



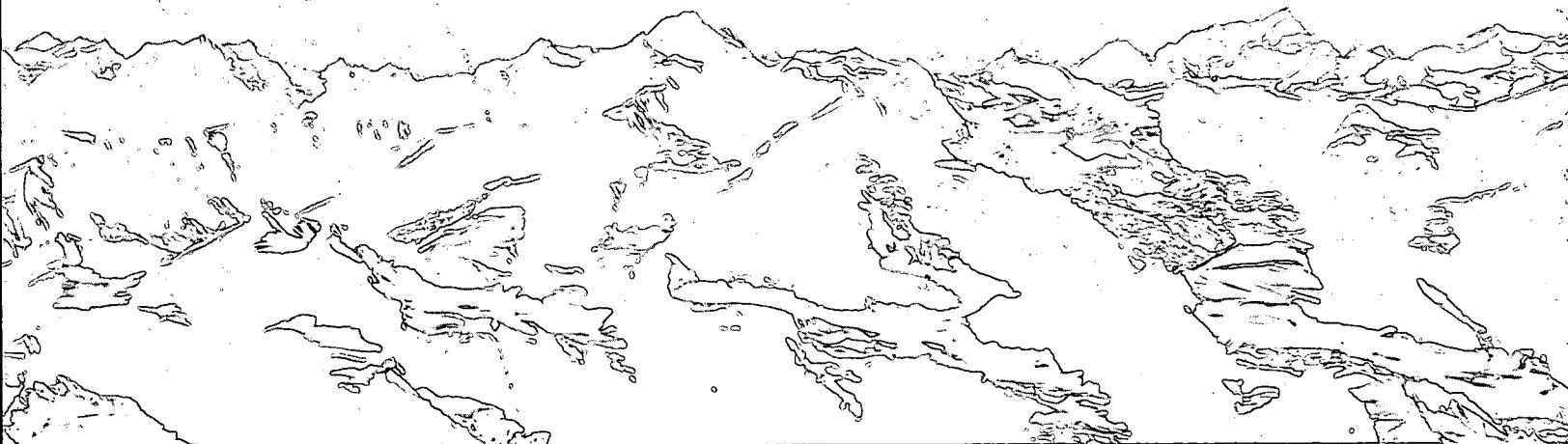
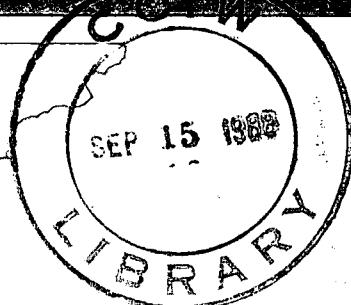
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# National Interlaboratory Quality Control Study No. 35

## Trace Metals in Sediments

V. Cheam, A.S.Y. Chau and W. Horn



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INLAND WATERS DIRECTORATE  
NATIONAL WATER RESEARCH INSTITUTE  
CANADA CENTRE FOR INLAND WATERS  
BURLINGTON, ONTARIO, 1988

(Disponible en français sur demande)



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## **Abstract**

This report describes an interlaboratory study for the analysis of ten heavy metals in five different sediment reference materials. Over 40 Canadian laboratories participated in the study. The "total" content, as expected, was greater than the "extractable" content for each of the metals studied (Al, Cd, Co, Cu, Fe, Mn, Ni, Pb, V, and Zn). The ratio of "total" to "extractable" varied from metal to metal and ranged from 3.5 for Al to 1.02 for Cu.

## **Résumé**

Ce rapport décrit une étude interlaboratoire pour l'analyse de dix métaux lourds dans cinq différentes substances sédimentaires de référence. Plus de 40 laboratoires canadiens ont participé à l'étude. La teneur «totale», comme on pouvait le prévoir, était supérieure à la teneur «extractible» pour chacun des métaux étudiés (Al, Cd, Co, Cu, Fe, Mn, Ni, Pb, V et Zn). Le rapport de «total» à «extractible» variait selon le métal, étant compris entre 3.5 pour Al et 1.02 pour Cu.

## List of Symbols

n Number of results used

l Number of laboratories reporting data

$\bar{x}$  Mean value,  $\bar{x} = \sum x_i/n$

$$S \text{ Standard deviation, } S = \left( \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1} \right)^{1/2}$$

H Result with a flag H was assessed to be high

VH Result with a flag VH was assessed to be very high

L Result with a flag L was assessed to be low

VL Result with a flag VL was assessed to be very low

T Total

E Extractable

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### INTRODUCTION

This intercomparison study forms part of the continuing National Interlaboratory Quality Control Program of the Quality Assurance Project at the National Water Research Institute (NWRI). As in other national studies, it serves to assess the methodology and data of the laboratories of the Water Quality Branch and the National Water Quality Laboratory by comparison with peer laboratories, and to establish laboratory performance of federal, provincial, university, and private laboratories.

The study covered ten heavy metals, including several priority pollutants such as Cd, Cu, Pb, Ni, and Zn.<sup>1</sup> Each participating laboratory analyzed five sediment samples for these metals and had its methods and data assessed against those of some 40 other laboratories.

### STUDY DESIGN

The study used five test samples of naturally contaminated sediment reference materials (RM) (Table 1). Each laboratory chose its own analytical method, but was encouraged to use more than one method.

Table 1. Description of Samples

Test samples	RM	Origin
1	WQB-1	Lake Ontario
2	WQB-3	Lake Ontario-Hamilton Harbour Mixture
3	TH-1	Toronto Harbour
4	HR-1	Humber River
5	SD-1	Sudbury

### EXPERIMENTAL

#### Sample Preparation

Test bottles used were of wide-mouth amber glass with a capacity of 50 mL. They were soaked in 2% HNO<sub>3</sub>

overnight, rinsed with deionized distilled water, and oven-dried before use. The sediments were dried and homogenized following the procedures described by Cheam and Chau.<sup>2</sup>

Forty-nine laboratories received 3-g sediment samples, whereas two laboratories requested and received 10-g samples.

#### Analyses

Table 2 lists the various methodologies and the number of laboratories using each of them. Several participants used more than one analytical method for determination of each metal.

Table 2. Methodologies Used

Methodology	No. of labs
Atomic absorption spectrometry with flame (AAS)	40
Atomic absorption with graphite furnace atomizer (AA Graphite)	5
Inductively coupled plasma (ICP)	16
Instrumental neutron activation analysis (INAA)	4
Direct current plasma (DCP)	2
Inductively coupled plasma/mass spectrometry (ICP/MS)	1
Other	3

### DATA EVALUATION

The median value for each sample was determined using all data (except the "less than" values) reported by the participants. The mean and standard deviation were calculated without data rejection (Appendix A, Tables A-1 to A-20). The results of each sample from all the laboratories were ranked according to Youden.<sup>3</sup> All the results were evaluated using the flagging technique<sup>4</sup> as applied in our other quality assurance (QA) programs for the Long Range Transport of Airborne Pollutants (LRTAP) and the International Joint Commission (IJC). By this technique,

the results are classified into five categories, namely unflagged, L (low), VL (very low), H (high), and VH (very high), based on comparison with the medians. Since medians are often good estimates of the true values in unknown samples, the flagging technique provides some evaluation of each result based on median values. Thus, the most accurate results are those that are not flagged, whereas the VH or VL results are farther away from the medians and are interpreted as less accurate.

The ranking procedure<sup>3,4</sup> also assesses simultaneously the pooled "total" and "extractable" results from all five samples to determine laboratories with pronounced systematic errors. The criteria for preparing statements of laboratory appraisals<sup>3,4,5</sup> routinely used in LRTAP and IJC programs have been applied to this study. The optimal values for the Lower Limit for Use of Basic Acceptable Error (LLBAE), the Basic Acceptable Error (BAE), and the Concentration Error Increment (CEI) used in the ranking process are shown in Table 3 for both "total" and "extractable" metals.

Table 3. Optimal Values Used in Ranking Process

Metals	LLBAE	BAE	CEI
Al	2.00	0.60	0.10
Cd	2.00	1.20	0.10
Co	10.00	7.50	0.10
Cu	70.00	7.00	0.10
Fe	2.00	0.25*	0.10
Mn	500.00	50.00	0.10
Ni	40.00	10.00	0.10
Pb	50.00	15.00	0.10
V	30.00	12.00	0.10
Zn	400.00	30.00	0.10

\*"Total" Fe; 0.5 for "extractable" Fe.

## RESULTS AND DISCUSSION

### Sample Pretreatment

The procedures for digesting sediments were so varied that there were almost as many procedures as participants. The tabulation of procedures with their associated chemicals, however, reveals that the most often used procedure for "total" metals was the  $\text{HNO}_3\text{-HClO}_4\text{-HF}$  digestion with some  $\text{HCl}$  and  $\text{H}_3\text{BO}_3$ . For "extractable" metals, aqua regia was the most often used digestion procedure. Table 4 lists the various procedures and the number of laboratories using each of them.

