	0.32	0.37	0.34	0.34	0.02	5.3
31	5	0.18	0.17	0.17	0.18	0.16	0.17	0.01	4.9
32	0								
33	0								
34	5	0.19	0.17	0.18	0.19	0.21	0.19	0.01	7.9
35	5	0.15	0.13	0.166	0.12	0.164	0.15	0.02	14.0
36	5	0.1673	0.1809	0.1793	0.1737	0.1853	0.1773	0.0070	3.9
37	0								
38	5	0.20	0.19	0.20	0.19	0.20	0.20	0.01	2.8
39	5	0.140	0.143	0.131	0.128	0.127	0.134	0.007	5.4
40	5	0.186	0.206	0.208	0.191	0.186	0.195	0.011	5.5
41	5	0.188	0.179	0.179	0.185	0.186	0.183	0.004	2.3
42	5	0.24	0.21	0.23	0.25	0.28	0.24	0.03	10.7
43	5	0.161	0.153	0.182	0.171	0.159	0.165	0.011	6.9
44	0								
45	5	0.219	0.172	0.171	0.182	0.172	0.183	0.021	11.2
46	5	0.18	0.178	0.177	0.181	0.175	0.18	0.00	1.3

CADMIUM
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	0.724	0.669	0.733	0.739	0.769	0.727	0.036	5.0
2	0								
3	5	0.909	0.828	0.831	0.872	0.884	0.865	0.035	4.0
4	5	0.96	0.52	0.65	0.55	0.87	0.71	0.20	27.6
5	5	0.62	0.94	1.07	0.98	1.10	0.94	0.19	20.3
6	5	0.88	0.87	0.89	0.94	0.89	0.89	0.03	3.0
7	0								
8	0								
9	5	0.993	0.956	0.967	0.928	0.95	0.959	0.024	2.5
10	5	0.667	0.689	0.652	0.666	0.678	0.670	0.014	2.1
11	5	0.811	0.811	0.806	0.786	0.813	0.805	0.011	1.4
12	5	0.788	0.796	0.79	0.789	0.796	0.792	0.004	0.5
13	5	0.70	0.74	0.71	0.72	0.74	0.72	0.02	2.7
14	5	0.87	0.91	0.91	0.89	0.89	0.89	0.02	1.9
15	5	0.82	0.86	0.85	0.85	0.91	0.86	0.03	3.8
16	5	0.880	0.901	0.890	0.890	0.890	0.890	0.007	0.8
17	5	0.83	0.83	0.85	0.84	0.84	0.84	0.01	1.0
18	5	0.811	0.802	0.81	0.83	0.82	0.81	0.01	1.3
19	5	0.773	0.791	0.817	0.795	0.822	0.800	0.020	2.5
20	5	0.73	0.804	0.734	0.858	0.868	0.799	0.066	8.2
21	5	0.77	0.81	0.79	0.76	0.79	0.78	0.02	2.5
22	0								
23	0								
24	5	0.82	0.94	0.77	0.67	0.40	0.72	0.20	28.3
25	5	0.78	0.84	0.84	0.78	0.87	0.82	0.04	4.9
26	5	0.815	0.773	0.796	0.816	0.783	0.797	0.019	2.4
27	5	0.76	0.72	0.7	0.72	0.72	0.72	0.02	3.0
28	5	0.8	0.8	0.8	0.7	0.7	0.8	0.1	7.2
29	0								
30	0								
31	5	0.84	0.83	0.83	0.84	0.83	0.83	0.01	0.7
32	0								
33	0								
34	5	0.63	0.72	0.67	0.70	0.69	0.68	0.03	5.0
35	5	0.817	0.796	0.824	0.811	0.819	0.813	0.011	1.3
36	5	0.8091	0.8264	0.7790	0.8140	0.7955	0.8048	0.0182	2.3
37	0								
38	5	0.80	0.86	0.84	0.86	0.86	0.84	0.03	3.1
39	5	0.718	0.784	0.722	0.722	0.738	0.737	0.027	3.7
40	5	0.796	0.790	0.819	0.831	0.818	0.811	0.017	2.1
41	5	0.831	0.854	0.832	0.867	0.834	0.844	0.016	1.9
42	5	0.91	0.89	0.84	0.89	0.90	0.89	0.03	3.0
43	5	0.857	0.900	0.822	0.851	0.805	0.847	0.036	4.3
44	0								
45	0								
46	0								

TIN
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	21.35	23.34	20.74	22.30	26.41	22.83	2.23	9.8
2	0								
3	0								
4	0								
5	0								
6	5	<20	<20	22	21	<20			
7	0								
8	0								
9	5	19.3	21.2	21.8	20.5	18.9	20.3	1.2	6.1
10	0								
11	5	20.28	20.88	19.79	19.62	19.72	20.06	0.53	2.6
12	0								
13	5	19.9	24.3	20.3	21.0	18.8	20.9	2.1	10.0
14	0								
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	21.9	23.6	22.1	22.2	23.6	22.7	0.8	3.7
23	0								
24	0								
25	5	22.5	24.3	24.3	23.2	21.9	23.2	1.1	4.6
26	5	22.3	19.1	22.0	17.5	19.1	20.0	2.1	10.4
27	0								
28	0								
29	0								
30	0								
31	5	21.9	20.3	20.9	22.0	21.4	21.3	0.7	3.3
32	0								
33	5	30.0	30.3	26.4	27.8	28.0	28.5	1.6	5.7
34	0								
35	0								
36	5	21.62	21.39	26.48	24.74	23.55	23.56	2.14	9.1
37	0								
38	5	9.93	9.76	9.27	10.40	9.22	9.72	0.49	5.0
39	5	< 10.1	< 10.1	< 10.1	< 10.1	< 10.1			
40	0								
41	5	13.0	13.2	12.1	11.9	12.6	12.6	0.6	4.5
42	0								
43	0								
44	0								
45	0								
46	5	20.7	20.7	21.7	20.2	20.9	20.84	0.55	2.6

TIN
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	2.361	2.031	2.079	2.266	2.098	2.167	0.14	6.5
2	0								
3	0								
4	0								
5	0								
6	5	<10	<10	<10	<10	<10			
7	0								
8	0								
9	5	2.36	2.12	2.31	2.33	2.18	2.26	0.10	4.5
10	0								
11	5	2.109	2.159	2.295	2.172	2.234	2.194	0.072	3.3
12	0								
13	5	2.46	2.53	2.45	2.82	2.44	2.54	0.16	6.2
14	0								
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	2.66	2.74	3.11	2.88	3.39	2.96	0.30	10.0
23	0								
24	0								
25	5	2.58	2.60	2.56	2.79	2.40	2.59	0.14	5.4
26	5	2.17	2.19	2.17	2.21	2.19	2.19	0.02	0.9
27	0								
28	0								
29	0								
30	0								
31	5	2.26	2.49	2.34	2.30	2.16	2.31	0.12	5.2
32	0								
33	5	2.49	2.22	2.60	2.38	2.24	2.39	0.16	6.8
34	0								
35	0								
36	5	2.370	2.267	2.190	2.431	2.599	2.372	0.158	6.6
37	0								
38	5	2.24	2.67	2.60	2.34	2.07	2.38	0.25	10.5
39	5	< 10.2	< 10.2	< 10.2	< 10.2	< 10.2			
40	0								
41	5	2.19	2.22	2.32	2.30	2.21	2.25	0.06	2.6
42	0								
43	0								
44	0								
45	0								
46	0								

TIN
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	5	<10	<8	<10	<8	<9			
4	5	1.03	0.95	1.48	1.48	1.09	1.21	0.26	21.1
5	0								
6	5	1.73	1.86	1.66	1.65	1.69	1.72	0.09	5.0
7	0								
8	0								
9	0								
10	0								
11	5	0.546	0.553	0.549	0.539	0.565	0.550	0.010	1.8
12	0								
13	0								
14	0								
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	0								
23	0								
24	0								
25	5	1.38	1.53	0.87	1.41	0.94	1.23	0.30	24.4
26	5	1.60	1.60	1.60	1.60	1.61	1.60	0.00	0.3
27	0								
28	0								
29	0								
30	0								
31	5	0.72	0.70	0.67	0.68	0.77	0.71	0.04	5.6
32	0								
33	0								
34	0								
35	5	1.09	0.878	1.14	1.16	1.13	1.08	0.12	10.7
36	5	1.501	1.551	1.614	1.637	1.657	1.592	0.065	4.1
37	0								
38	0								
39	5	< 10.4	< 10.4	<10.4	< 10.4	< 10.4			
40	0								
41	5	1.52	1.50	1.58	1.50	1.51	1.52	0.03	2.2
42	0								
43	0								
44	0								
45	0								
46	5	1.68	1.66	1.65	1.65	1.63	1.65	0.02	1.1

TIN
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	5	<9	<8	<8	<9	<9			
4	0								
5	0								
6	5	0.11	0.1	0.11	0.14	0.11	0.11	0.02	13.3
7	0								
8	0								
9	0								
10	0								
11	5	0.094	0.0945	0.0962	0.0855	0.0887	0.0918	0.0045	4.9
12	0								
13	0								
14	0								
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	0								
23	0								
24	0								
25	5	0.093	0.096	0.101	0.100	0.107	0.099	0.005	5.4
26	5	0.0904	0.093	0.0991	0.0928	0.0875	0.0926	0.0043	4.6
27	0								
28	0								
29	0								
30	0								
31	5	0.10	0.097	0.085	0.11	0.11	0.10	0.01	10.4
32	0								
33	0								
34	0								
35	5	<0.5	<0.5	<0.5	<0.5	<0.5			
36	5	0.10933	0.09853	0.11905	0.09900	0.10009	0.10520	0.00891	8.5
37	0								
38	0								
39	5	< 10.3	< 10.3	< 10.3	< 10.3	< 10.3			
40	0								
41	5	< 0.29	< 0.29	< 0.29	< 0.29	< 0.29			
42	0								
43	0								
44	0								
45	0								
46	0								

ANTIMONY
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	0								
5	0								
6	5	1.37	1.25	1.45	1.31	1.30	1.34	0.08	5.7
7	0								
8	0								
9	5	1.17	1.15	1.10	1.14	1.14	1.14	0.03	2.4
10	0								
11	5	0.9614	1.01	1.13	0.907	0.917	0.985	0.091	9.2
12	0								
13	5	1.09	0.99	1.02	1.05	1.00	1.03	0.04	4.0
14	5	1.44	1.37	1.42	1.38	1.31	1.38	0.05	3.6
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	1.31	1.26	1.25	1.25	1.43	1.30	0.08	5.9
23	0								
24	0								
25	5	1.53	1.4	1.44	1.36	1.41	1.43	0.06	4.5
26	5	1.15	1.07	1.06	1.03	1.04	1.07	0.05	4.3
27	0								
28	5	1.4	1.3	1.4	1.3	1.3	1.3	0.1	4.1
29	0								
30	0								
31	5	1.44	1.34	1.44	1.39	1.44	1.41	0.04	3.2
32	0								
33	5	1.26	1.25	1.19	1.38	1.20	1.26	0.08	6.0
34	0								
35	5	1.38	1.31	0.778	1.13	0.839	1.09	0.27	24.9
36	5	1.275	1.306	1.468	1.392	1.400	1.368	0.077	5.7
37	0								
38	0								
39	5	0.682	0.785	0.742	0.732	0.803	0.749	0.048	6.3
40	5	1.224	1.270	1.238	1.215	1.212	1.232	0.024	1.9
41	5	0.739	0.748	0.930	0.797	0.873	0.817	0.082	10.1
42	0								
43	0								
44	0								
45	0								
46	5	1.24	1.25	1.35	1.24	1.29	1.27	0.05	3.7