The neutron activation technique, which was used by four laboratories for analysis of "total" metals, needs no sample pretreatment. The "total" content by this technique

Table 4. Sample Pretreatment Procedures

"Total" metal pretreatment procedures	No. of labs
$\text{HNO}_3\text{-HClO}_4\text{-HF}$	8
$\text{HNO}_3\text{-HClO}_4\text{-HF-HCl}$	6
$\text{HNO}_3\text{-HClO}_4\text{-HG-H}_3\text{BO}_3$	1
Aqua regia- $\text{HF-H}_3\text{BO}_3$	3
Aqua regia-HF	3
Aqua regia-HF- $\text{H}_2\text{O}_2$	1
Aqua regia (for "total")	3
$\text{HNO}_3\text{-HClO}_4\text{-HCl}$	2
$\text{HNO}_3\text{-HCl}$	2
$\text{HNO}_3\text{-HF}$	2
$\text{HF-HClO}_4\text{-HCl}$	1
Ash overnight- $\text{HNO}_3\text{-HCl}$	1
Metaborate fusion and pyrosulphate fusion	2

"Extractable" metal pretreatment procedure	No. of labs
Aqua regia	7
$\text{HNO}_3\text{-HClO}_4$	2
0.5 N HCl	2
$\text{HNO}_3$	2
$\text{HCl-HNO}_3\text{-H}_2\text{O}_2$	1
$\text{HNO}_3\text{-H}_2\text{O}_2$	1
$\text{HNO}_3\text{-HCl-Microwave}$	1

is grouped with that by wet chemical techniques, which usually entail complete destruction of the sediment matrix including the silica lattice. The "extractable" dissolution procedures usually extract the more readily available metals without destruction of the silica lattice.

### Analytical and Ranking Data

All raw, flagged, and ranked data for individual samples are tabulated in Appendix A, Tables A-1 to A-20, along with the medians, means, and standard deviations. The overall ranking results for pooled "total" and pooled "extractable" data are given in Appendix B, Tables B-1 to B-10.

### Aluminum

The median values from each methodology are compared with the medians from pooled data for both "total" and "extractable" aluminum in Appendix C, Table C-1. Calculations indicate that the individual medians are within 10% of the pooled medians and therefore are, as operationally defined, compatible.

Besides methodology comparison, Table C-1 also compares "total" to "extractable" Al and shows significant disparity between the two, the "total" being more than three times the "extractable." In fact, the exact ratio of the pooled "total" median to the pooled "extractable" median

for each of the five samples ranges from 3.2 to 3.7, giving an average of 3.5. This means that 71% of "total" Al content is well-embedded in the silica lattice as 29% of it is easily extracted by the "extractable" dissolution procedures.

Table 5 summarizes the overall ranking results, listing the laboratories with the fewest systematic errors (column 3) and laboratories with biased results (columns 4 and 5) for all "total" metals studied. Laboratories with the fewest systematic errors for Al were laboratories 130, 111, 58, 120, 102, and 136.

Table 6 summarizes the overall ranking results for "extractable" metals. Laboratories 19C, 30D, 13, and 67 were identified as having the fewest systematic errors for Al.

#### Cadmium

Of all the metals studied, cadmium is the only element that has the number of results used smaller than the number of laboratories reporting Cd data for each methodology (Appendix C, Table C-2). This is due to a combination of high detection limit and low levels of Cd in the sediments studied. Thus a small degree of compatibility is expected.

The DCP "extractable" results by laboratory 47 are obviously biased high (Table C-2). The overall Cd ranking results are summarized in Tables 5 and 6.

#### Cobalt

Appendix C, Table C-3, summarizes the median results and shows that there is very little difference between the two types of cobalt. In fact, the ratio of the pooled "total" median to the pooled "extractable" median ranges only from 1.01 to 1.06, with an average of 1.04; that is, 96% of Co can be easily extracted.

The AA "total" data are consistently higher than the pooled medians in all five samples (Table C-3). The Co ranking results are summarized in Tables 5 and 6.

#### Copper

As in cobalt, the difference between the two species of copper is small; the ratio of the pooled "total" median to the pooled "extractable" median ranges from 1.00 to 1.04, with an average of only 1.02. This corresponds to 98% extraction efficiency of the "extractable" dissolution procedures.

The methodologies are compatible for both species.

Note, however, that the INAA has a high detection limit and DCP results fluctuate more than the others (Appendix C, Table C-4). Many laboratories are identified as having few systematic errors (Tables 5 and 6).

#### Iron

Appendix C, Table C-5, shows that there is a significant difference between the two types of iron. The pooled "total" medians are higher than the pooled "extractable" medians, giving an average ratio of 1.26, which corresponds to about 20% of Fe embedded in the silica lattice.

All methodologies except DCP are compatible. The DCP "extractable" results are consistently higher than the pooled medians by more than 10%. The Fe ranking results are summarized in Tables 5 and 6.

#### Manganese

The pooled "total" medians for manganese are consistently higher than the pooled "extractable" medians by an average ratio of 1.16, which corresponds to 86% of "extractable" Mn. All methodologies are compatible, and the ranking results are summarized in Tables 5 and 6.

A point of interest should be noted. Laboratory 57 attempted fusion at different temperatures and found potential loss of Mn at elevated temperatures. In sample 1, for example, they found 1420 ppm Mn at 800°C as opposed to 2320 ppm Mn at 650°C. The latter result is indeed very close to the pooled "total" median (Appendix C, Table C-6).

#### Nickel

Appendix C, Table C-7, shows that the individual "total" medians for nickel are compatible, but the DCP "extractable" results are high. The ratio of pooled medians ranges from 1.03 to 1.17, with an average of 1.10 for the five samples; 91% of Ni is in "extractable" form. The ranking results for both species of Ni are summarized in Tables 5 and 6.

#### Lead

The ratio of pooled "total" medians to pooled "extractable" medians for lead for each of the five samples ranges from 1.02 to 1.14 (Appendix C, Table C-8), with an average of 1.07 or 93% in "extractable" form. The DCP "extractable" data are again high, whereas the other methodologies are compatible. The Pb ranking results are summarized in Tables 5 and 6.

**Table 5. Summary of Overall Ranking Results for Pooled "Total" Metals in Five Samples**

Metal	Rank range (Rank average)	Labs within 20% of rank average	Labs with biased high results	Labs with biased low results
Al	1.2 - 32 (16.5)	130, 111, 58, 120, 102, 136	30B, 74	53, 12, 8, 51
Cd	3.0 - 23.9 (13.56)	57, 93, 74B, 62, 73, 19, 24	6	120B
Co	2.0 - 31.2 (16.21)	136, 102, 30, 51, 137, 58, 19, 24, 19B	11B, 53, 65	120B, 12
Cu	1.6 - 33.6 (17.60)	30, 57, 8, 62, 6, 109B, 57B, 23, 74, 19, 58, 111	30B	53, 12, 74B
Fe	1.2 - 34.6 (18.5)	111, 109, 23, 30, 109B, 6, 62, 3, 137	19B, 58, 24	12, 8
Mn	2.0 - 33.2 (17.5)	57B, 51, 8, 23, 111, 109B 19, 30, 58, 76, 109, 19B, 53	136, 137	12
Ni	2.4 - 30.4 (16.92)	76, 51, 19B, 73, 30, 10, 58C, 120, 89, 60, 57B	111B, 6	15, 53, 12
Pb	3.4 - 32.0 (16.5)	73, 74, 109, 57B, 51B, 102 30B, 60B, 109B	65, 111B	12, 23, 10C
V	1.6 - 20.6 (11.5)	65, 136, 137, 10, 57B	15, 23, 19	12, 51
Zn	4 - 36.6 (19.5)	109, 60, 137, 62, 19B, 41, 120B, 102, 30B	136, 15	65, 19, 93

**Table 6. Summary of Overall Ranking Results for Pooled "Extractable" Metals in Five Samples**

Metal	Rank range (Rank average)	Labs within 20% of rank average	Labs with biased high results	Labs with biased low results
Al	1.0 - 12.8 (7.0)	19C, 30D, 13, 67	119, 34	2, 58B
Cd	2.1 - 14.6 (7.81)	30D, 13, 19C, 58B	47, 10D	71
Co	1.0 - 13.8 (7.5)	19C, 13, 19D, 30C	5	58B
Cu	1.2 - 17.0 (9.0)	30D, 19C, 119, 5, 67, 10D, 34	13	58B, 93B, 2
Fe	1.6 - 15.5 (9.0)	67, 19C, 13, 5, 21	30D	2, 58B, 93B
Mn	1.2 - 14.5 (8.5)	5, 21	130C	58B, 71
Ni	1.0 - 15.1 (8.5)	19D, 21	119, 130C	58B, 2
Pb	1.0 - 15.5 (8.5)	34, 21, 30D	47, 119	58B
V	1.0 - 9.4 (5.5)	67, 10B, 19D, 13	30C, 119	58B, 5
Zn	2.0 - 18.0 (9.5)	19C, 19D, 71, 21	119	2, 93B

## **Vanadium**

The number of analytical results and laboratories reporting vanadium data are fewer than for other metals (Appendix C, Table C-9). The pooled medians indicate that the "total" content exceeds the "extractable" content by about 100%. In fact, the average ratio for the five samples is exactly 2.00. This ratio may not be very reliable, however, as the degree of methodology compatibility is small. For example, the AA "total" medians are high relative to the pooled medians, whereas the "extractable" medians by AA and ICP differ greatly from each other.