ANTIMONY
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	0								
5	0								
6	5	1.24	1.16	1.07	1.20	1.14	1.16	0.06	5.5
7	0								
8	0								
9	5	1.04	0.99	1.02	1.02	1.01	1.02	0.02	1.9
10	0								
11	5	1.129	0.935	1.013	0.934	0.963	0.995	0.082	8.2
12	0								
13	5	0.96	0.96	0.94	1.07	0.92	0.97	0.06	5.9
14	5	1.17	1.25	1.28	1.16	1.16	1.20	0.06	4.7
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	1.13	0.981	1.01	1.12	1.06	1.06	0.07	6.2
23	0								
24	0								
25	5	1.26	1.22	1.19	1.23	1.15	1.21	0.04	3.5
26	5	1.02	1.01	1.04	1.04	1.01	1.02	0.02	1.5
27	0								
28	5	1.2	1.2	1.2	1.2	1.2	1.2	0.0	0.0
29	0								
30	0								
31	5	1.11	1.18	1.21	1.15	1.18	1.17	0.04	3.2
32	0								
33	5	1.23	1.16	1.22	1.18	1.20	1.20	0.03	2.4
34	0								
35	5	1.10	1.17	1.12	1.02	1.13	1.11	0.06	5.0
36	5	1.0637	0.9948	0.9604	1.0868	1.1683	1.0548	0.0814	7.7
37	0								
38	0								
39	5	0.371	0.402	0.377	0.371	0.382	0.381	0.013	3.4
40	5	1.076	1.102	1.088	1.100	1.112	1.096	0.014	1.3
41	5	0.884	0.893	0.939	0.888	0.947	0.910	0.030	3.3
42	0								
43	0								
44	0								
45	0								
46	0								

The determination of antimony was not required in the biologicals

MERCURY
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	0.8626	0.8196	0.8064	0.8113	0.8045	0.8209	0.0240	2.9
2	5	0.76	0.75	0.75	0.74	0.79	0.76	0.02	2.5
3	0								
4	5	1.05	0.97	0.84	0.82	0.96	0.93	0.10	10.4
5	0								
6	5	0.93	0.84	0.84	0.84	0.885	0.87	0.04	4.6
7	0								
8	0								
9	0								
10	0								
11	5	0.955	0.994	1.009	1.07	0.964	0.998	0.046	4.6
12	0								
13	5	0.85	0.87	0.77	0.75	0.82	0.81	0.05	6.4
14	5	0.730	0.788	0.776	0.814	0.872	0.796	0.052	6.6
15	5	0.808	0.863	0.696	0.763	0.674	0.761	0.078	10.3
16	5	0.857	0.869	0.863	0.899	0.855	0.869	0.018	2.1
17	5	0.945	0.943	0.95	0.846	0.916	0.920	0.043	4.7
18	5	0.749	0.753	0.781	0.764	0.76	0.761	0.012	1.6
19	5	0.786	0.830	0.784	0.844	0.781	0.805	0.030	3.7
20	5	0.541	0.667	0.584	0.536	0.522	0.570	0.059	10.3
21	0								
22	5	0.404	0.422	0.407	0.418	0.433	0.417	0.012	2.8
23	5	0.912	1.000	0.904	1.030	0.904	0.950	0.060	6.4
24	0								
25	5	0.824	0.906	0.906	0.843	0.844	0.865	0.039	4.5
26	5	0.794	0.838	0.841	0.84	0.938	0.850	0.053	6.2
27	0								
28	5	0.80	0.74	0.72	0.76	0.82	0.77	0.04	5.4
29	5	0.72	0.71	0.74	0.72	0.72	0.72	0.01	1.5
30	0								
31	5	0.78	0.83	0.84	0.81	0.79	0.81	0.03	3.1
32	0								
33	5	0.86	0.78	0.78	0.76	0.80	0.80	0.04	4.8
34	5	0.57	0.37	0.42	0.55	0.72	0.53	0.14	26.2
35	5	0.847	0.829	0.803	0.844	0.805	0.826	0.021	2.5
36	0								
37	0								
38	5	1.14	1.10	1.10	1.10	1.10	1.11	0.02	1.6
39	5	1.03	0.99	0.935	0.93	0.925	0.96	0.05	4.8
40	5	0.8412	0.8076	0.7941	0.8146	0.8036	0.8122	0.0178	2.2
41	5	0.728	0.821	0.748	0.727	0.817	0.768	0.047	6.1
42	5	0.606	0.608	0.604	0.603	0.601	0.604	0.003	0.4
43	0								
44	0								
45	0	0.805	0.880	0.839	0.938		0.865	0.057	6.6
46	0								

MERCURY
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	0.0864	0.0905	0.0869	0.0876	0.0694	0.0842	0.0084	10.0
2	5	0.104	0.087	0.081	0.078	0.087	0.087	0.010	11.5
3	0								
4	5	0.087	0.087	0.087	0.096	0.091	0.090	0.004	4.4
5	0								
6	5	0.083	0.083	0.091	0.091	0.091	0.088	0.004	5.0
7	0								
8	0								
9	0								
10	0								
11	5	0.089	0.0924	0.0894	0.1105	0.0835	0.0930	0.0103	11.1
12	0								
13	5	0.089	0.088	0.090	0.089	0.087	0.089	0.001	1.1
14	5	0.081	0.091	0.090	0.091	0.087	0.088	0.004	4.8
15	5	0.083	0.08	0.09	0.09	0.09	0.09	0.00	5.5
16	5	0.098	0.097	0.095	0.093	0.095	0.096	0.002	1.9
17	5	0.093	0.090	0.091	0.095	0.090	0.092	0.002	2.4
18	5	0.102	0.096	0.092	0.085	0.084	0.092	0.008	8.2
19	5	0.090	0.088	0.089	0.088	0.090	0.089	0.001	1.1
20	5	0.077	0.077	0.08	0.078	0.076	0.078	0.002	2.0
21	0								
22	5	0.0823	0.0843	0.0858	0.0858	0.0843	0.0845	0.0014	1.7
23	5	0.099	0.094	0.093	0.094	0.098	0.096	0.003	2.8
24	0								
25	5	0.087	0.089	0.093	0.096	0.093	0.092	0.004	3.9
26	5	0.0944	0.0944	0.0928	0.0928	0.0951	0.0939	0.0010	1.1
27	0								
28	5	0.08	0.08	0.08	0.08	0.08	0.08	0.00	0.0
29	5	0.079	0.082	0.076	0.074	0.074	0.077	0.003	4.5
30	0								
31	5	0.092	0.099	0.097	0.098	0.093	0.096	0.003	3.3
32	0								
33	5	0.10	0.09	0.09	0.09	0.08	0.09	0.01	7.9
34	5	0.07	0.12	0.05	0.06	0.07	0.07	0.03	36.5
35	5	0.0916	0.094	0.0984	0.0938	0.095	0.095	0.002	2.6
36	0								
37	0								
38	5	0.10	0.10	0.10	0.10	0.095	0.099	0.002	2.3
39	5	0.096	0.097	0.099	0.096	0.105	0.099	0.004	3.8
40	5	0.0958	0.09105	0.0866	0.0863	0.0864	0.0892	0.0042	4.7
41	5	0.0974	0.0946	0.0965	0.103	0.104	0.099	0.004	4.2
42	5	0.091	0.095	0.096	0.085	0.093	0.092	0.004	4.7
43	0								
44	0								
45	0								
46	0								

MERCURY
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	0.09968	0.09921	0.1019	0.1039	0.1003	0.1010	0.0019	1.9
2	5	0.095	0.1	0.096	0.097	0.11	0.10	0.01	6.1
3	0								
4	0								
5	0								
6	5	0.110	0.110	0.108	0.114	0.110	0.110	0.002	2.0
7	0								
8	5	0.104	0.102	0.096	0.094	0.102	0.100	0.004	4.4
9	0								
10	5	0.099	0.101	0.099	0.1	0.098	0.099	0.001	1.1
11	5	0.105	0.103	0.102	0.097	0.1	0.101	0.003	3.0
12	0								
13	5	0.089	0.092	0.091	0.094	0.092	0.092	0.002	2.0
14	5	0.085	0.084	0.089	0.089	0.087	0.087	0.002	2.4
15	5	0.073	0.077	0.070	0.067	0.064	0.070	0.005	7.2
16	5	0.103	0.099	0.099	0.099	0.101	0.100	0.002	1.9
17	5	0.103	0.103	0.105	0.100	0.108	0.104	0.003	2.8
18	5	0.109	0.106	0.099	0.105	0.105	0.105	0.004	3.5
19	5	0.112	0.101	0.102	0.097	0.113	0.105	0.007	6.8
20	5	0.082	0.081	0.091	0.092	0.093	0.088	0.006	6.6
21	5	0.084	0.1	0.1	0.1	0.102	0.097	0.007	7.6
22	0								
23	5	0.042	0.041	0.031	0.031	0.048	0.039	0.007	19.3
24	5	<0.25	<0.25	<0.25	<0.25	<0.25			
25	5	0.115	0.101	0.105	0.100	0.115	0.107	0.007	6.9
26	5	0.0967	0.0931	0.0913	0.0936	0.0921	0.0934	0.0021	2.2
27	0								
28	5	0.08	0.08	0.10	0.08	0.08	0.08	0.01	10.6
29	0								
30	5	0.09	0.096	0.097	0.09	0.093	0.093	0.003	3.5
31	5	0.084	0.092	0.086	0.090	0.092	0.089	0.004	4.1
32	0								
33	0								
34	5	0.054	0.043	0.051	0.041	0.053	0.048	0.006	12.4
35	5	0.105	0.104	0.102	0.100	0.102	0.103	0.002	1.9
36	5	0.05589	0.05429	0.05118	0.06597	0.05577	0.05662	0.00556	9.8
37	0								
38	5	0.10	0.098	0.091	0.092	0.10	0.096	0.004	4.6
39	5	0.096	0.098	0.106	0.102	0.108	0.102	0.005	5.0
40	5	0.1099	0.0892	0.0964	0.0928	0.0890	0.0955	0.0086	9.0
41	5	0.0965	0.103	0.107	0.107	0.108	0.104	0.005	4.6
42	5	0.051	0.050	0.047	0.048	0.053	0.050	0.002	4.8
43	5	0.06	0.06	0.07	0.06	0.05	0.06	0.01	11.8
44	0								
45	5	0.101	0.103	0.102	0.098	0.099	0.101	0.002	2.1
46	0								

MERCURY
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	0.06334	0.0565	0.05974	0.05924	0.06272	0.06031	0.00278	4.6
2	5	0.079	0.071	0.065	0.073	0.064	0.070	0.006	8.7
3	0								
4	0								
5	0								
6	5	0.062	0.062	0.061	0.063	0.064	0.062	0.001	1.8
7	0								
8	5	0.059	0.058	0.056	0.057	0.058	0.058	0.001	2.0
9	0								
10	5	0.073	0.066	0.065	0.066	0.052	0.064	0.008	11.9
11	5	0.062	0.058	0.069	0.058	0.057	0.061	0.005	8.2
12	0								
13	5	0.056	0.054	0.054	0.054	0.053	0.054	0.001	2.2
14	5	0.052	0.054	0.054	0.055	0.057	0.054	0.002	3.3
15	5	0.051	0.053	0.052	0.066	0.045	0.053	0.008	14.4
16	5	0.063	0.070	0.081	0.068	0.067	0.070	0.007	9.5
17	5	0.072	0.069	0.063	0.067	0.066	0.067	0.003	5.0
18	5	0.067	0.065	0.068	0.070	0.065	0.067	0.002	3.2
19	5	0.063	0.063	0.063	0.059	0.060	0.062	0.002	3.2
20	5	0.055	0.055	0.053	0.052	0.055	0.054	0.001	2.6
21	5	0.054	0.052	0.056	0.053	0.052	0.053	0.002	3.1
22	0								
23	3	0.029	0.03	0.024			0.028	0.003	11.6
24	5	<0.25	<0.25	<0.25	<0.25	<0.25			
25	5	0.067	0.062	0.063	0.061	0.063	0.063	0.002	3.6
26	5	0.061	0.063	0.0597	0.0608	0.0567	0.0602	0.0023	3.8
27	0								
28	5	0.09	0.09	0.09	0.09	0.09	0.09	0.00	0.0
29	0								
30	0								
31	5	0.058	0.060	0.061	0.063	0.059	0.060	0.002	3.2
32	0								
33	0								
34	5	0.032	0.028	0.029	0.021	0.020	0.026	0.005	20.2
35	5	0.0633	0.0611	0.0624	0.0612	0.0604	0.0617	0.0012	1.9
36	5	0.05631	0.05861	0.05665	0.06553	0.05871	0.05916	0.00373	6.3
37	0								
38	5	0.061	0.069	0.064	0.069	0.057	0.064	0.005	8.1
39	5	0.071	0.063	0.076	0.072	0.063	0.069	0.006	8.4
40	5	0.0607	0.0646	0.0593	0.0565	0.0565	0.0595	0.0034	5.7
41	5	0.0699	0.071	0.0698	0.0694	0.0721	0.0704	0.0011	1.6
42	5	0.059	0.060	0.060	0.058	0.058	0.059	0.001	1.7
43	5	<0.05	<0.05	<0.05	<0.05	<0.05			
44	0								
45	0								
46	0								