## **Zinc**

Appendix C, Table C-10, shows that "total" and "extractable" medians for zinc are very similar, the average ratio of the pooled medians being only 1.03. This seems to suggest that Zn, as with Co, Cu, and Pb, is not well embedded in the silica lattice, and therefore is more easily extracted than Al, Fe, Mn, and perhaps V.

The results from the various methodologies compare well with each other, although the INAA median in sample 1 and the DCP medians in samples 1 and 4 are high. The Zn ranking results are summarized in Tables 5 and 6.

## **CONCLUSION**

This study helped each laboratory to assess its methods and data against many other laboratories in the analysis of heavy metals in sediments. Methods validation and data verification are essential components of any credible quality assurance program.

Although a few laboratories tended to have consistent biased results, many participants reported compatible heavy metals data. Appendix D summarizes the laboratory appraisals based on pooled data.

The average ratio of pooled "total" medians to pooled "extractable" medians over the five samples studied ranged from 1.02 to 3.5 and could be grouped as follows: metals with low ratio of 1.02 to 1.07 (Cu, Co, Zn, and Pb); metals with a medium ratio of 1.10 to 1.26 (Ni, Mn, Cd, and Fe); and metals with a high ratio of 2.0 to 3.5 (V and Al).

## **ACKNOWLEDGMENTS**

We gratefully acknowledge the participation of the managers and analysts of the participating laboratories listed in Appendix E.

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- Aspila, K.I. Interlaboratory quality control study No. 23: metals in analytical reference sediment WQB-2.
- Aspila, K.I., and H. Agemian. National interlaboratory quality control study No. 28: arsenic and selenium in soils and sediments.
- Cheam, V., and A.S.Y. Chau. National interlaboratory quality control study No. 30: chloride, sulphate, nitrate and nitrite, reactive silica, and fluoride in natural and spiked water samples.
- Lee, H.B., and A.S.Y. Chau. National interlaboratory quality control study No. 31: analysis of PCBs in sediment extracts and standard solutions.
- Lee, H.B., and A.S.Y. Chau. National interlaboratory quality control study No. 32: analysis of OC insecticides.
- Lee, H.B., and A.S.Y. Chau. National interlaboratory quality control study No. 34: analysis of PAH in solution and sediment samples.

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**Appendix A**  
**Tables for Raw, Flagged, and Ranked Data  
for Individual Samples**

Table A-1. Total Aluminum (pooled data)

SAMPLE	LAB NO	REPORTED VALUE	RANK	1	REPORTED VALUE	RANK	2	REPORTED VALUE	RANK	3	REPORTED VALUE	RANK	4	REPORTED VALUE	RANK	5	REPORTED VALUE	RANK
N006		8.90	26.50		6.10	26.50		6.60	29.00		6.30	24.50		6.70	28.00			
N008		2.53 VL	3.00		1.80 VL	3.00		1.94 VL	3.00		1.73 VL	3.00		2.70 VL	6.00			
N010		7.39	10.00		3.89 VL	8.00		3.35 VL	6.00		4.79 L	9.00		4.93 L	9.00			
N012		1.75 VL	1.00		1.17 VL	2.00		1.40 VL	2.00		1.08 VL	2.00		1.11 VL	2.00			
N015		5.78 VL	7.00		3.28 VL	6.00		3.42 VL	7.00		3.58 VL	7.00		3.45 VL	7.00			
N019		7.61	12.00		5.51	11.00		5.51	10.00		5.64	13.50		5.94	13.00			
N019B		8.81	25.00		6.18	28.00		6.54	27.00		6.65	31.00		6.93	30.00			
N023		5.40 VL	9.00		5.20	10.00		5.60	11.00		5.60	12.00		5.80	10.50			
N030		8.60	22.50		6.00	23.00		6.20	20.00		6.20	20.00		6.20	15.50			
N030B		9.79 H	32.00		6.72	32.00		6.09 H	32.00		6.81 VL	32.00		7.15 VL	32.00			
N051		3.42 VL	4.00		2.04 VL	4.00		2.37 VL	4.00		1.88 VL	4.00		1.85 VL	3.00			
N053		1.85 VL	2.00		1.40 VL	1.00		1.38 VL	1.00		1.37 VL	1.00		1.07 VL	1.00			
N057		8.38	19.00		6.00	23.00		6.40	24.00		6.16	18.00		6.40	19.00			
N057B		8.56	21.00		6.02	25.00		6.33	22.00		6.26	22.00		6.23	25.00			
N058		8.06	14.00		5.77	14.00		6.08	17.00		6.10	17.00		6.23	17.00			
N062		9.71 H	31.00		6.10	26.50		6.60	29.00		6.29	23.00		6.47 VL	21.00			
N065		4.20 VL	5.00		4.40 L	9.00		5.50 VL	9.00		5.00 VL	10.00		5.70 VL	8.00			
N073		5.98 VL	8.00		3.34 VL	7.00		3.66 VL	8.00		3.25 VL	6.00		3.55 VL	5.00			
N074		9.50 H	30.00		6.38	30.00		6.60	29.00		6.60	30.00		7.00	31.00			
N074B		8.90	26.50		6.00	23.00		6.00	16.00		6.30	24.50		6.50	23.00			
N076		8.78	24.00		5.97	19.00		6.37	23.00		6.20	20.00		6.66	27.00			
N102		8.60	22.50		5.80	16.50		5.80	12.00		6.20	20.00		6.20	15.50			
N109		9.07	29.00		5.99	21.00		6.46	25.00		6.35	26.00		6.51	24.00			
N109B		8.44	20.00		6.21	29.00		6.76	31.00		6.59	28.50		6.43	20.00			
N111		7.52	11.00		5.78	15.00		6.11	18.00		6.78	15.50		5.96	14.00			
N111B		8.98	28.00		6.48	31.00		6.48	26.00		6.59	29.50		6.82	29.00			
N120		8.28	16.00		5.83	18.00		5.85	13.00		4.16 VL	8.00		6.54	26.00			
N120B		5.15 VL	6.00		2.63 VL	5.00		2.93 VL	5.00		2.08 VL	5.00		2.29 VL	4.00			
N130		8.30	17.00		5.60	13.00		5.92	15.00		5.64	13.50		5.80	10.50			
N130B		7.91	13.00		5.56	12.00		5.88	14.00		5.56	11.00		5.91	12.00			
N135		8.13	15.00		5.80	16.50		6.16	19.00		5.78	15.50		6.48	12.00			
N137		8.33	18.00		5.98	20.00		6.27	21.00		6.39	27.00		6.39	18.00			
MEDIAN CONC.		8.290			5.800			6.040			5.940			6.215				
$\bar{x}$		7.31			5.00			5.27			5.12			5.35				
S		2.28			1.71			1.78			1.84			1.87				
n		32			32			32			32			32				
1		32			32			32			32			32				

Table A-2. Extractable Aluminum (pooled data)

SAMPLE LAR NC	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N002	.120 VL	1.00	.066 VL	1.00	.033 VL	1.00	.056 VL	1.00	.089 VL	1.00
N005	2.35	4.00	1.35	3.00	1.73	4.00	1.69	3.00	1.43	3.00
N010B	1.99	3.00	1.43	4.00	1.65	3.00	1.69	10.00	1.80	8.50
N013	2.57	6.00	1.63	8.00	2.28	9.50	1.65	8.00	1.58	5.00
N019C	2.71	8.00	1.57	6.00	1.82	5.00	1.23	4.00	1.33	10.00
N019D	3.56 H	11.00	1.83	10.00	2.29	11.00	1.68	9.00	1.33	11.00
N030C	3.13	10.00	1.85	11.00	2.20	9.50	1.78	11.00	1.74	7.00
N030D	2.61	7.00	1.61	7.00	1.90	7.00	1.57	6.00	2.47 H	12.00
N034	5.00 VH	13.00	2.66 VH	12.00	2.93 VH	12.00	2.50 H	12.00	1.130 VL	2.00
N054B	2.146 VL	2.00	0.0914 VL	2.00	0.128 VL	2.00	0.1070 VL	2.00	1.80	8.50
N067	2.9	9.00	1.7	9.00	2.0	8.00	1.60	7.00	4.22 VH	13.00
N119	4.76 VH	12.00	4.20 VH	13.00	4.43 VH	13.00	4.20 VH	13.00	1.62	6.00
N130C	2.38	5.00	1.56	5.00	1.84	6.00	1.39	5.00		
MEDIAN CONC.	2.610	1.610		1.900			1.600		1.740	
$\bar{x}$	2.63	1.66		1.93			1.59		1.70	
S	1.43	1.03		1.10			1.02		1.01	
n	13	13		13			13		13	
l	13	13		13			13		13	