THALLIUM
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	0								
5	0								
6	5	<20	<20	<20	<20	<20			
7	0								
8	0								
9	0								
10	0								
11	5	0.916	0.902	0.922	0.908	0.91	0.912	0.008	0.8
12	0								
13	5	0.91	0.88	0.92	0.95	0.98	0.93	0.04	3.9
14	5	0.96	1.03	0.97	0.93	0.97	0.97	0.03	3.6
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	0.513	0.568	0.688	0.653	0.454	0.575	0.097	16.8
23	0								
24	0								
25	5	0.81	0.80	0.79	0.80	0.81	0.80	0.01	1.0
26	5	0.736	0.735	0.703	0.704	0.701	0.716	0.018	2.6
27	0								
28	0								
29	0								
30	0								
31	5	0.84	0.82	0.93	0.92	0.89	0.88	0.05	5.5
32	0								
33	5	0.98	0.92	0.94	0.88	0.91	0.93	0.04	4.0
34	0								
35	0								
36	5	0.7993	0.8026	0.7842	0.7585	0.8344	0.7958	0.0277	3.5
37	0								
38	0								
39	5	0.384	0.419	0.399	0.381	0.407	0.398	0.016	4.0
40	5	0.665	0.642	0.655	0.639	0.633	0.647	0.013	2.0
41	5	0.424	0.339	0.393	0.324	0.395	0.375	0.042	11.2
42	0								
43	0								
44	0								
45	0								
46	5	0.8	0.77	0.79	0.79	0.78	0.79	0.01	1.5

THALLIUM
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	0								
2	0								
3	0								
4	0								
5	0								
6	5	<10	<10	<10	<10	<10			
7	0								
8	0								
9	0								
10	0								
11	5	0.931	0.993	0.982	1.002	1.002	0.982	0.030	3.0
12	0								
13	5	1.06	1.11	1.08	1.20	1.07	1.11	0.06	5.2
14	5	0.94	0.98	1.05	1.10	1.04	1.02	0.06	6.1
15	0								
16	0								
17	0								
18	0								
19	0								
20	0								
21	0								
22	5	0.638	0.756	0.615	0.609	0.634	0.650	0.060	9.3
23	0								
24	0								
25	5	0.95	0.95	0.96	0.99	0.97	0.96	0.02	1.7
26	5	0.814	0.779	0.783	0.788	0.781	0.789	0.014	1.8
27	0								
28	0								
29	0								
30	0								
31	5	0.91	0.89	0.94	0.89	0.99	0.92	0.04	4.6
32	0								
33	5	1.08	1.03	1.09	1.02	1.03	1.05	0.03	3.1
34	0								
35	0								
36	5	0.9666	0.9546	0.9362	0.9506	0.9735	0.9563	0.0145	1.5
37	0								
38	0								
39	5	0.272	0.288	0.267	0.295	0.272	0.279	0.012	4.3
40	5	0.884	0.841	0.849	0.797	0.816	0.837	0.033	4.0
41	5	0.744	0.694	0.615	0.690	0.584	0.665	0.065	9.7
42	0								
43	0								
44	0								
45	0								
46	0								

The determination of thallium was not required in the biologicals

LEAD
Sediment 98
mg/kg

Lab							Mean	SD	RSD
1	5	253.6	255.2	252.9	266.9	260.9	257.9	5.9	2.3
2	0								
3	5	290	278	269	268	269	275	9	3.4
4	5	275	273	273	289	289	280	8	3.0
5	0								
6	5	285	285	288	288	285	286	2	0.6
7	5	189	206	164	196	185	188	16	8.3
8	0								
9	5	234	233	240	237	243	237	4	1.8
10	0								
11	5	287.7	293.3	302.1	292.7	288.8	292.9	5.7	1.9
12	0								
13	5	233	235	232	259	282	248	22	8.8
14	5	225	254	246	241	243	242	11	4.4
15	5	235	236	226	218	234	230	8	3.3
16	5	218.5	221.8	230.0	218.5	221.5	222.1	4.7	2.1
17	5	201	203	219	211	224	212	10	4.7
18	5	273.3	272	286.3	280.9	278	278.1	5.8	2.1
19	5	277	280	278	277	278	278	1	0.4
20	5	219	236	233	223	229	228	7	3.1
21	0								
22	5	272	281	279	263	277	274	7	2.6
23	5	223	221	214	211	214	217	5	2.4
24	0								
25	5	259	268	260	259	257	261	4	1.6
26	5	283	281	319	310	311	301	18	5.8
27	5	285	270	277	281	265	276	8	2.9
28	5	270	270	270	270	270	270	0	0.0
29	5	248	248	249	245	256	249	4	1.6
30	0								
31	5	279	281	283	274	273	278	4	1.6
32	0								
33	5	303	291	296	299	294	297	5	1.6
34	5	241	239	231	241	243	239	5	2.0
35	5	248	251	246	249	248	248	2	0.7
36	5	229.8	235.1	221.4	215.0	242.0	228.6	10.7	4.7
37	0								
38	5	278	275	275	280	283	278	3	1.2
39	5	271	264	275	276	275	272	5	1.8
40	5	255.84	235.36	266.05	253.65	250.11	252.20	11.13	4.4
41	5	280	275	281	275	273	277	3	1.3
42	5	233	230	233	232	234	232	2	0.7
43	0								
44	0								
45	5	269	280	284	276	294	281	9	3.3
46	5	270	274	273	268	271	271	2	0.9

LEAD
MESS-2
mg/kg

Lab							Mean	SD	RSD
1	5	18.84	18.02	18.43	19.39	18.63	18.66	0.51	2.7
2	0								
3	5	21	22.1	21.2	22.1	20.5	21.4	0.7	3.3
4	5	22.9	23.3	22.6	23.2	22.7	22.9	0.3	1.3
5	0								
6	5	22	22	21	22	21	22	1	2.5
7	5	21.4	19.8	23.2	21.3	20	21.1	1.4	6.4
8	0								
9	5	20.9	19.9	21.1	21.4	20.0	20.7	0.7	3.3
10	0								
11	5	21.94	22.82	22.19	22.24	21.96	22.23	0.36	1.6
12	0								
13	5	21.5	21.4	21.9	21.4	21.7	21.6	0.2	1.0
14	5	21.0	22.3	19.9	20.7	21.9	21.2	1.0	4.5
15	5	20.0	18.8	19.9	20.5	20.6	20.0	0.7	3.6
16	5	22.0	21.2	20.3	16.7	20.7	20.2	2.0	10.1
17	5	19.4	20.3	19.2	20.2	20.1	19.8	0.5	2.5
18	5	22.6	20.8	19.4	21.5	20.6	21.0	1.2	5.6
19	5	19.6	19.5	20.3	19.5	19.3	19.6	0.4	2.0
20	5	17.6	20.1	17.9	20.2	18.7	18.9	1.2	6.4
21	0								
22	5	21.3	22	20.9	19.1	19.2	20.5	1.3	6.3
23	5	12.1	14.2	12.2	19.1	13.3	14.2	2.9	20.3
24	0								
25	5	22.3	21.8	22.3	22.7	22.8	22.4	0.4	1.8
26	5	20.0	27.0	22.9	20.6	21.2	22.3	2.8	12.6
27	5	14.7	31.8	26.1	24.8	26.8	24.8	6.3	25.2
28	5	20	20	22	23	22	21	1	6.3
29	5	18.3	19.1	20.3	19.2	19.2	19.2	0.7	3.7
30	0								
31	5	20.0	21.3	20.6	20.8	21.8	20.9	0.7	3.3
32	0								
33	5	24.7	23.4	24.6	23.3	23.8	24.0	0.7	2.7
34	5	19.1	18.6	14.9	18.5	17.1	17.6	1.7	9.7
35	5	21.6	21.6	20.6	20.9	20.4	21.0	0.6	2.7
36	5	21.50	21.16	20.52	21.43	21.62	21.25	0.44	2.1
37	0								
38	5	20.7	21.6	20.4	22.3	21.6	21.3	0.8	3.6
39	5	19.7	19.7	19.7	20.5	20.0	19.9	0.3	1.8
40	5	21.90	22.26	22.3	22.44	21.62	22.10	0.34	1.5
41	5	21.6	21.0	20.1	20.4	20.5	20.7	0.6	2.8
42	5	21.92	22.01	21.35	21.52	22.71	21.90	0.53	2.4
43	0								
44	0								
45	0								
46	0								

LEAD
Tissue 98
mg/kg

Lab							Mean	SD	RSD
1	5	2.552	2.386	2.273	2.154	2.174	2.308	0.165	7.1
2	0								
3	5	1.78	1.79	1.89	1.86	1.77	1.82	0.05	2.9
4	5	1.59	1.65	1.79	1.50	1.53	1.61	0.11	7.1
5	5	4.42	3.99	4.41	4.01	4.44	4.25	0.23	5.5
6	5	2.4	2.4	2.4	2.3	2.4	2.4	0.0	1.9
7	0								
8	0								
9	5	2.22	2.23	2.15	2.19	2.25	2.21	0.04	1.8
10	5	1.984	1.885	2.037	1.952	1.928	1.957	0.057	2.9
11	5	2.29	2.37	2.31	2.29	2.26	2.30	0.04	1.8
12	5	2.27	2.25	2.26	2.28	2.26	2.26	0.01	0.5
13	5	2.04	2.00	2.06	2.26	2.16	2.10	0.11	5.0
14	5	2.23	2.07	2.13	2.27	2.29	2.20	0.09	4.3
15	5	2.47	2.59	2.46	2.44	2.52	2.50	0.06	2.4
16	5	2.07	2.09	2.05	2.03	2.07	2.06	0.02	1.2
17	5	2.13	2.11	2.21	2.19	2.18	2.16	0.04	1.9
18	5	1.98	1.988	2.008	2.014	2.01	2.00	0.02	0.8
19	5	2.18	2.16	2.23	2.22	2.28	2.21	0.05	2.1
20	5	1.78	2.90	3.20	2.97	2.88	2.75	0.55	20.2
21	5	2.20	2.11	2.07	2.10	2.14	2.12	0.05	2.3
22	0								
23	0								
24	5	<1.9	<1.9	<1.9	<1.9	<1.9			
25	5	2.43	2.44	2.49	2.47	2.34	2.43	0.06	2.4
26	5	2.25	2.04	1.98	1.93	1.99	2.04	0.12	6.1
27	5	2.6	2.6	2.6	2.6	2.5	2.6	0.0	1.7
28	5	2	2	3	2	2	2	0	20.3
29	0								
30	0								
31	5	2.02	2.19	2.13	2.04	1.98	2.07	0.09	4.1
32	0								
33	0								
34	5	1.75	1.73	1.79	1.90	1.84	1.80	0.07	3.8
35	5	2.37	2.20	2.22	2.46	2.40	2.33	0.11	4.9
36	5	2.343	2.260	2.224	2.182	2.323	2.266	0.067	3.0
37	0								
38	5	2.37	2.46	2.55	2.53	2.54	2.49	0.08	3.0
39	5	2.44	2.50	2.57	2.80	2.86	2.63	0.19	7.1
40	5	2.19	2.07	2.29	2.16	2.20	2.18	0.08	3.6
41	5	2.35	2.32	2.37	2.42	2.37	2.37	0.04	1.5
42	5	1.87	1.57	1.98	2.23	1.73	1.88	0.25	13.4
43	5	1.89	2.00	2.14	2.19	1.95	2.03	0.13	6.2
44	0								
45	0								
46	5	2.14	2.26	2.20	2.13	2.10	2.17	0.06	2.9

LEAD
CRM 2976
mg/kg

Lab							Mean	SD	RSD
1	5	1.087	1.027	1.07	1.107	1.102	1.079	0.032	3.0
2	0								
3	5	1.08	0.971	0.976	0.983	0.990	1.000	0.045	4.5
4	5	0.80	0.83	0.63	0.76	0.81	0.77	0.08	10.5
5	5	1.01	0.99	1.15	1.13	0.98	1.05	0.08	7.7
6	5	1.3	1.3	1.3	1.3	1.3	1.3	0.0	0.0
7	0								
8	0								
9	5	1.23	1.28	1.17	1.19	1.13	1.20	0.06	4.8
10	5	1.094	1.065	1.047	1.036	1.053	1.059	0.022	2.1
11	5	1.12	1.12	1.11	1.11	1.11	1.11	0.01	0.5
12	5	1.28	1.28	1.26	1.27	1.26	1.27	0.01	0.8
13	5	1.11	1.17	1.15	1.16	1.23	1.17	0.04	3.7
14	5	1.19	1.16	1.35	1.20	1.30	1.24	0.08	6.5
15	5	1.40	1.31	1.32	1.41	1.42	1.37	0.05	3.8
16	5	1.21	1.15	1.18	1.21	1.17	1.18	0.03	2.2
17	5	1.18	1.22	1.20	1.21	1.23	1.21	0.02	1.6
18	5	1.16	1.183	1.16	1.157	1.17	1.17	0.01	0.9
19	5	1.18	1.23	1.14	1.19	1.14	1.18	0.04	3.2
20	5	0.782	0.815	0.821	0.849	0.983	0.850	0.078	9.2
21	5	1.18	1.14	1.15	1.16	1.19	1.16	0.02	1.8
22	0								
23	0								
24	5	<1.9	<1.9	<1.9	<1.9	<1.9			
25	5	1.12	1.1	1.14	1.09	1.27	1.14	0.07	6.4
26	5	1.21	1.20	1.23	1.21	1.24	1.22	0.02	1.3
27	5	1.25	1.32	1.34	1.37	1.34	1.32	0.05	3.4
28	5	1	1	1	1	1	1	0	0.0
29	0								
30	0								
31	5	1.18	1.17	1.19	1.17	1.09	1.16	0.04	3.4
32	0								
33	0								
34	5	1.08	0.98	0.88	0.90	0.89	0.95	0.08	9.0
35	5	1.16	1.25	1.18	1.20	1.21	1.20	0.03	2.8
36	5	1.219	1.215	1.251	1.233	1.201	1.224	0.019	1.5
37	0								
38	5	1.17	1.27	1.30	1.35	1.31	1.28	0.07	5.3
39	5	1.18	1.40	1.36	1.39	1.45	1.36	0.10	7.6
40	5	1.25	1.16	1.20	1.19	1.16	1.19	0.04	3.1
41	5	1.25	1.27	1.31	1.27	1.26	1.27	0.02	1.8
42	5	1.37	1.12	1.27	1.21	0.98	1.19	0.15	12.5
43	5	1.13	1.23	1.19	1.14	1.12	1.16	0.05	4.0
44	0								
45	0								
46	0								

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APPENDIX C

Table C-1

Sediment Preparation Procedures

Lab No.	Sediment Preparation Procedure	Instrumentation
1	- 0.5g - HNO_3, HF - closed vessel microwave digestion	ICPMS- Al,Cr,Fe,Ni,Cu,Zn, As,Se,Ag,Cd,Sn,Pb
2	NA	
3	- 0.5g - HNO_3, H_2O_2 - closed vessel microwave digestion	GFAAS- Ag,As,Cd,Se ICPAES- Al,Fe,Cr,Mn,Ni, Cu,Zn
4	- 0.2g - HNO_3, HF, HCl, boric acid - closed vessel microwave digestion	GFAAS- Cd,Pb ICPAES- Si,As,Be,Fe,Ni,Zn Cu,Mn,As,Pb
5	- 0.5g - HNO_3, HF, HCl, boric acid - closed vessel microwave digestion	FAAS- Cr,Mn,Fe,Ni,Cu,Zn,Cd
6	- 1.0g - HNO_3, HCl - open vessel digestion	HGAAS- As,Se,Sb ICPAES- Be,Cu,Tl,Sn,Zn FAAS, Cd,Pb,Ag
	- 0.5g - HNO_3, HCl, $HClO_4$, HF - closed vessel microwave digestion	ICPAES- Al, Cr,Fe,Mn,Ni
7	- 0.12g - HNO_3, HF, H_2O_2, HCl, $HClO_4$ - closed vessel microwave digestion	GFAAS- Cd,Pb ICPAES- Al,Cr,Mn,Fe,Ni, Cu,Zn,Cd,Pb
8	NA	
9	- 0.2g - HNO_3, HF - closed vessel microwave digestion	XRF- Al,Si,Fe ICPMS- Cr,Mn,Ni,Cu,Zn, As,Se,Ag,Cd,Sn,Sb,Pb
10	NA	
11	- 0.3g - HNO_3, HF, HCl, boric acid - closed vessel microwave digestion	ICPMS- Be,Cr,Mn,Ni,Cu,Zn, As,Se,Ag,Cd,Sn,Tl, Sb ICPAES- Al,Si,Fe
12	NA	

Lab No.	Sediment Preparation Procedure	Instrumentation
13	- 0.25g - HNO_3, HF, $HClO_4$ - open vessel digestion	FAAS- Al,Fe,Mn GFAAS- Ag ICPMS- Be, Cr, Ni,Cu,Zn,As, Cd,Sn,Sb,Tl,Pb
14	- 0.5g - HNO_3, HF, HCl, $HClO_4$ - open vessel digestion	GFAAS- Se ICPMS- Be,As,Cd,Sb,Tl,Pb ICPAES- Al,Cr,Mn,Fe,Ni,Cu,Zn
	- 0.25g - HNO_3, HCl - open vessel digestion	ICPMS- Ag
15	- 0.3g - HNO_3, H_2O_2 - closed vessel microwave digestion	GFAAS- Ag,Cr,Pb,As,Se ICPAES- Cd,Cu,Ni,Zn,Be,Fe
16	- 2.5g - pressed powder	XRF- Al,Si,Cr,Mn,Fe,Ni, Cu,Zn,Pb
	- 0.7g - HNO_3, $HClO_4$, H_2SO_4 - open vessel digestion	HGAAS- As,Se
	- 0.7g - HNO_3, HCl - closed vessel microwave digestion	GFAAS- Cd
17	- 0.1 -0.25g - HNO_3, HF, HCl, $HClO_4$ - open vessel digestion	FAAS- Cu, Mn,Zn GFAAS- Ag,Cd,Cr,Ni,Pb HGAAS- As,Se
	- 0.2 - 0.4g - HNO_3, HF, HCl - closed vessel microwave digestion	FAAS- Fe
18	- 0.15- 0.2 g - HNO_3 - closed vessel microwave digestion	GFAAS- Cd,As,Se,Pb
19	- 0.5g - HNO_3, HF, HCl, H_2SO_4, $HClO_4$ - open vessel digestion	FAAS- Cu, Ni DCPAES- Be,Al,Cr,Mn,Fe,Zn
	- 0.4g - HNO_3, H_2SO_4, $HClO_4$ - open vessel digestion	HGAAS- As, Se
	- HNO_3, HCl - open vessel digestion	GFAAS- Cd, DCP- Pb

Lab No:	Sediment Preparation Procedure	Instrumentation
20	- 0.5g - HNO_3 - closed vessel microwave digestion	GFAAS- Ag,As,Cd,Se ICPAES- Al,Cr,Cu,Fe,Mn,Ni, Pb,Zn
21	NA	
22	- 0.25g - HNO_3, HF, HCl - closed vessel microwave digestion	GFAAS- As,Se,Ag,Cd,Sn,Sb, Tl,Pb ICPAES- Al,Be,Cr,Cu,Fe,Mn, Ni,Si,Zn
23	- 0.5g - HNO_3, HCl - open vessel digestion	GFAAS- As,Ag ICPAES- Al,Cr,Mn,Fe,Ni,Cu, Zn,Pb
24	NA	
25	- 0.45 g - HNO_3, HF, $HClO_4$ - open vessel digestion	FAAS- Al,Fe,Mn,Cr,Cu,Zn ICPMS- Pb,Cd,Tl,Sb,Sn, Be,Ni, As,Ag
26	- 0.2g - HNO_3, HCl - closed vessel microwave digestion	GFAAS- Ag,Se
	- 0.125g - HNO_3, HF - open vessel digestion	ICPMS- Be,Cd,Cr,Sb, Sn,Tl,Zn XRF- Al,As,Cu,Fe,Mn,Ni, Pb,Si
27	- 0.25g - HNO_3, HF, HCl - closed vessel microwave digestion	ICPAES- Al,Fe.Mn,Zn,Cu, Cr,Ni,Pb
28	- 0.250 g - HNO_3, HF, H_2O_2, HCl, $HClO_4$ - open vessel digestion	FAAS- Ag,Cd,Pb HGAAS- As,Se,Sb ICPAES- Cu,Zn,Cr,Ni,Be,Fe, Mn,Al
29	- 0.5g - HNO_3, HCl - closed vessel microwave digestion	GFAAS- Ag,Se ICPAES- Be,Al,Cr,Mn,Fe, Ni,Cu,Zn,As,Sb,Pb
30	NA	
31	- 0.2g - HNO_3, HF, $HClO_4$ - closed vessel microwave digestion	ICPMS- Be,Cr,Mn,Fe,Ni,Cu, Zn,As,Se,Ag,Cd,Sn,Sb,Tl,Pb

Lab No.	Sediment Preparation Procedure	Instrumentation
32	- 0.2g - HNO_3, HF - open vessel digestion	GFAAS- Cr ICPAES- Be,Mn,Fe,Cu,Zn
33	- 0.2g - HNO_3, HF, HCl, $HClO_4$ - open vessel digestion	ICPMS- Al,Fe,Mn,Ag,As,Cd, Be,Cr,Cu,Ni,Pb,Sb,Zn
33	- 0.25g - HNO_3, HF, HCl, H_2SO_4, $HClO_4$ - open vessel digestion	HGAAS- Se
34	- 1g - HNO_3, HCl - open vessel digestion	HGAAS- Se ICPAES-Al,As,Cd,Cr,Cu,Fe, Mn,Ni,Pb,Zn
35	- 1 g - HNO_3, HF, HCl - closed vessel microwave digestion	FAAS- Zn GFAAS- Se,Ag,Cd,Sb ICPAES- Be,Si,Cr,Fe,Ni, Cu,As,Pb
36	- 0.45 g - HNO_3, HF, HCl, boric acid - closed vessel microwave digestion	FAAS- Al,Si,Cr,Mn,Fe,Cu,Zn ICPMS- Be,Ni,As,Se,Cd, Sn,Sb,Tl,Pb
37	NA	
38	- 0.25g - HNO_3, HF, HCl, $HClO_4$ - open vessel digestion	ICPAES- Al,Be,Cu,Cr,Fe,Mn, Ni,Zn
	- 1.0g - HNO_3, HCl - open vessel digestion	FAAS- Pb GFAAS- Ag,As,Se ICPMS- Cd ICPAES- Sn
39	- 0.5g - HNO_3 - closed vessel microwave digestion	ICPMS- Be,Cr,Mn,Ni,Cu,Zn, As,Se,Ag,Cd,Sn,Sb,Tl,Pb
40	- 0.25g - HNO_3, HF, boric acid - closed vessel microwave digestion	ICPMS- Be,Cr,Mn,Ni,Cu,Zn, As,Se,Cd,Sb,Tl,Pb ICPAES- Ni,Cu,Zn
41	- 0.2g - HNO_3, HF, boric acid - closed vessel microwave digestion	GFAAS- As,Cd,Pb,Ni, Ag,Tl

Lab No.	Sediment Preparation Procedure	Instrumentation
	- 0.2g - HNO_3, HF, HCl, boric aid -closed vessel microwave digestion	FAAS- Al,Fe,Mn,Zn GFAAS- Sb, Sn ICPAES- Be,Cr,Cu,Si HGAFS- Se
42	- 0.7 g - HNO_3, HF, H_2O_2 - boric acid -closed vessel, microwave digestion	FAAS- Al,Cu,Fe,Zn,Pb GFAAS- Ag,Be,Cd,Cr,Mn, Ni,Pb HGAAS- As,Se
43	NA	
44	- 0.25 g - solid sampling	INAA- Al,Mn,As
45	- 0.25g - HNO_3, HF, HCl - closed vessel, microwave heating	ICPAES- Al,Fe,Zn, Mn
	- 0.25g - HNO_3, HF, $HClO_4$ - closed vessel, microwave heating	GFAAS- Ag,As,Be,Cd,Cr,Cu, Ni,Pb,Se
46	- 0.25g - HNO_3, HF - closed vessel, microwave heating	ICPMS- Cr,Ni,Cu,Zn,Cd,Sn, Sb,Tl,Pb