Table A-3. Total Cadmium (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N003	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00
N006	4. VH	21.00	6. VH	24.50	8. VH	26.00	8. VH	28.00	4. H	20.00
N008	3.	18.50	6. VH	26.50	6. VH	27.50	6. VH	23.00	3.	14.00
N010C	4.72 VH	23.00	6.45 VH	27.00	6.95 H	27.00	6.40 VH	25.00	3.20	16.00
N012	2.24	16.00	4.62	18.00	6.45	20.00	4.93	21.00	2.12	9.00
N019	1.83	11.00	3.37	11.00	6.77 H	23.00	5.60	13.00	3.56 H	18.00
N019B	<5.0	0.00	<5.0	0.00	<5.0	0.00	<5.0	0.00	<5.0	0.00
N023	3.	18.50	6. VH	24.50	6. VH	27.00	4.8	16.50	<2.	0.00
N024	1.1	6.00	3.7	13.00	9.5 VH	28.00	4.2	20.00	2.2	10.00
N030	1.6	8.00	3.0	8.50	4.1	7.00	3.0	9.00	1.7	25.50
N030B	<2. L	2.00	2.25 L	5.00	4.0	5.00	2.39	7.50	1.0 L	22.50
N041	1.70	9.50	6.7 VL	1.00	4.7	8.00	2.39	3.00	0.7 VL	1.00
N051B	1.5	7.00	3.0	8.50	4.5	9.00	3.55	12.00	1.0 L	22.50
N057	1.05	5.00	2.77	7.00	4.77	12.00	2.99	6.00	1.46	4.00
N057R	<2.0	0.00	3.57	12.00	4.8	13.00	3.3	10.50	<2.0	0.00
N058	<2.00	0.00	4.0	16.50	4.6	10.50	3.3	10.50	1.7	5.50
N060	<1.	0.00	5.01	20.00	6.02	19.00	3.67	14.00	<2.00	0.00
N062	<2.	0.00	5.2	21.00	<1. VL	1.00	2.0 L	2.00	<1.	0.00
N065	4.13 VH	17.00	6.36 VH	26.00	4.0	5.00	<2.0 L	1.00	8.6 VH	21.00
N072	2.1	14.50	3.9	15.00	4.40 VH	27.00	7.76 VH	27.00	3.16	15.00
N074	2.6	14.50	4.8	19.00	4.6	10.50	4.0	16.50	2.3	11.00
N074B	1.9	12.00	3.8	14.00	5.05	21.50	4.66	19.00	2.5	12.00
N089	2.0	13.00	5.5 H	22.00	5.3	15.00	6.1 VH	24.00	1.9	7.00
N093	1.5 L	4.00	3.01	10.00	5.5	16.00	4.4	18.00	2.0	8.00
N102	<1.	0.00	2.0 L	22.50	4.7	5.00	7.50	7.50	<1.	13.00
N111	3.7 H	20.00	5.9 H	23.00	7.8 VH	25.00	5.9 VH	22.00	3.9 H	19.00
N111B	5.0 VH	24.00	6.6 VH	28.00	6.5	21.50	6.5 VH	26.00	3.4	17.00
N120	<2. L	2.00	2.56	6.00	3.79	3.00	2.61	5.00	<2.	0.00
N120B	<2. L	2.00	2.14 L	4.00	3.62 L	2.00	2.40	4.00	<2.	0.00
N130	<10.	0.00	<10.	0.00	<10.	0.00	<10.	0.00	<10.	0.00
MEDIAN CONC.	1.950	3.850		5.150		3.735		2.300		
$\bar{x}$	2.44	4.01		5.66		4.30		2.64		
S	1.23	1.59		1.64		1.64		1.70		
n	21	28		27		27		21		
l	31	31		31		31		31		

**Table A-4. Extractable Cadmium (pooled data)**

SAMPLE	1	2	3	4	5			
LAB NO	REPORTED VALUE	RANK						
N002	2.1	10.00	3.9	11.00	5.9	12.00	4.0	11.50
N005	<1.	1.00	2.	1.00	1.	1.00	1.	3.00
N0100	2.81 H	12.00	5.9 VH	14.00	7.88 VH	14.00	6.48 VH	14.00
N013	1.6	8.00	3.4	7.00	4.3	6.00	3.6	9.00
N019C	3.72 VH	13.00	4.85	12.00	3.46	1.00	1.30 VL	1.00
N019D	<5.0	0.00	<5.0	0.00	<5.0	0.00	<5.0	0.00
N021	1.8	9.00	3.8	9.50	3.52	11.00	3.8	10.00
N030C	1.2	3.50	2.6	3.00	3.5	2.50	2.9	2.00
N030D	1.45	7.00	3.65	8.00	4.65	7.00	3.55	1.1
N034	1.3	6.00	3.8	15.00	4.0	5.00	3.4	1.4
N047	10. VH	14.00	17. VH	15.00	14. VH	15.00	12. VH	15.00
N058B	<2.00	0.00	3.8	9.50	4.84	9.00	3.47	7.00
N067B	1.2	3.50	3.1	6.00	4.7	8.00	3.4	5.50
N071	1.1	2.00	2.6	3.00	3.5	2.50	2.3	2.00
N093B	2.3	11.00	4.8	13.00	6.6 H	13.00	5.3 H	13.00
N119	1.24	5.00	2.6	3.00	3.7	4.00	2.7	3.00
N130C	<5.	0.00	<5.	0.00	<5.	0.00	<5.	0.00
MEDIAN CONC.	1.525		3.650		4.700		3.550	
X	2.45		4.42		5.42		4.15	
S	2.39		3.62		2.68		2.48	
n	13		15		15		15	
l	17		17		17		17	

Table A-5. Total Cobalt (pooled data)

SAMPLE	REPORTED LAB NO	1 VALUE	1 RANK	2 REPORTED VALUE	2 RANK	3 REPORTED VALUE	3 RANK	4 REPORTED VALUE	4 RANK	5 REPORTED VALUE	5 RANK	
N003	<20.	0.00	<20.	0.00	<20.	0.00	<20.	0.00	<20.	0.00	41.2	10.00
N006	34.	VH	28.00	30.	VH	28.00	30.	VH	27.00	65.	VH	31.00
N008	26.		24.00	20.		25.00	20.		25.00	50.		24.00
N010	24.0		23.00	18.		20.50	19.		22.00	18.		18.50
N012	14.7		6.00	10.3		4.00	9.71		3.00	6.42		2.00
N019	19.8		18.00	13.4		11.00	15.4		17.00	16.7		15.00
N019B	21.2		20.00	14.8		16.00	17.1		20.00	14.5		21.00
N023	29.	H	25.00	27.	VH	26.00	31.	VH	28.00	27.	VH	30.00
N024	22.4		21.00	18.2		22.00	15.2		16.00	10.6		25.00
N030	17.		10.50	14.		14.00	14.		14.00	13.		12.00
N030B	14.5		5.00	11.		12.50	10.		4.50	8.		14.00
N051	18.5		17.00	13.8		12.00	13.8		11.00	11.5		22.00
N053	64.	VH	30.00	44.	VH	30.00	44.	VH	30.00	44.	VH	33.00
N057	18.		14.00	14.		14.00	12.		7.00	9.		15.00
N057R	9.	L	1.00	15.		18.50	16.		18.00	14.		4.00
N058	17.2		12.00	12.3		8.00	16.2		19.00	14.6		20.00
N060	14.		4.00	6.	L	1.00	11.		6.00	13.		7.00
N062	20.6		19.00	19.8		23.00	20.6		24.00	15.2		26.00
N065	36.2	VH	29.00	37.6	VH	29.00	38.2	VH	29.00	36.9	VH	29.00
N073	16.		7.50	12.		7.00	10.		4.50	11.		8.00
N074	<80.		0.00	<80.		0.00	<80.		0.00	<80.		0.00
N074A	23.0		22.00	18.0		20.50	17.3		21.00	15.3		18.50
N076	16.7		9.00	13.1		10.00	13.2		10.00	11.3		9.00
N089	30.3	H	26.00	19.9		24.00	20.8		25.00	18.2		23.00
N102	18.		14.00	15.		18.50	13.		8.00	12.		12.00
N109	16.		7.50	11.		5.00	14.		14.00	9.		7.00
N109R	17.		10.50	13.		9.00	14.		14.00	11.		12.00
N111	31.9	VH	27.00	29.3	VH	27.00	26.7	H	26.00	22.8	H	27.00
N111B	67.9	VH	31.00	49.2	VH	31.00	49.1	VH	31.00	45.5	VH	32.00
N120	11.8		3.00	6.65	L	2.00	7.02	L	2.00	7.31		2.00
N120B	10.1		2.00	6.76	L	3.00	5.81	L	1.00	5.94		3.00
N130	<50.		0.00	<50.		0.00	<50.		0.00	<50.		0.00
N130B	<25.		0.00	<25.		0.00	<25.		0.00	<25.		0.00
N136	18.0		14.00	14.0		14.00	13.0		8.50	11.7		14.00
N137	18.2		16.00	14.9		17.00	13.9		12.00	12.1		16.00
MEDIAN CONC.	18.200		14.800			15.200			13.000		44.600	
$\bar{x}$	23.07		18.13			18.42			16.47		47.85	
s	13.24		10.32			10.30			9.98		11.85	
n	31		31			31			31		32	
$\Sigma$	35		35			35			35		35	