Table C-2
Tissue Preparation Procedures

Lab No.	Tissue Preparation Procedure	Instrumentation
1	- 0.3 g - HNO_3 - other	ICPMS- Al,Cr,Fe,Ni,Cu,Zn, As,Se,Ag,Cd,Pb
2	NA	
3	- 0.5g - HNO_3, H_2O_2 - closed vessel microwave digestion	GFAAS- Ag,As,Cd,Se ICPAES- Al,Fe,Cr,Ni, Cu,Zn
4	- 1 g - HNO_3, $HClO_4$ - closed vessel microwave digestion	GFAAS- Cd,Pb ICPAES- Al,As,Fe,Ni,Zn, Cu,Pb,Sn
5	- 0.5g - HNO_3 - closed vessel microwave digestion	FAAS- Cr,Fe,Ni,Cu,Zn,Cd,Pb
6	- 1 g - HNO_3, H_2O_2 - open vessel digestion	HGAAS- Se ICPMS- Al,As,Cd,Cr,Cu,Pb, Ni,Ag,Sn,Zn FAAS, Fe
7	NA	
8	NA	
9	- 0.2g - HNO_3, H_2O_2 - closed vessel microwave digestion	ICPAES- Al,Fe ICPMS- Ni,Zn,As,Se,Cd,Pb
10	- 0.25g - HNO_3, H_2O_2 - closed vessel microwave digestion	ICPMS- Al,Fe,Ni,Se,Ag, Cd,Pb ICPAES- Cr,Cu,Zn,As
11	- 0.3g - HNO_3 - closed vessel microwave digestion	ICPMS- Ni,Cu,As,Se,Ag,Cd, Sn,Pb ICPAES- Al,Cr,Zn,Al,Cu,Fe
12	- 1 g - HNO_3, H_2O_2 - open vessel digestion	ICPMS- As,Cd,Cu,Ni,Pb, Zn,Al,Fe

Lab No.	Tissue Preparation Procedure	Instrumentation
13	- 0.5 g - HNO_3, HF, - open vessel digestion	FAAS- Al,Fe,Mn
	- 0.5g - HNO_3 - closed vessel microwave digestion	ICPMS- Cr,Ni,Cu,Zn,As, Cd,Sb,Pb
14	- 0.5g - HNO_3, H_2O_2 - closed vessel microwave digestion	GFAAS- Cr,Se ICPMS- Al,Ni,Cu,Zn,As, Ag,Cd,Pb ICPAES- Fe
15	- 1 g - HNO_3, H_2O_2 - open vessel digestion	GFAAS- Ag,Cd,Pb,As,Se ICPAES- Cr,Cu,Ni,Zn,Fe
16	- 1 g - HNO_3, $HClO_4$, H_2SO_4 - open vessel digestion	HGAAS- As,Se ICPAES- Zn
	- 0.5 - HNO_3, HCl, H_2O_2 - closed vessel microwave digestion	GFAAS- Cr,Ni,Cu,Cd,Pb
17	- 0.1 -0.25g - HNO_3, HF, HCl, $HClO_4$ - open vessel digestion	FAAS- Cu, Zn GFAAS- Ag,Cd,Cr,Ni,Pb
	- 0.2- 0.4 g - HNO_3, HF HCl - closed vessel microwave digestion	FAAS- Fe
	- 0.1 - 0.25g - HNO_3, HCl - $Mg(NO_3)_2$ dry ash	HGAAS- As,Se
18	- 0.18 - 0.2 g - HNO_3 - closed vessel microwave digestion	GFAAS- Cd,As,Se,Pb
19	- 0.45g - HNO_3, H_2O_2 - open vessel digestion	FAAS- Cu, Zn GFAAS - Cd,Ni DCPAES- Fe
	- 0.2g - HNO_3, H_2O_2, H_2SO_4 - open vessel digestion - DDDC extraction	GFAAS - Pb

Lab No.	Tissue Preparation Procedure	Instrumentation
	- 0.2 g - HNO_3, HCl, H_2SO_4, $HClO_4$ - open vessel digestion	HGAAS- Se
20	- 0.5g - HNO_3 - closed vessel microwave digestion	GFAAS- Ag,As,Cd,Cr,Cu, Ni.Pb,Se ICPAES- Al,Fe,Zn
21	- 0.5g - HNO_3 - closed vessel microwave digestion	FAAS- Fe ICPMS- Al,Cr,Ni,Cu,Zn,As, Ag,Cd,Pb
22	NA	
23	- 0.5g - HNO_3, H_2O_2, HCl - open vessel digestion	GFAAS- Cr,As,Ag,Pb ICPAES- Fe,Cu,Zn,
24	- 1 g - HNO_3, H_2O_2 - open vessel digestion	FAAS- Cd,Cu,Pb,Zn GFAAS- Cr
25	- 1.0 g - HNO_3, H_2O_2, HCl - open vessel digestion	FAAS- Al,Fe,Zn ICPMS- Pb,Cd,Sn, GFAAS- Ag,As,Cr,Cu,Ni,Se
26	- 0.5 g - HNO_3 - closed vessel	ICPMS- Ag,Al,As,Cd,Cu,Fe, Ni,Pb,Se XRF - Zn
27	- 0.75g - HNO_3, H_2O_2 - closed vessel microwave digestion	ICPAES- Fe, Zn GFAAS- AS,Ag,Cd,Pb,Ni,Cu
28	- 0.250 g - HNO_3, HF, H_2O_2, HCl, $HClO_4$ - open vessel digestion	FAAS- Ag,Cd,Pb HGAAS- Se ICPAES- As,Cu,Zn,Cr,Ni,Fe, Al
29	NA	
30	- 0.2 g - HNO_3, H_2O_2 - closed vessel microwave digestion	GFAAS- Cr,Cu,Cd
31	- 0.2g - HNO_3 - closed vessel microwave digestion	ICPMS- Al,Cr,Fe,Ni,Cu, Zn,As,Se,Ag,Cd,Sn,Pb

Lab No.	Tissue Preparation Procedure	Instrumentation
32	- 0.1 g - HNO_3, HF - open vessel digestion	GFAAS- Cr ICPAES- Mn,Fe,Cu,Zn
33	NA	
34	- 1g - HNO_3, $HClO_4$ - open vessel digestion	ICPAES-Ag,Al,As,Cd, Cu,Fe,Ni,Pb,Zn
35	- 1 g - HNO_3 - closed vessel microwave digestion	GFAAS- Se,Pb ICPAES- Al,Cr,Fe,Ni, Cu,Zn,As,Cd,Sn,Ag
36	- 0.5 g - HNO_3 - closed vessel microwave digestion	FAAS- Fe, Zn ICPMS- Cr,Cu,Ni,As,Se,Cd, Sn,Ag,Pb
37	- 0.5 g - HNO_3 - closed vessel microwave digestion	ICPMS - As
38	- 1.0 g - HNO_3, H_2O_2 - open vessel digestion	ICPAES- Cu ICPMS- Al,Ag,As,Cd,Cr,Fe, Ni,Pb,Se,Zn
39	- 0.5g - HNO_3 - closed vessel microwave digestion	ICPMS- Cr,Fe,Ni,Cu,Zn, As,Se,Ag,Cd,Sn,Pb
40	- 0.5g - HNO_3 - closed vessel microwave digestion	ICPMS- Cr,Ni,Cu,Zn,As, Se,Cd,Pb ICPAES- Ni,Cu,Zn
41	- 0.2g - HNO_3 - closed vessel microwave digestion	GFAAS- As,Cd,Cr,Pb,Se,Ag, Cu,Sn
	- 0.2g - HNO_3, HCl -closed vessel microwave digestion	ICPAES- Al,Fe,Ni,Zn
42	- 1.2g - HNO_3, HF, H_2O_2, H_2SO_4 -boric acid -flask and hot plate	FAAS- Al,Fe,Zn GFAAS- Ag,Cd,Cr,Cu,Ni,Pb HGAAS- As,Se
43	- 1 g - HNO_3, H_2O_2 -open vessel	ICPMS- As,Se,Ni,Cu,Ag, Cd,Pb ICPAES- Cr,Fe,Al,Zn

Lab No.	Tissue Preparation Procedure	Instrumentation
44	NA	
45	- 0.25 g - HNO_3, H_2O_2 -closed vessel, microwave heating	GFAAS- Ag,As,Cd,Cr,Cu, Ni,Se ICPAES- Al,Fe,Zn
46	- 0.25 g - HNO_3 -closed vessel, microwave heating	ICPMS- Ni,Cu,Zn,Ag,Cd,Sn, Pb
	- 0.25 g - HNO_3, H_2O_2, HF -closed vessel, microwave heating	ICPAES- Al,Fe,Zn

Table C-3
Sample Preparation for Hg Determination

Lab No.	Sediment Dissolution Procedures	Tissue Dissolution Procedures	Instrumentation
1	same as for other elements		CVAFS
2	-1.0 g - HNO_3, H_2O_2, $KMnO_4$, $K_2S_2O_8$ - open vessel digestion	- 0.25 g - HNO_3, H_2O_2, $KMnO_4$, $K_2S_2O_8$ - open vessel digestion	CVAAS
3	NA	NA	CVAFS
4	- 0.2g - HNO_3, HCl - open vessel digestion	NA	CVICP
5	NA	NA	
6	same as for other elements	same as for other elements	CVAAS
7	NA	NA	
8	NA	- 0.2g - HNO_3, H_2SO_4 - open vessel digestion	CVAAS
9	NA	NA	

Lab No.	Sediment Dissolution Procedures	Tissue Dissolution Procedures	Instrumentation
10	NA	- 1 - 1.5 g - HNO_3, H_2SO_4, $KMnO_4$, $K_2S_2O_8$ - open vessel digestion	CVAAS
11	same as for other elements	same as for other elements	ICPMS
12	NA	NA	
13	same as for other elements with Hg 201 spike	same as for other elements	ICPMS
14	- 0.5g - HNO_3, HCl - open vessel digestion	same as for other elements	CVAAS
15	- 0.3g - HNO_3, H_2SO_4 - open vessel digestion	- 0.5 g - HNO_3, H_2SO_4 - open vessel digestion	CVAAS
16	same as for other elements	- 0.5 g - HNO_3, H_2O_2 - closed vessel microwave digestion	CVAAS
17	- 0.06- 0.4 g - HNO_3, H_2SO_4 - open vessel digestion	- 0.1 - 0.2 g - HNO_3, H_2SO_4 - open vessel digestion	CVAFS
18	same as for other elements	same as for other elements	CVAAS
19	- 0.25 g - HNO_3, HCl - open vessel digestion	- 0.48 g - HNO_3, H_2O_2, H_2SO_4, $KMnO_4$ - open vessel digestion	CVAAS
20	- 0.2 g - HNO_3, H_2SO_4, $KMnO_4$, NH_2OH-HCl - closed vessel microwave digestion	- 0.2 g - HNO_3, H_2SO_4, $KMnO_4$, NH_2OH-HCl - closed vessel microwave digestion	CVAAS
21	NA	same as for other elements	CVAAS
22	- 0.25g - HNO_3, HF, HCl - closed vessel microwave digestion	NA	CVAAS

Lab No.	Sediment Dissolution Procedures	Tissue Dissolution Procedures	Instrumentation
23	- 0.5g - HNO_3, HCl - open vessel digestion	- 0.5 g - HNO_3, H_2O_2, HCl - open vessel digestion	CVAAS
24	NA	same as for other elements	CVAAS
25	- 0.5 g - HNO_3, H_2SO_4 - closed vessel microwave digestion	- 0.5 g - HNO_3, H_2SO_4 - closed vessel microwave digestion	CVAAS
26	same as for other elements	same as for other elements	CVAAS
27	NA	NA	
28	- 0.25 g - HNO_3, HCl - open vessel digestion	- 0.25 g - HNO_3, HCl - open vessel digestion	CVAAS
29	- 0.5 g - HNO_3, HCl - closed vessel microwave digestion	NA	CVAAS
30	NA	- 0.5 g - HNO_3, H_2SO_4, $KMnO_4$ - closed vessel microwave digestion	CVAAS
31	- 0.2 g - HNO_3, HF, H_2SO_4 - closed vessel microwave digestion	- 0.2 g - HNO_3 - closed vessel microwave digestion	ICPMS
32	NA	NA	
33	- 0.1 g - HNO_3 , $NaCr_2O_7$ - open vessel digestion	NA	CVAAS
34	- 1 g - HNO_3, HCl - open vessel digestion	same as for other elements	CVAAS
35	- 1.0 g - HNO_3, HF, HCl - closed vessel microwave digestion	- 1.0 g - HNO_3 - closed vessel microwave digestion	CVAAS