Table A-6. Extractable Cobalt (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N005	24.	13.00	22. H	14.00	23. H	14.00	18.	14.00	48.	14.00
N010R	17.	5.50	11.	3.00	12.	5.50	11.	5.00	36.	4.00
N013	18.4	8.00	13.4	5.00	10.7	3.00	14.1	9.00	39.5	6.00
N019C	14.5	3.00	13.9	7.00	15.1	9.00	13.2	8.00	33.6	3.00
N019N	17.1	7.00	15.3	9.00	16.4	10.00	14.9	10.00	36.9	5.00
N030C	20.	10.00	16.	10.50	14.	8.00	12.	6.00	44.	9.00
N030D	20.	10.00	16.	10.50	14.5	8.00	12.5	7.00	46.	11.50
N034	15.	4.00	13.5	6.00	11.5	4.00	9.5	4.00	40.5	7.00
N047	20.	10.00	19.	12.00	19.	13.00	16.	13.00	46.	11.50
N058R	2.81 VL	1.00	2.91 L	1.00	3.10 L	1.00	5.75 L	1.00	22.7 VL	1.00
N067	21.	12.00	14.	8.00	17.	11.00	15.	11.50	44.	9.00
N071	17.	5.50	13.	4.00	12.	5.50	8.8	3.00	32.	2.00
N119	28. H	14.00	20.	13.00	18.	12.00	15.	11.50	44.	9.00
N130C	10.	2.00	19.	2.00	10.	2.00	7.	2.00	47.	13.00
MEDIAN CONC.	17.750	13.950		14.250			12.850		42.250	
$\bar{x}$	17.49	14.29		14.02			12.13		40.01	
s	6.03	4.67		4.79			4.04		7.14	
n	14		14		14		14		14	
l	14		14		14		14		14	

Table A-7. Total Copper (pooled data)

SAMPLE	LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK								
N003		91.3 H	31.50	86.3	26.00	108.	25.50	33.2	24.00	572.	21.00		
N006		80.	18.50	80.	18.00	100.	9.50	80.	14.50	590.	28.50		
N008		80.	18.50	78.	6.50	96.	5.00	96.	VH	33.00	560.	15.00	
N010C		84.	25.00	85.	23.00	108.	25.50	86.	28.50	592.	30.00		
N012		73.15	6.00	71.85 L	22.00	93.0 L	2.00	68.4 VL	3.00	484.5 L	3.00		
N015		85.8	29.00	84.8	22.00	107.	22.50	85.1	27.00	587.	27.00		
N019		79.4	15.50	109. VH	34.00	105.	18.00	81.8	20.00	550.	10.50		
N019B		71.1 L	4.00	100. VH	32.00	96.7	6.00	74.6	6.00	540.	6.50		
N023		95. VH	34.00	84.	20.00	108.	9.50	78.	11.50	554.	12.00		
N024		91.3 H	31.50	86.6	27.00	109.	29.50	87.0	30.00	622.	H	12.50	
N030		80.	18.50	81.	13.00	95.	4.00	79.	13.00	577.	H	23.50	
N030A		94.5 VH	33.00	101. VH	33.00	125.5 VH	34.00	98. VH	34.00	625.	H	34.00	
N041		20.5 VL	1.00	82.7	16.00	109.	29.50	15.2 VL	1.00	560.		15.00	
N051		76.	8.50	78.	6.50	100.	9.50	75.	9.00	560.		15.00	
N053		49. VL	2.00	50. VL	1.00	65. VL	1.00	50. VL	2.00	365.	VL	12.00	
N057		81.	21.00	81.	13.00	104.	14.00	80.	14.50	558.		13.00	
N057B		70. L	3.00	83.	17.00	105.	18.00	81.	18.00	590.		28.50	
N058		77.1	12.00	86.6	27.50	108.	25.50	82.9	23.00	550.		10.50	
N060		78.2	13.00	81.0	13.00	102.	13.00	74.9	7.00	575.		22.00	
N062		79.4	15.50	79.9	9.00	104.2	15.00	80.8	16.00	580.2		25.00	
N065		86.8	30.00	87.9	30.00	109.	29.50	80.9	17.00	56.2 VL		1.00	
N073		76.	8.50	76.	6.00	101.	12.00	75.	9.00	543.		8.00	
N074		75.0	8.50	79. n	8.00	105.	18.00	82.0	21.50	630.	H	35.00	
N074B		73.0	5.00	72.0 L	3.00	94.0 L	3.00	70.0 L	4.00	547.		6.50	
N089		78.9	14.00	83.9	19.00	111.	33.00	93.0 H	32.00	547.		9.00	
N093		82.2	23.00	83.7	18.00	106.0	21.00	81.4	19.00	603.2		31.00	
N102		84.	25.00	86.	24.00	110.	32.00	86.	28.50	556.		18.00	
N109		76.	8.50	73. L	4.00	98.	7.00	72. L	5.00	522.		4.00	
N109B		80.	18.50	82.	15.00	105.	18.00	78.	11.50	568.		20.00	
N111		81.2	22.00	84.4	21.00	107.	22.50	82.0	21.50	563.		17.00	
N111B		84.8	27.00	86.2	25.00	108.	25.50	84.0	25.00	577.		23.50	
N120		84.9	28.00	86.8	29.00	109.	29.50	84.9	26.00	567.		19.00	
N120B		76.5	11.00	80.2	11.00	100.	9.50	75.0	9.00	530.		5.00	
N130		84.	22.00	89.	31.00	105.	18.00	88.	31.00	582.		26.00	
N136		<400.	0.00	<400.	0.00	<400.	0.00	<400.	0.00	620.		32.00	
MEDIAN				83.350		105.000		80.950		565.000			
CONC.		80.000				103.19		78.50		548.72			
X		78.27		82.94						97.15			
S		13.07		9.57		9.16		14.03		35			
n		34		34		34		34		35			
l		35		35		35		35		35			

Table A-8. Extractable Copper (pooled data)

SAMPLE	REPORTED LAB NO	1 VALUE	RANK	REPORTED LAB NO	2 VALUE	RANK	REPORTED LAB NO	3 VALUE	RANK	REPORTED LAB NO	4 VALUE	RANK	REPORTED LAB NO	5 VALUE	RANK	
N002	61.0	VL	3.00	62.7	VL	3.00	80.6	VL	3.00	68.0	L	3.00	485.	L	2.00	
N005	78.		8.50	78.		8.50	103.		11.50	83.		14.00	564.		9.00	
N010D	81.		14.50	80.		8.50	103.		11.50	82.		12.50	503.	L	6.00	
N013	100.	VH	17.00	98.0	VH	17.00	114.	H	17.00	103.	VH	17.00	679.	VH	17.00	
N019C	77.5		7.00	78.1		8.00	102.		8.50	80.6		11.00	530.		7.00	
N019D	73.3		5.00	71.1	L	4.00	95.2		4.00	69.9	L	4.00	501.	L	5.00	
N021	77.		6.00	75.		5.00	103.		11.50	76.		5.00	545.		8.00	
N030C	81.		14.50	81.		12.50	101.		7.00	80.		10.00	600.		15.00	
N030D	72.5		4.00	77.5		6.00	100.5		6.00	79.5		9.00	579.	0	11.00	
N034	80.		11.50	80.5		11.00	103.		11.50	78.		7.00	587.		13.00	
N047	80.		11.50	90.	H	16.00	110.		15.50	85.		16.00	500.	L	4.00	
N058D	36.4	VL	1.00	30.6	VL	1.00	54.5	VL	2.00	47.3	VL	1.00	358.	VL	1.00	
N067	82.		16.00	81.		12.50	100.		5.00	79.		8.00	570.		10.00	
N071	80.		11.50	84.		14.00	105.		14.00	84.		15.00	580.		12.00	
N093B	55.3	VL	2.00	58.1	VL	2.00	61.4	VL	1.00	65.2	VL	2.00	486.	5 L	3.00	
N119	78.		8.50	80.		9.50	102.		8.50	77.		6.00	650.	VH	16.00	
N130C	80.		11.50	86.		15.00	110.		15.50	82.		12.50	598.		14.00	
MEDIAN							102.000			79.500			564.000			
CONC.		78.000			80.000											
$\bar{x}$		74.88			75.98			97.54			77.62			547.97		
S		13.60			14.88			14.82			11.33			75.05		
n		17			17			17			17			17		
l		17			17			17			17			17		