Lab No.	Sediment Dissolution Procedures	Tissue Dissolution Procedures	Instrumentation
36	NA	same as for other elements	CVAAS
37	NA	NA	
38	same as for other elements	same as for other elements	CVAFS
39	same as for other elements	same as for other elements	ICPMS
40	- 0.25 g - HNO_3, H_2SO_4, $KMnO_4$ - open vessel digestion	- 0.25 g - HNO_3, H_2SO_4, $KMnO_4$ - open vessel digestion	CVAAS
41	- 0.2 g - HNO_3, HF, HCl, boric acid - closed vessel microwave digestion	NA	CVAAS
42	- 1g - HNO_3, H_2SO_4, $KMnO_4$, $K_2S_2O_8$ - closed vessel, 2 hr @ 95°C	- 2 g - HNO_3, H_2SO_4, $KMnO_4$, $K_2S_2O_8$ - closed vessel, 2 hr @ 95°C	CVAAS
43	NA	- 1g - HNO_3, H_2O_2 - open vessel	CVAAS
44	NA		
45	- 0.25g - HNO_3 - closed vessel, microwave heating	- 0.25g - HNO_3 - closed vessel, microwave heating - $KBrO_3$/KBr	CVAAS
46	NA		

APPENDIX D

Appendix D

Z- Scores for Sediments

LAB	Be		Al		Si		Cr		Mn		Fe		Ni		Cu		Zn	
	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2
1			-14.5	-14.9			-1.0	-1.8			-7.6	-9.7	-0.0	-0.5	0.4	0.6	-3.7	-3.3
2																		
3							-1.9	-1.4					-1.3	-1.3	-0.6	-1.1	0.3	-0.7
4	0.7	-0.0	-0.0	0.2	-0.2	-0.6	-0.5	-0.4	0.1	-0.7	0.3	-0.9	-0.5	-0.8	0.8	0.1	0.4	-0.9
5							-0.9	0.8	-3.7	-1.1	-5.8	-5.4	4.9	1.8	-3.4	-2.3	-1.2	-0.7
6	-0.7	-0.7	0.5	0.5			0.5	0.2	0.5	-0.2	1.1	0.6	0.5	-0.2	1.2	0.2	1.1	-0.7
7			-3.1	-0.9			-1.1	-1.6	-0.1	-0.7	-0.8	-1.2	-0.5	-1.3	-0.7	-1.5	-0.7	-1.7
8																		
9			-0.5	-0.3	-0.8	-0.9	-0.6	-0.7	0.1	-0.2	-1.3	-1.1	-0.1	-0.8	0.4	-0.0	-0.2	-0.4
10																		
11	1.2	0.6	-0.1	-0.0	-0.2	-0.5	-0.0	-0.3	-0.9	-0.2	0.5	-0.2	0.5	0.4	-0.7	0.1	0.3	-0.5
12																		
13	-0.2	0.4	0.4	0.5			0.3	0.2	0.7	0.4	0.2	0.1	-0.2	0.1	0.1	0.4	1.1	-0.4
14	-0.5	0.2	-5.2	-0.9			-0.6	-0.9	-0.6	-1.0	-1.8	-0.9	-0.4	-0.5	0.0	-0.7	0.1	-0.7
15	-2.3	-0.5					-2.4	-3.7			-1.4	-2.8	0.4	-1.2	-0.4	0.2	-1.3	-2.5
16			0.3	-1.0	0.1	-0.8	0.7	0.6	0.1	-0.6	0.3	-0.7	-0.9	-0.2	0.2	-0.1	1.2	-0.5
17									0.5	-0.4	0.1	0.4	-0.3	-1.0	0.5	-0.4	1.1	0.9
18																		
19	-1.1	0.6	-0.8	-1.1			0.8	0.2	-0.3	-0.5	0.3	0.1	-0.0	-0.4	0.0	-0.3	0.6	-0.5
20	-4.1	-5.3	-14.6	-15.5			-5.5	-7.1	-4.2	-2.1	1.6	9.8	-1.4	-1.5	-1.2	-1.4	-1.2	-2.2
21																		
22	1.0	1.1	-3.9		-0.4	-0.6	0.1	-0.3	-0.4	-1.0	-1.4	-2.4	0.1	-0.9	0.2	-0.6	-0.7	-1.9
23			-15.2				-6.0	-7.5	-4.7	-3.4	-4.9	-5.7	-3.2	-3.1	-2.3	-2.5	-2.6	-2.3
24																		
25	0.5	0.1	0.8	0.2			-0.0	0.2	0.6	-0.0	0.7	-0.6	0.2	-0.0	0.0	-0.1	0.7	-0.7
26	-0.9	-0.6	-2.7	-2.4	0.1	-0.0	-0.3	-0.7	-0.5	-0.5	-0.8	-1.2	-0.1	-0.9	-0.1	-0.5	-0.7	-0.5
27			-6.9	-15.0			6.0	7.3	0.8	2.9	-0.0	4.9	1.1	4.0	-0.7	0.3	0.3	2.1
28	-0.1	0.3	-1.4	-0.1			0.3	-0.2	0.8	-0.2	1.0	-0.5	0.4	0.2	-1.1	-0.6	-0.2	-0.9
29	-3.4	-3.6	-12.8	-12.6			-4.6	-5.4	-2.6	-1.5	-4.0	-5.4	-0.5	-0.3	-0.3	-0.3	-0.3	-1.3
30																		
31	0.7	0.2					0.3	-0.4	0.4	-0.3	0.8	0.3	-0.5	-0.2	-0.2	0.2	1.0	0.2
32	3.1	-1.0					0.5	0.5	-0.9	-1.1	-2.1	0.0			0.5	-0.4	-0.0	-0.6
33			-0.6	0.0			0.2	0.1	-0.4	-0.7	-0.1	-0.2	0.9	0.1	-0.3	-0.3	-0.6	-1.4
34			-12.9	-12.8			-5.0	-6.0	-2.9	-2.1	-1.5	-4.5	-1.4	-2.5	-0.5	-1.2	-0.7	-2.2
35	0.3	0.3			-2.1	-2.0	-0.7	-0.8			-2.1	-3.0	-1.0	-0.6	-0.3	-0.2	0.6	-0.2
36	-1.9	0.9	0.3	0.1	-0.2	-0.2	0.4	-0.3	0.6	-0.2	1.5	0.5	5.6	0.1	0.1	-0.1	0.5	-0.2
37																		
38	0.3	1.1	0.6	-0.0			1.6	0.2	0.7	-0.2	0.8	0.0	1.1	-0.0	-0.1	0.2	0.7	-0.4
39	-4.3	-4.1					-5.0	-5.9	-3.6	-0.8			0.9	0.5	0.4	1.2	-0.2	-1.0
40	-0.2	0.7					-0.9	-0.0	-0.5	-1.0			-0.2	-0.2	0.1	-0.2	1.7	0.6
41	1.6	1.5	-0.2	-0.4	0.1	-0.2	0.3	-0.2	1.0	-0.1	1.1	-0.3	-0.2	-0.5	0.5	0.1	1.1	-0.3
42	-1.0	1.1	-0.2	-0.1			2.5	0.5	0.1	0.3	-0.2	-0.1	-0.0	-0.1	0.9	-0.2	1.3	0.4
43																		
44			-0.2						-0.1	-0.8								

Z- Scores for Sediments

LAB	As		Se		Ag		Cd		Sn		Sb		Hg		Tl		Pb	
	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2
1	-0.2	0.2	1.5	2.9	1.2	28.0	0.8	9.1	0.6	-0.5			0.2	-0.9			-0.1	-1.5
2													-0.6	-0.5				
3	-1.0	-0.1			0.6	-4.4	-0.6	-2.5									0.5	-0.2
4	0.6	-0.1					-0.2	0.1					1.6	-0.3			0.7	0.5
5							14.6	51.8										
6	0.1	-0.8	0.3	0.3	0.4	1.1	-2.2				1.0	0.7	0.8	-0.5			1.0	-0.1
7							-2.5	0.2									-2.8	-0.3
8																		
9	-0.7	-1.1	-3.7	-1.2	-1.0	-0.3	-0.3	0.1	-0.6	-0.0	-0.6	-0.7					-0.9	-0.6
10																		
11	1.0	0.0	0.0	0.4	0.0	0.1	0.5	0.3	-0.7	-0.3	-1.9	-0.9	2.4	0.1	0.5	0.4	1.2	0.2
12																		
13	-2.2	-0.7			3.3	1.4	2.9	-0.6	-0.3	1.2	-1.5	-1.1	0.1	-0.4	0.7	1.8	-0.5	-0.1
14	0.0	-0.7	1.0	-0.1	0.6	-0.0	1.2	-0.0			1.4	1.0	-0.1	-0.4	1.1	0.9	-0.7	-0.3
15	0.9	-0.9	-4.0	-2.0	0.6	-0.4	-0.6	0.1					-0.5	-0.6			-1.2	-0.9
16	-0.1	0.1	-0.5	0.6			0.5	0.5					0.8	0.4			-1.5	-0.8
17	0.5	0.0	-0.2	-0.1	-2.7	-0.6	0.6	0.1					1.5	-0.0			-1.9	-0.9
18	2.6	-0.3	-4.4	1.2			-0.2	-0.8					-0.5	-0.0			0.7	-0.4
19	0.8	0.0	-1.8	0.1			-0.1	-0.2					0.0	-0.3			0.7	-1.0
20	-0.9	-2.2	-7.1	6.8	-1.9	-4.1	-1.4	-2.1					-2.9	-1.6			-1.3	-1.4
21																		
22	1.1	0.3	-1.0	6.7	3.5	0.3	0.3	0.4	0.5	3.0	0.7	-0.3	-4.8	-0.8	-3.4	-3.1	0.5	-0.6
23	-1.6	-0.8			-3.3	-3.2							1.8	0.4			-1.7	-3.5
24																		
25	0.1	0.1	0.9	-0.4	-1.9	-1.1	0.8	0.3	0.8	1.4	1.8	1.1	0.8	-0.0	-0.8	0.3	-0.0	0.2
26	-1.4	0.4	1.1	0.5	1.4	-0.9	-0.9	-1.3	-0.7	-0.4	-1.2	-0.6	0.6	0.2	-1.8	-1.6	1.5	0.2
27																	0.6	1.3
28	1.1	0.3	2.3	-0.3	3.1		2.4	-0.8			1.1	1.0	-0.4				0.3	-0.2
29	0.0	0.0	-2.0	2.4	-3.9	-1.9	2.0	-0.7					-1.0				-0.5	-1.2
30																		
31	0.2	-0.2	-0.6	0.6	-0.9	-0.6	-0.9	0.8	-0.1	0.2	1.7	0.7	0.1	0.4	0.1	-0.2	0.7	-0.5
32																		
33	-1.0	-0.5	0.2	2.5	-3.2	-1.7	7.5	-0.2	3.2	0.5	0.4	1.0	-0.1	-0.2	0.6	1.2	1.4	0.9
34	-0.6	-1.0	-1.0	-2.2			0.5	-0.8					-3.4	-2.0			-0.8	-1.9
35	-0.1	0.9	0.6	2.8	0.8	-0.7	1.3	0.8			-1.0	0.2	0.3	0.3			-0.5	-0.4
36	-1.1	-0.0	0.2	0.0			0.4	-0.4	0.9	0.4	1.3	-0.3			-0.9	0.2	-1.2	-0.3
37																		
38	1.1	-0.0	-1.4	-0.5	1.7	0.1	1.7	0.2	-5.5	0.5			3.8	0.8			0.7	-0.3
39	-0.7	-2.6	0.4	-1.0	-1.2	-1.7	1.2	9.9			-3.8		2.0	0.7	-5.4	-7.0	0.4	-0.9
40	-0.2	-0.1	-0.4	3.2			-0.5	-0.1			0.2		0.1	-0.3	-2.6	-1.1	-0.3	0.1
41	-0.3	-0.4	-0.4	-0.6	0.9	-0.4	0.4	-0.4	-4.2	-0.1	-3.2		-0.4	0.8	-5.7	-2.9	0.6	-0.5
42	0.1	-0.3	1.1	0.2	-6.2	-1.2	-0.1	1.1					-2.5	0.0			-1.1	0.0
43																		
44	0.6	0.4																