Table A-9. Total Iron (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N003	4.44	6.50	6.33	31.00	3.70	24.50	3.37	28.50	3.30	13.50
N006	4.90	18.00	6.00	20.00	3.60	17.00	3.20	19.50	3.50	24.50
N008	3.80	VL	4.00	VL	2.80	VL	2.35	VL	2.65	VL
N010	3.73	VL	3.00	VL	2.44	VL	2.87	VL	3.10	VL
N012	3.50	VL	1.00	VL	2.44	VL	1.90	VL	2.27	VL
N015	5.05	21.50	6.12	25.50	3.61	18.50	3.45	VL	3.61	VL
N019	5.26	33.50	6.24	35.00	3.95	32.50	3.44	H	3.79	H
N019-B	5.26	33.50	6.44	35.00	3.95	32.50	3.61	H	3.36	33.50
N023	5.29	VL	5.64	36.00	7.28	VH	3.04	VL	3.46	VL
N024	5.29	35.00	6.61	36.00	4.10	H	3.51	VL	3.77	VL
N030	4.83	14.00	6.80	21.00	3.50	12.00	3.20	19.50	3.25	11.00
N030-B	5.38	36.00	6.96	29.50	3.70	24.50	3.31	25.00	3.46	13.00
N041	4.78	13.00	5.67	10.00	3.34	L	4.00	VL	2.55	L
N051	4.44	6.50	5.91	16.00	3.08	L	2.62	VL	3.40	VL
N053	5.14	27.00	5.79	14.00	3.7	24.50	3.3	VL	3.6	VL
N057-B	5.14	25.50	6.3	27.50	3.98	34.00	3.51	VL	3.65	VL
N058	5.20	30.50	6.41	33.00	3.83	30.00	3.96	VL	3.50	VL
N060	5.24	32.00	6.66	22.00	3.67	21.00	3.22	VL	3.41	VL
N062	5.05	21.50	6.00	20.00	3.20	7.00	2.80	L	2.80	L
N065	4.00	VL	4.80	VL	4.70	24.50	3.38	VL	3.87	VL
N073	4.66	10.00	5.42	6.00	3.47	11.00	2.88	VL	3.50	VL
N074	4.96	20.00	5.97	18.00	3.70	24.50	3.38	VL	3.50	VL
N074-B	4.70	11.50	5.30	L	3.15	L	2.94	VL	3.03	VL
N076	4.55	8.00	5.48	7.00	3.39	10.00	2.94	VL	3.03	VL
N089	5.10	25.50	5.56	8.00	3.37	9.00	2.55	VL	3.86	VL
N093	4.70	11.50	5.94	17.00	3.55	13.00	3.35	VL	3.20	VL
N102-B	5.09	23.50	6.14	24.00	3.59	13.00	3.14	VL	3.44	VL
N109	4.87	16.00	5.77	13.00	3.56	15.00	3.15	VL	3.39	VL
N109-B	4.94	19.00	5.90	15.00	3.56	15.00	3.18	VL	3.34	VL
N111	4.64	9.00	5.75	11.00	3.62	20.00	3.4	VL	3.7	VL
N111-B	5.02	30.50	6.3	27.00	3.8	29.00	3.44	VL	3.50	VL
N120	5.09	23.50	6.38	32.00	3.85	31.00	2.74	L	3.01	L
N120-B	4.86	15.00	5.75	11.50	3.56	15.00	2.74	L	3.48	L
N130	5.17	29.00	6.43	34.00	3.79	28.00	3.30	VL	3.64	VL
N136	5.16	28.00	6.32	29.50	3.75	27.00	3.37	VL	3.52	VL
N137	4.69	17.00	6.24	25.50	3.61	18.50	3.29	VL	22.00	VL
MEDIAN CONC.	4.920	5.985		3.610		3.190			3.395	
$\bar{x}$	4.80	5.83		3.64		3.10			3.32	
S	0.49	0.61		0.71		0.36			0.34	
n	36	36		36		36			36	
l	36	36		36		36			36	

Table A-10. Extractable Iron (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N002	.296 VL	2.00	.213 VL	2.00	.059 VL	1.00	.113 VL	1.00	.176 VL	2.00
N005	.28	9.00	.424	7.00	.292	10.00	.230	8.50	.53	6.00
N010B	3.41 L	5.00	4.35	5.00	2.58	5.00	2.26	6.50	2.30	5.00
N013	4.14	7.00	4.74	10.00	2.89	9.00	2.26	6.50	2.65	8.00
N019C	4.42	10.00	4.40	6.00	2.71	7.00	2.38	10.00	2.58	7.00
N019D	4.69	13.00	4.90	11.00	3.23	13.00	2.53	11.00	2.69	9.00
N021	4.16	8.00	4.95	12.00	2.86	8.00	2.18	5.00	3.41 H	17.00
N030C	4.50	11.00	5.70 H	13.00	3.00	11.00	2.68	12.50	3.00	12.50
N030D	4.79	15.50	5.85 H	16.00	3.24	14.00	2.80	16.00	3.30 H	16.00
N034	4.79	15.50	4.65	8.00	3.31	15.00	2.83	17.00	2.98	11.00
N047	4.6	12.00	5.9 VH	17.00	3.4	17.00	2.7	14.00	3.0	12.50
N058B	.210 VL	1.00	.194 VL	1.00	.246 VL	3.00	.168 VL	2.00	.105 VL	1.00
N067	4.0	6.00	4.7	9.00	2.7	6.00	2.30	8.50	2.70	10.00
N071	2.80 VL	3.00	3.00 VL	3.00	2.10 L	4.00	1.70 L	4.00	2.00 L	4.00
N093B	2.06 VL	4.00	1.47 VL	3.00	2.40 VL	2.00	1.80 VL	3.00	1.25 VL	3.00
N119	3.19 H	17.00	5.75 H	14.00	3.16	12.00	2.73	15.00	3.16	14.00
N130C	4.78	14.00	5.82 H	15.00	3.34	16.00	2.60	12.50	3.20	15.00
MEDIAN CONC.	4.280		4.700		2.890		2.300		2.590	
X	3.71		4.19		2.47		2.07		2.41	
S	1.52		1.87		1.14		0.87		1.00	
n	17		17		17		17		17	
l	17		17		17		17		17	

Table A-11. Total Manganese (pooled data)