p- Scores for Sediments

LAB	Be		Al		Si		Cr		Mn		Fe		Ni		Cu		Zn	
	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2
1			3.0	1.8			0.2	0.4			0.6	0.5	0.3	0.3	0.2	0.5	0.5	0.4
2																		
3							0.5	0.4					0.2	0.3	0.1	0.5	0.0	0.2
4	0.4	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.1	0.2	0.3	0.2	0.3	0.4	0.5	0.1
5							0.3	0.3	0.3	0.2	0.3	0.6	0.3	0.0	0.1	0.5	0.9	0.1
6	0.0	0.0	0.3	0.2			0.2	0.2	0.2	0.1	0.3	0.2	0.7	0.3	0.2	0.2	0.1	0.1
7			1.7	0.5			0.4	0.1	0.3	0.1	0.6	0.3	0.5	0.3	0.4	0.5	0.3	0.1
8																		
9			0.1	0.0	0.1	0.1	0.2	0.6	0.2	0.2	0.2	0.1	0.6	0.5	0.4	0.8	0.3	1.1
10																		
11	0.2	0.5	0.2	0.2	0.2	0.3	0.2	0.1	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2
12																		
13	0.2	0.3	0.2	0.4			0.4	0.4	0.1	0.2	0.4	0.9	0.2	0.5	0.2	0.7	0.6	0.4
14	0.8	0.3	3.2	2.6			0.3	0.4	0.3	0.4	0.9	0.7	1.1	0.6	0.4	0.7	0.3	0.4
15	0.1	0.8					0.3	0.6			0.2	0.7	0.5	0.3	0.1	0.4	0.2	0.3
16			0.4	0.4	0.2	0.5	0.1	0.2	0.1	0.2	0.1	0.4	0.4	0.5	0.1	0.3	0.1	0.3
17									0.2	0.3	0.4	0.6	0.2	0.4	0.4	0.2	0.2	0.4
18																		
19	0.8	0.9	0.2	0.2			0.1	0.1	0.3	0.2	0.8	0.2	0.4	0.1	0.1	0.3	0.2	0.3
20	0.4	0.8	1.7	3.0			0.4	1.2	0.3	0.1	2.8	3.7	0.3	0.2	0.2	0.4	0.3	0.1
21																		
22	0.2	1.0	3.2	1.8	0.3	0.2	0.1	0.2	0.1	0.2	0.3	0.6	0.3	0.7	0.1	0.7	0.1	0.1
23			0.4	0.7			0.3	0.6	0.3	0.2	0.3	0.3	0.6	1.0	0.1	0.7	0.3	1.6
24																		
25	0.3	0.4	0.1	0.1			0.3	0.4	0.1	0.1	0.4	0.4	0.1	0.5	0.1	0.1	0.2	0.2
26	0.6	0.3	0.9	0.8	0.5	0.4	0.2	0.1	0.4	0.3	0.3	0.7	0.9	0.8	0.4	0.3	0.1	0.2
27			1.3	3.4			0.4	0.1	0.2	0.2	0.5	0.7	0.4	0.8	0.5	0.5	0.3	0.5
28	0.2	0.4	0.0	0.1			0.1	0.1	0.1	0.2	0.4	0.3	0.3	0.4	0.1	0.2	0.2	0.4
29	0.1	0.1	0.3	0.5			0.1	0.1	0.1	0.1	0.4	0.4	0.1	0.5	0.1	0.5	0.1	0.1
30																		
31	0.2	0.1					0.4	0.3	0.2	0.2	0.3	0.4	0.2	0.2	0.4	0.3	0.2	0.3
32	0.2	0.2					0.7	0.6	0.1	0.1	0.5	0.3			0.1	0.2	0.1	0.4
33			0.4	0.9			0.3	0.3	0.1	0.3	0.3	0.6	0.3	0.6	0.3	0.4	0.2	0.3
34			1.5	3.8			0.4	1.6	0.4	1.1	0.5	2.2	0.5	1.2	0.3	1.1	0.3	1.2
35	0.1	0.2			0.2	0.7	0.1	0.2			0.2	0.5	0.2	0.5	0.1	0.7	0.1	0.4
36	0.6	0.4	0.1	0.2	0.5	0.6	0.6	0.1	0.1	0.2	0.5	0.3	0.3	0.1	0.2	0.1	0.1	0.1
37																		
38	0.2	0.2	0.2	0.3			0.5	0.2	0.1	0.2	0.2	0.3	0.3	0.3	0.1	0.3	0.1	0.1
39	0.2	0.6					0.1	0.6	0.2	0.6			0.2	0.6	0.2	0.6	0.1	0.5
40	0.3	0.3					0.1	0.7	0.5	0.3			0.6	0.5	0.3	0.3	0.5	0.4
41	0.2	0.2	0.2	0.2	0.6	0.6	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.6	0.1	0.1
42	0.5	0.5	0.7	0.4			0.3	0.4	0.2	0.3	0.4	0.5	0.7	0.2	0.1		0.2	0.3
43																		
44				0.2					0.1	0.2								

p- Scores for Sediments

LAB	As		Se		Ag		Cd		Sn		Sb		Hg		Tl		Pb	
	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2	Sed 98	MESS-2
1	0.6	0.6	0.2	0.2	0.7	0.4	0.4	0.3	1.0	0.6			0.3	1.0			0.2	0.3
2													0.3	1.2				
3	0.2	0.8			0.6	0.6	0.4	0.6									0.3	0.3
4	0.3	0.4					0.2	0.5					1.0	0.4			0.3	0.1
5							0.6	0.5										
6	0.5	0.4	0.4	0.7	0.3	0.0	0.7				0.6	0.6	0.5	0.5			0.1	0.3
7							0.1	0.5									0.8	0.6
8																		
9	0.1	0.6	0.7	1.4	0.3	1.7	0.0	0.2	0.6	0.5	0.2	0.2					0.2	0.3
10																		
11	0.2	0.2	0.4	0.6	0.3	0.3	0.3	0.3	0.3	0.3	0.9	0.8	0.5	1.1	0.1	0.3	0.2	0.2
12																		
13	1.3	0.7			0.5	0.6	0.5	0.6	1.0	0.6	0.4	0.6	0.6	0.1	0.4	0.5	0.9	0.1
14	0.3	0.7	0.5	0.3	0.4	0.3	0.7	1.1			0.4	0.5	0.7	0.5	0.4	0.6	0.4	0.5
15	0.3	0.5	0.6	1.5	0.3	2.1	0.4	0.7					1.0	0.6			0.3	0.4
16	0.1	0.2	0.1	0.2			0.5	0.1					0.2	0.2			0.2	1.0
17	0.1	0.2	0.3	1.0	0.4	1.4	0.1	0.3					0.5	0.2			0.5	0.3
18	0.2	0.6	0.4	0.2			0.0	0.6					0.2	0.8			0.2	0.6
19	0.1	0.2	0.2	0.3			0.4	0.2					0.4	0.1			0.0	0.2
20	1.2	0.8	0.9	0.9	0.5	0.3	0.7	0.4					1.0	0.2			0.3	0.6
21																		
22	0.9	0.9	1.2	1.3	1.3	0.2	3.3	2.8	0.4	1.0	0.6	0.6	0.3	0.2	1.7	0.9	0.3	0.6
23	0.3	0.5			0.5	0.7							0.6	0.3			0.2	2.0
24																		
25	0.3	0.3	1.5	1.5	0.4	1.9	0.3	0.3	0.5	0.5	0.4	0.3	0.4	0.4	0.1	0.2	0.2	0.2
26	1.0	0.3	0.8	1.2	0.3	0.3	0.5	0.7	1.0	0.1	0.4	0.2	0.6	0.1	0.3	0.2	0.6	1.3
27																	0.3	2.5
28	0.2	0.3	0.4	0.0	1.4		0.4	2.0			0.4	0.0		0.0			0.0	0.6
29	0.1	0.2	0.4	0.3	0.0	2.5	1.1	0.2						0.4			0.2	0.4
30																		
31	0.3	0.3	0.2	0.2	0.2	0.4	0.2	0.5	0.3	0.5	0.3	0.3	0.3	0.3	0.6	0.5	0.2	0.3
32																		
33	0.2	0.3	0.2	0.4	0.9	2.6	0.3	0.4	0.6	0.7	0.6	0.2	0.5	0.8	0.4	0.3	0.2	0.3
34	0.5	1.0	0.7	0.9			0.4	2.7					2.6	3.7			0.2	1.0
35	0.3	0.2	0.6	0.4	0.2	0.1	0.1	0.3			2.5	0.5	0.3	0.3			0.1	0.3
36	0.4	0.2	0.5	0.7			0.4	0.3	0.9	0.7	0.6	0.8			0.3	0.2	0.5	0.2
37																		
38	0.4	0.2	0.6	0.6	0.4	0.6	0.6	0.5	0.5	1.0			0.2	0.2			0.1	0.4
39	0.4	0.1	0.6	0.7	0.6	0.3	0.1	0.5			0.6	0.3	0.5	0.4	0.4	0.4	0.2	0.2
40	0.6	0.4	0.6	0.6			0.2	0.4			0.2	0.1	0.2	0.5	0.2	0.4	0.4	0.2
41	0.1	0.2	0.2	0.2	0.2	0.3	0.1	0.2	0.4	0.3	1.0	0.3	0.6	0.4	1.1	1.0	0.1	0.3
42	0.1	0.4	1.4	0.3	0.6	0.5	0.4	0.8					0.0	0.5			0.1	0.2
43																		
44	0.3	0.2																