SAMPLE LAB NO	REPORTED VALUE	RANK								
N006	2330.	24.00	1240.	22.00	600.	26.00	560.	27.50	610.	25.50
N008	2300.	21.00	1250.	25.00	550.	6.50	500.	9.00	600.	21.00
N010	2315.	23.00	1002. VL	2.00	434. VL	2.00	465. L	6.00	498. L	3.00
N012	2045.	6.00	21.5 VL	1.00	10.0 VL	1.00	9.63 VL	1.00	8.08 VL	1.00
N015	2420.	30.50	1330.	32.00	595.	23.00	545.	21.00	624.	28.00
N016	2370.	27.00	1230.	20.00	575.	14.00	535.	15.00	574.	13.50
N019B	2420.	30.50	1200.	15.00	574.	13.00	540.	17.00	605.	23.00
N023	1770. VL	2.00	1310.	31.00	588.	18.50	544.	20.00	562.	12.00
N030	2100.	8.50	1230.	20.00	590.	20.50	550.	23.50	600.	21.00
N030B	2135.	12.00	1090. L	15.00	552.5	8.00	510.	10.00	588.	18.00
N051	2470.	32.00	1200.	15.00	550.	6.50	475. L	7.00	580.	17.00
N053	2200.	14.00	1200.	15.00	600.	26.00	560.	27.50	600.	21.00
N057	1920. VL	4.00	1290.	29.00	600.	26.00	320. VL	2.00	510. L	21.00
N057B	1030. VL	1.00	1080. L	4.00	590.	20.50	550.	23.50	610.	29.50
N058	2110.	10.00	1250.	25.00	584.	17.00	541.	18.00	609.	24.00
N062	2282.	20.00	1245.	23.00	636.	30.00	574.	29.00	621.	27.00
N065	2100.	8.50	1100.	6.50	596.	24.00	535.	15.00	552.	11.00
N073	2310.	22.00	1180.	11.50	526.	9.00	494.	8.00	521. L	7.00
N074	2260.	17.50	1130.	8.00	560.	10.50	530.	12.00	540.	10.00
N074B	2160.	13.00	1070. L	3.00	495. VL	3.00	460. L	5.00	530.	8.00
N076	2230.	15.00	1250.	25.00	579.	15.00	551.	25.00	573.	14.00
N089	2330.	28.00	1150.	10.00	520. L	4.00	420. VL	3.00	490.	2.00
N093	1822. VL		1180.	11.50	573.	12.00	535.	15.00	502. L	5.00
N102	2260.	17.50	1270.	27.00	645. H	31.50	592.	31.00	647. H	32.00
N109	2332.	25.00	1195.	13.00	583.	16.00	546.	22.00	587.	19.00
N109B	2247.	16.00	1209.	17.00	594.	22.00	542.	19.00	569.	13.00
N111	2098.	7.00	1223.	18.00	588.	18.50	557.	26.00	574.	15.50
N111B	2369.	26.00	1273.	28.00	604.	28.00	604. H	34.00	677. VH	33.00
N120	2530. H	34.00	1350. H	34.00	697. VH	34.00	534.	13.00	637. VH	30.00
N120B	1960. L	5.00	1100.	6.00	545.	5.00	439. VL	4.00	500. L	4.00
N130	2270.	19.00	1230.	28.00	610.	29.00	597.	3.00	625.	29.00
N130B	2116.	11.00	1135.	9.00	560.	10.50	512.	11.00	535.	9.00
N136	2489. H	33.00	1332.	33.00	659. H	33.00	602. H	33.00	691. VH	34.00
N137	2413.	29.00	1302.	30.00	645. H	31.50	594.	32.00	641. H	31.00
MEDIAN CONC.	2250.000		1216.000		586.000		540.500		582.500	
X	2197.06		1171.99		565.81		514.17		564.33	
S	270.17		219.46		108.81		102.55		110.82	
n	34		34		34		34		34	
1	34		34		34		34		34	

Table A-12. Extractable Manganese (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK	
N002	2220.	9.00	970. L	3.00	370. VL	4.00	340. VL	4.00	440.	4.00	
N005	2280.	10.00	1090.	8.00	480.	7.00	395.	5.00	480.	7.00	
N010B	2004.	4.00	1050.	7.00	477.	6.00	416.	11.00	446.	5.00	
N013	2404.	15.00	1152.	10.00	498.	9.00	419.	11.00	527.	13.00	
N019C	2340.	14.00	1190.	13.00	530.	13.00	425.	12.00	500.	11.00	
N019D	2320.	12.00	1160.	11.00	526.	12.00	415.	8.00	490.	9.00	
N021	2200.	7.50	1100.	9.00	511.	11.00	405.	7.00	483.	8.00	
N030C	2200.	7.50	1280. VH	16.00	570. H	16.00	490. H	16.00	570. VH	15.50	
N030D	2310.	11.00	1165.	12.00	508. 5	10.00	446.	13.00	544. 5 H	14.00	
N034	2480. H	16.00	1250. H	14.00	507. H	14.00	489. H	15.00	524. 5	12.00	
N058B	1910. L	2.00	734. VL	1.00	231. VL	1.00	243. VL	1.00	300. VL	1.00	
N067	2100.	6.00	1000.	4.50	470.	5.00	400.	6.00	490.	9.50	
N071	15.00.	VL	1.00	1000.	4.50	320. VL	3.00	254. VL	2.00	320. VL	2.00
N093B	2061.	5.00	957. L	6.00	303. VL	2.00	296. VL	3.00	364. VL	3.00	
N119	1941. L	3.00	1045.	6.00	493.	8.00	418. VL	10.00	478.	6.00	
N130C	2330.	13.00	1260. VH	15.00	560. H	15.00	480. H	14.00	570. VH	15.50	
MEDIAN CONC.	2210.000		1095.000		495.500		415.500		486.500		
$\bar{x}$	2162.50		1087.69		465.91		395.69		470.41		
S	241.69		139.91		94.12		75.92		80.77		
n	16		16		16		16		16		
l	16		16		16		16		16		

Table A-13. Total Nickel (pooled data)

SAMPLE	REPORTED LAB NO	1 VALUE	1 RANK	REPORTED 2 VALUE	2 RANK	REPORTED 3 VALUE	3 RANK	REPORTED 4 VALUE	4 RANK	REPORTED 5 VALUE	5 RANK
N003	46.2	L	2.00	<20.	VL	1.00	20.	VL	1.00	33.1	7.00
N006	82.	VH	31.00	73.	VH	29.00	64.	VH	29.00	990.	27.00
N008	70.		26.00	60.		22.00	50.		23.00	1080.	33.00
N010	65.		23.00	55.		19.00	43.		13.00	960.	22.00
N012	48.95		4.00	43.75		5.00	36.95		5.00	911.	9.00
N015	30.7	VL	1.00	42.2	L	4.00	27.1	VL	2.00	760.	VL
N019	51.3		7.00	41.7	L	3.00	36.9		4.00	864.	4.00
N019B	59.3		17.00	51.6		13.00	46.8		19.00	896.	8.00
N023	51.		5.50	75.	VH	30.00	57.	H	27.00	935.	14.00
N024	72.8	H	27.00	63.9		23.00	56.8	H	26.00	1000.	28.50
N030	58.		12.50	54.		15.00	39.		16.00	1155.	VH
N030B	56.5		10.00	52.5		14.00	7.		7.00	945.	19.00
N041	85.7	VH	32.00	71.3	H	27.00	83.6	VH	32.00	955.	21.00
N051	60.		18.00	50.		9.00	40.		8.00	931.	13.00
N053	63.1		5.50	38.	L	2.00	42.		3.00	1020.	30.00
N057	62.		19.00	50.		9.50	50.		10.00	625.	VL
N057B	48.		3.00	58.		21.00	53.7		23.00	33.	0.00
N058C	58.6		15.00	54.4		17.50	50.		15.00	1055.	H
N060	64.		20.00	54.		15.00	50.		23.00	939.	32.00
N062	53.6		8.00	45.5		8.00	-2.4		11.00	926.	10.00
N065	69.7		25.00	71.4	VH	28.00	64.1	VH	30.00	1044.	H
N073	59.		16.00	51.		12.00	43.		13.00	927.	11.00
N074	<100.		0.00	<100.		0.00	<100.		0.00	120.	0.00
N074B	58.0		12.50	50.0		9.00	-1.0		9.00	972.	25.00
N076	58.		12.50	<45.		0.00	<45.		0.00	<100.	16.50
N089	64.8		22.00	58.1		20.00	57.3		20.00	30.0	1.00
N102	58.		12.50	50.		9.50	53.		13.00	<40.	9.00
N103	66.		24.00	65.		24.00	48.		21.00	<40.	9.00
N109R	77.	H	28.00	66.	H	25.00	=2.		25.00	39.7	18.50
N111	77.3	VH	29.00	67.8	H	26.00	=1.8	VH	28.00	12.50	895.
N111R	92.8	VH	33.00	79.5	VH	32.00	75.2	VH	31.00	66.9	VH
N120	64.2		21.00	54.4		17.50	44.2		17.00	37.0	
N120B	56.3		9.00	49.3		7.00	38.8		6.00	31.8	
N130	78.	VH	30.00	78.	VH	31.00	46.		18.00	4.00	
N136	<100.		0.00	<100.		0.00	<100.		0.00	33.	H
N137	<100.		0.00	<100.		0.00	<100.		0.00	26.00	
MEDIAN CONC.	59.300		54.200			44.100			38.500	941.000	
$\bar{x}$	62.14		57.17			48.15			41.70	945.69	
s	12.54		11.19			11.87			10.65	99.16	
n	33		31			31			32	35	
1	36		36			36			36	36	

Table A-14. Extractable Nickel (pooled data)