Z- Scores for Tissues

LAB	Cr		Fe		Ni		Cu		Zn		As		Se		Ag		Cd		Sn		Hg		Pb	
	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976
1	0.1	11.1	-2.9	-4.0	-0.1	-4.3	0.8	-0.7	-0.3	-1.7	0.9	-0.8	0.2	-0.2	2.5	0.0	0.1	-1.1			-0.1	-0.1	0.5	-0.9
2																					-0.2	1.5		
3	-0.6	1.1	-0.8	-1.2	-1.5		-1.3	-2.1	-1.6	-1.4	-2.8	-2.0	-0.3	0.4	-5.7		-1.6	0.5					-1.7	-1.6
4	-2.2	1.1	-0.3	-1.5	-2.2	-3.3	-2.0	-2.7	-0.4	-1.0	-1.7	-0.6					-0.7	-1.3	-1.7				-2.6	-3.6
5	-0.6	-0.9	-3.8	-2.5	-0.4	0.3	-2.2	-0.3	-2.0	-0.1							22.3	1.5					9.4	-1.2
6	0.3	0.2	1.7	0.6	0.9	-1.1	1.1	0.4	0.6	0.5	1.1	0.9	0.4	0.8	0.2		1.1	0.9	1.8	1.9	0.8	0.2	0.9	0.9
7																					-0.2	-0.6		
8									2.4	0.3	-0.4	-0.3	1.7	1.5			10.1	1.7					0.1	0.1
9			0.0	-0.6	-0.9	-1.0			-1.4	-1.5	-1.6	-1.5	-1.1	-0.3	-3.8	0.7	-1.1	-1.8			-0.3	0.6	-1.1	-1.1
10	-0.8	2.6	0.6	0.2	-0.2	0.3	-0.8	-1.3											-6.2	-0.4			0.5	-0.6
11	-4.2	-1.0	-1.2	-0.8	-0.6	-1.7	0.6	-0.2	0.1	-0.2	0.1	0.2	0.8	0.3	0.2	-2.1	-1.3	-0.2			-0.1	-0.0	0.3	0.7
12			-1.3	-0.9	-1.6	-2.6	-0.5	-0.4	0.3	0.5	-0.0	0.2			-1.1	-5.1	0.8	-0.3					-0.4	-0.2
13	0.1	2.7	-1.0	-0.7	-0.3	-0.1	-0.9	-1.1	0.6	0.6	-0.3	-0.4	11.1	4.3	-6.7	4.0	1.4	-1.2			-1.0	-1.1	0.0	0.4
14	-1.0	-1.3	0.7	0.1	0.2	1.0	0.4	-0.4	0.4	-0.2	1.9	1.5	1.7	1.4	-0.1	1.2	1.6	0.9			-1.5	-1.1	0.0	0.4
15	-0.5	-0.5	-0.9	-0.7	-0.7	-2.9	-0.5	-0.7	-0.7	-0.1	1.0	-0.1	-3.8	-2.1	0.4	-2.2	1.9	0.5			-3.1	-1.2	1.4	1.5
16	0.1	1.0			0.7	-0.6	0.7	-0.2	-0.1	-0.3	0.4	0.9	-1.4	-1.1			1.0	0.9			-0.2	1.4	-0.6	-0.0
17	-1.3	-1.4	0.3	0.0	-1.7	-1.5	0.3	0.1	-0.3	0.5	0.4	0.4	-0.0	0.0	-1.4	-0.2	0.0	0.2			0.2	1.0	-0.1	0.2
18											0.2	0.5	-0.8	0.3			-1.1	-0.1			0.3	1.0	-0.9	-0.2
19			-0.3	-0.2	-0.7	0.1	-0.9	-0.4	-0.3	0.4			-0.9	-0.4			-0.9	-0.2			0.3	0.1	0.1	-0.1
20	-8.7	-0.5	-1.9	-1.0	0.3	-0.1	0.4	-0.8	-0.7	-0.4	-2.0	-1.2	1.2	4.1	-2.2	-10.0	-2.5	-0.3			-1.4	-1.1	2.5	-2.9
21	1.4	5.6	0.6	-0.3	-0.1	-2.6	0.1	-0.4	-0.1	-0.6	1.6	0.8			-1.7	-3.3	-0.9	-0.4			-0.5	-1.2	-0.3	-0.2
22															-2.8						-6.2	-5.5		
23	-3.6		-1.7	-1.9			0.0	-0.4	-0.5	-1.8	-4.5	-0.9						-1.2						
24	-2.8	-3.1					0.7	1.1	-0.4	-0.1														
25	0.1	0.1	1.1	0.2	0.2	-0.4	-0.1	-0.5	0.5	0.6	0.8	-0.9	0.7	0.3	1.9	-4.0	0.6	0.0	-1.5	0.4	0.5	0.4	1.1	-0.4
26	0.1	1.9	0.7	0.3	-0.2	-0.7	-0.4	-0.4	0.2	-0.0	-0.3	0.1	-1.1	-0.3		2.3	-2.1	-0.3	1.0	-0.4	-0.8	-0.1	-0.7	0.2
27			0.9	0.4	-0.4	-2.3	0.9	-0.0	-2.1	-0.7	-0.5	-0.8			-3.6		-4.9	-1.2					1.8	1.1
28	0.4	-1.2	2.3	0.8	2.4	0.8	-0.8	-2.0	0.1	-0.5	0.0	0.8	-2.5	-5.4	3.8		5.6	-0.7			-1.8	4.8	0.0	-1.6
29																					-0.9			
30	0.5						-0.5										9.1							
31	-1.0	-0.2	0.4	0.5	-0.2	0.2	-0.1	0.3	0.1	-0.1	-0.1	0.2	-0.8	0.2	0.6	-0.4	-0.4	0.2	-5.1	0.5	-1.3	-0.1	-0.5	-0.3
32	1.5	-0.1	1.1	0.0			1.2	0.7	-0.1	0.2														
33															-0.2		0.4	-1.7			-5.3	-5.7	-1.8	-2.1
34			0.0	-0.8	-0.9	-2.8	1.4	1.0	-0.2	-0.6	2.8	1.2									0.1	0.1	0.6	0.1
35	-1.4	0.8	0.0	0.1	0.5	1.3	-0.6	-0.7	-0.0	0.2	-2.2	-0.9	0.4	0.3	-0.8		-1.9	-0.1	-2.6					
36	1.1	-0.2	1.7	0.1	1.2	0.5	1.1	-0.1	0.3	0.2	0.6	0.1	-2.4	0.2	-4.3	-0.9	-0.2	-0.2	1.0	1.0	-4.4	-0.3	0.3	0.3
37											1.6	1.2												
38	0.9	0.1	0.8	0.3	0.9	-0.7	0.0	-0.4	-0.2	-0.4	-0.2	-0.3	0.8	0.4	1.5		0.9	0.3			-0.6	0.5	1.4	0.8
39	0.4		-0.5	-0.4	0.2	0.4	1.4	0.6	1.2	1.1	-0.1	-0.4	0.5	1.4	-0.2		-2.6	-1.0			0.0	1.3	2.0	1.4
40	-2.4	1.1			0.0	0.2	-0.1	0.1	0.2	0.1	-1.5	-1.0	-1.1	0.3			0.9	-0.1			-0.6	-0.2	-0.0	0.0
41	1.0	-0.5	1.3	0.2	1.1	-0.5	-1.7	-0.7	0.3	0.7	-0.1	0.0	-0.0	-0.5	0.0		0.2	0.3	0.5		0.2	1.5	0.8	0.7
42	-7.5	-0.9	-1.3	-0.0	-2.2	-0.1	-0.8	0.4	0.7	0.6	-2.0	-0.2	0.1	-0.3	-7.7	-4.4	3.4	0.8			-5.1	-0.3	-1.4	0.0
43	-2.2	2.2	-1.9	-1.3	-0.5	-0.2	-0.1	0.2	-0.4	-0.2	-0.4	0.2	1.2	1.8	-4.9		-0.8	0.3			-4.1		-0.7	-0.2
44																								

p- Scores for Tissues

LAB	Al		Cr		Fe		Ni		Cu		Zn		As		Se		Ag		Cd		Sn		Hg		Pb	
	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976	Tiss 98	2976
1	0.9	1.1	1.3	0.9	1.2	0.7	0.7	0.8	0.7	0.5	0.9	0.5	1.1	0.6	0.5	0.7	0.7	2.9	1.1	0.5			0.2	0.5	0.7	0.3
2																							0.6	0.9		
3	0.3	0.8	1.0	1.8	0.3	0.1	0.4		0.1	0.3	0.1	0.1	0.3	0.4	1.2	0.9	1.2		0.2	0.4					0.3	0.5
4	0.1	0.1	1.5	2.8	0.2	0.3	0.6	2.0	0.2	0.6	0.2	0.4	0.2	0.7					0.5	2.8	2.1				0.7	1.0
5			0.9	0.3	0.8	0.6	0.4	1.4	1.7	0.3	0.2	0.2							1.5	2.0					0.5	0.8
6	0.1	0.6	0.3	0.5	0.3	0.2	0.1	0.2	0.3	0.2	0.1	0.2	0.2	0.2	0.3	0.4	0.9		0.6	0.3	0.5	1.3	0.2	0.2	0.2	0.0
7																										
8																							0.4	0.2		
9	0.3	0.1			0.2	0.2	0.1	0.3			0.2	0.3	0.0	0.1	0.4	0.5			0.2	0.2					0.2	0.5
10	0.3	0.3	0.7	1.8	0.3	0.4	0.4	0.4	0.1	0.1	0.2	0.1	0.2	0.3	0.9	0.6	0.8	0.7	0.6	0.2			0.1	1.2	0.3	0.2
11	0.1	0.5	0.4	0.2	0.1	0.2	0.1	0.3	0.1	0.2	0.1	0.1	0.1	0.4	0.2	0.7	0.2	0.5	0.1	0.1	0.2	0.5	0.3	0.8	0.2	0.0
12	0.1	0.1			0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.0			0.1	0.5	0.1	0.0					0.1	0.1
13	0.6	1.2	2.1	0.6	0.8	0.6	0.3	0.5	0.3	0.3	0.1	0.1	0.1	0.3	0.4	1.3	1.0	0.5	0.2	0.3			0.2	0.2	0.5	0.4
14	0.4	0.4	0.3	0.5	0.1	0.1	0.4	0.2	0.4	0.4	0.4	0.3	0.5	0.3	0.3	0.2	0.3	1.3	1.1	0.2			0.2	0.3	0.4	0.7
15			0.1	0.4	0.1	0.2	0.2	0.7	0.1	0.4	0.1	0.1	0.3	0.2	0.2	0.9	0.1	2.3	0.3	0.4			0.7	1.4	0.2	0.4
16			0.7	1.6			0.3	0.5	0.1	0.1	0.1	0.1	0.2	0.1	1.0	1.2			0.2	0.1			0.2	1.0	0.1	0.2
17			0.8	0.7	0.2	0.2	0.4	0.5	0.1	0.4	0.2	0.3	0.3	0.1	0.3	0.4	0.4	2.6	0.0	0.1			0.3	0.5	0.2	0.2
18													0.2	0.4	0.3	0.3			0.2	0.1			0.3	0.3	0.1	0.1
19					0.4	0.2	0.3	0.1	0.2	0.5	0.3	0.1			0.2	0.3			0.4	0.3			0.7	0.3	0.2	0.3
20	1.8	0.9	1.3	1.2	0.6	0.4	0.3	0.8	0.4	0.5	0.2	0.4	1.1	1.1	1.2	4.0	0.3		0.9	0.8			0.7	0.3	2.0	0.9
21	0.6	0.2	0.3	0.7	0.3	0.2	0.2	0.2	0.2	0.5	0.2	0.2	0.1	0.1			1.3	0.7	0.3	0.2			0.8	0.3	0.2	0.2
22																										
23			0.4		0.3	0.1			0.3	0.2	0.2	0.2	0.3	0.7			0.3						1.9	1.2		
24			1.1	3.5					0.2	0.8	0.1	0.1								2.8						
25	0.3	0.5	0.8	0.1	0.2	0.1	0.5	0.4	0.4	0.2	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.8	0.4	0.5	2.4	0.5	0.7	0.4	0.2	0.6
26	0.4	0.3	0.7	0.4	0.1	0.1	0.1	0.3	0.1	0.1	0.1	0.2	0.1	0.2	1.1	0.8		1.5	0.3	0.2	0.0	0.5	0.2	0.4	0.6	0.1
27					0.0	0.1	0.3	1.2	0.1	0.5	0.2	0.2	0.3	0.3			0.9		3.3	0.3					0.2	0.3
28	0.1	0.4	1.2	2.6	0.4	0.3	1.0	0.0	0.5	1.4	0.0	0.0	1.1	0.4	0.8	1.3	0.5		3.9	0.7			1.1	0.0	2.0	0.0
29																										
30			0.3						0.1										0.5				0.4			
31	0.4	0.3	0.6	0.6	0.4	0.2	0.4	0.4	0.2	0.4	0.4	0.4	0.1	0.2	0.6	0.3	0.3	0.9	0.5	0.1	0.6	1.0	0.4	0.3	0.4	0.3
32			0.1	1.0	0.2	0.4			0.4	0.8	0.3	0.2														
33																										
34	0.5	2.0			0.4	0.3	0.3	0.7	0.3	0.7	0.3	0.7	0.4	1.1			0.3		0.8	0.5			1.2	2.0	0.4	0.9
35	0.4	0.2	0.2	0.6	0.5	0.1	0.4	0.9	0.5	0.1	0.5	0.1	0.8	0.3	0.7	0.3	0.5		1.4	0.1	1.1		0.2	0.2	0.5	0.3
36			0.1	0.3	0.1	0.2	0.1	0.6	0.2	0.2	0.1	0.2	0.2	0.2	0.7	0.5	0.5	1.0	0.4	0.2	0.4	0.8	1.0	0.6	0.3	0.2
37													0.2	0.1												
38	0.3	0.8	0.2	0.5	0.3	0.3	0.2	0.5	0.1	0.2	0.3	0.2	0.3	0.5	0.2	0.4	0.2		0.3	0.3			0.5	0.8	0.3	0.5
39			0.4		0.3	0.7	0.7	0.7	0.3	0.2	0.1	0.2	0.2	0.5	0.9	1.0	0.4		0.5	0.4			0.5	0.8	0.7	0.8
40			0.3	0.3			0.5	0.8	0.4	0.6	0.5	0.4	0.6	0.1	0.5	0.5			0.6	0.2			0.9	0.6	0.4	0.3
41	0.1	0.3	0.2	0.2	0.2	0.3	0.2	0.5	0.7	0.7	0.0	0.4	0.3	0.4	0.2	0.3	0.4		0.2	0.2	0.2		0.5	0.2	0.2	0.2
42	1.2	0.2	0.6	1.6	0.0	0.2	0.3	0.8	0.7	0.2	0.1	0.5	1.3	0.8	0.6	0.3	1.4	3.9	1.1	0.3			0.5	0.2	1.3	1.2
43	5.1	1.5	0.7	1.8	0.6	0.6	0.5	0.6	0.5	0.3	0.6	0.3	0.6	0.4	0.7	0.9	1.7		0.7	0.4			1.2		0.6	0.4
44																										