SAMPLE LAB. NO.	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N002	43.3 L	2.00	30.3 VL	2.00	18.0 VL	2.00	25.5	3.00	648. VL	2.00
N006	52.	13.00	53.	12.50	42.	11.50	36.	12.00	929.	11.00
N010B	48.	3.00	48.	8.50	42.	11.50	30.	6.00	780.	4.00
N013	54.	7.00	42.	4.00	32.	3.00	30.	6.00	882.	9.00
N019C	49.0	4.00	43.5	5.00	34.7	5.00	25.2	20.00	774.	3.00
N019D	58.1	9.00	47.1	7.00	38.8	7.00	32.9	8.00	795.	6.00
N021	57.	8.00	48.	8.50	40.	8.00	33.	9.00	904.	10.00
N030C	61.	12.00	55.	13.00	43.	13.00	39.	13.00	990. H	14.00
N030D	59.	11.00	51.	10.50	41.	10.00	35.5	11.00	967.5 H	13.00
N034	58.5	10.00	51.	10.00	40.5	9.00	34.5	10.00	993. H	15.00
N047	64.	14.00	59. H	14.00	50.	15.50	42.	14.00	810.	6.00
N058B	16.8 VL	1.00	12.2 VL	1.00	9.93 VL	1.00	9.45 VL	1.00	467. VL	1.00
N067	51.	5.00	40.	3.00	33.	4.00	29.	4.00	850.	8.00
N071	52.	6.00	46.	3.00	35.	6.00	30.	6.00	830.	7.00
N119	67.	15.00	62. H	15.50	40.	14.00	43. H	15.00	895. H	16.00
N130C	68.	16.00	62. H	15.50	50	15.50	44. H	16.00	937.	12.00
MEDIAN CONC.	57.550		48.000		40.250		32.950		866.000	
M	54.29		46.88		37.43		32.44		846.72	
S	12.17		12.40		10.80		8.43		140.25	
n	16		16		16		16		16	
1	16		16		16		16		16	

Table A-15. Total Lead (pooled data)

SAMPLE	LAB NO	REPORTED VALUE	RANK	1	REPORTED VALUE	RANK	2	REPORTED VALUE	RANK	3	REPORTED VALUE	RANK	4	REPORTED VALUE	RANK	5
N003		89.0	20.00	233.	12.00	284.	27.00	167.	24.00	94.1	VH	28.00				
N006		100.	25.00	260.	24.00	310.	VH	180.	H	80.	H	26.00				
N008		102.	26.00	247.	20.00	266.	23.00	168.	H	29.	00	24.00				
N010C		64. L	2.00	180.	VL	144.	VL	120.		25.	00	21.				
N012		66.5 L	3.00	200.	5 L	218.5	L	119.5		3.00		10.50				
N019R		114. VH	27.00	200.	5 L	25.	00	170.	H	26.500	103. VH	30.00				
N023		81.	9.50	140.	VL	130.	VL	90.	VL	1.00		43.8				
N024		92.4	22.00	237.	14.00	264.		148.		21.00		4.00				
N030		74.	4.00	219.		229.		131.		10.00		6.50				
N030B		93.5	23.00	237.5	15.00	242.5		147.0		7.500		25.00				
N041		123. VH	30.00	296.	VH	309.	VH	185.	VH	19.00		63.66	VL	1.00		
N051B		85.	15.00	245.	18.00	260.		145.		18.00		6.50				
N053		84.	14.00	195.	L	203.	L	126.		5.000		20.00				
N057		78.	8.00	220.		240.		132.		9.000		42. L				
N057B		62. L	1.00	248.		251.		143.		13.00		2.00				
N058		118. VH	28.00	273.	27.00	288.		175.	H	16.00		21.50				
N060B		82.	11.00	255.	23.00	272.		150.		22.00		29.00				
N062		77.	7.00	234.		256.		138.		11.00		17.00				
N065		276. VH	32.00	681.	VH	692.	VH	412.	VH	32.00		13.00				
N073		81.	9.50	248.	21.50	263.		11.00		32.00		32.00				
N074		75.0	5.00	245.	18.00	265.		138.		11.00		8.00				
N074B		83.0	13.00	225.	9.00	230.		140.		11.00		19.00				
N089		91.2	21.00	352.	VH	310.		150.		14.00		19.00				
N093		121. VH	29.00	276.	28.00	282.		170.	H	22.00		12.00				
N102		87.	18.50	241.	16.00	252.		26.00		26.500		27.00				
N109		87.	18.50	229.	18.00	251.		141.		15.00		17.00				
N109B		86.	17.00	245.	18.00	249.		139.		13.00		17.00				
N111		85.3	16.00	229.	10.50	243.		150.		12.00		21.00				
N111B		163. VH	31.00	320.	VH	30.	00	346.	VH	11.00		43.7				
N120		82.5	12.00	208.	L	231.		31.	00	135.	VH	31.00	107. VH	31.00		
N120B		75.8	6.00	210.		229.		8.	00	131.		5.00		31.00		
N130		98.	24.00	272.		278.		5.50		129.		5.00		5.00		
MEDIAN CONC.		85.650		243.000		254.500		143.500		58.000						
$\bar{x}$		96.35		255.34		265.19		155.98		63.31						
S		38.83		87.02		88.14		54.28		25.55						
n		32		32		32		32		32		32		32		
l		32		32		32		32		32		32		32		

Table A-16. Extractable Lead (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N002	64.6	4.00	217.	4.00	209. L	3.00	132.	6.00	52.8	9.00
N005	98. H	13.00	267.	12.00	271.	13.00	142.	10.00	62.	14.00
N010D	57.	5.00	212.	3.00	238.	6.00	118.	2.00	43.	12.00
N013	96. H	11.00	285. VH	14.00	272.	14.00	154.	13.00	56.	13.00
N019D	97.3 H	12.00	234.	9.00	262.	12.00	130.	9.00	59.5	13.00
N021	79.	9.50	243.	11.00	255.	10.00	135.	8.00	46.	10.00
N030C	75.	7.50	222.	15.00	230.	5.00	133.	7.00	47.	7.00
N030D	79.	9.50	240.5	10.00	252.	9.00	142.5	11.00	54.0	10.50
N034	75.	7.50	233.	8.00	249.	8.00	131.	5.00	45.	5.00
N047	100. H VL	14.50	290. VH	16.00	310. VH	16.00	180. VH	16.00	70. H VL	11.00
N058B	37. A VL	1.00	77.4 VL	1.00	144. VL	1.00	72.8 VL	1.00	14.2 VL	1.00
N067	74.	6.00	200. L	2.00	210. L	4.00	120.	3.50	49.	8.00
N071	64.8	3.00	228.	7.00	240.	7.00	120.	3.00	43.	2.00
N093B	66.8	2.00	223.	6.00	163. VL	2.00	149.	12.00	43.1	4.00
N119	111. VH	16.00	287. VH	15.00	298. H	15.00	178. VH	15.00	78. VH	16.00
N130C	100. H	14.50	260.	13.00	260.	11.00	160.	14.00	54.	10.50
MEDIAN CONC.	77.000		233.500		260.500		137.500		50.900	
$\bar{x}$	80.03		231.87		241.44		137.96		51.04	
s	19.09		49.35		43.71		25.41		14.04	
n	16		16		16		16		16	
1	16		16		16		16		16	

Table A-17. Total Vanadium (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N006	146.	17.00	107. H	17.00	101.	17.00	92. H	18.00	126. VH	21.00
N010	138.	16.00	95.	15.00	85.	11.00	78.	13.00	78. 70 VL	12.00
N012	44.15 VL	1.00	39. 85 VL	1.00	44. 80 VL	1.00	34. 15 VL	1.00	45. 70 VL	1.00
N015	221. VH	22.00	135. VH	21.00	125. VH	22.00	130. VH	22.00	76. 1	16.00
N019	157. H	20.00	116. VH	20.00	115. VH	19.00	106. VH	21.00	85. 0	18.50
N019B	164. VH	21.00	115. H	19.00	112. VH	18.00	105. VH	20.00	88. 5 H	20.00
N023	151. H	19.00	161. VH	22.00	121. VH	21.00	91. H	17.00	132. VH	22.00
N030	150. H	18.00	110. H	18.00	100.	16.00	45. H	13.00	35.	18.50
N030B	116. 5	7.00	81.	9.00	75. 5	4.00	67. 5	6.00	61. 0	6.00
N051	53. VL	2.00	48. VL	2.00	50. VL	4.00	41. VL	2.00	45. VL	3.00
N053	120.	9.00	88.	11.00	115. VH	19.50	80.	16.00	78.	15.00
N057	125.	11.50	95.	15.00	88.	13.00	79.	15.00	73.	14.00
N058	111.	5.00	85. 2	10.00	78. 4	12.00	70. 0	9.00	66. 5	9.00
N063	113.	6.00	89. 7	12.00	92. 4	15.00	69. 9	8.00	69. 8	11.00
N073	130.	14.00	79.	4.00	90.	14.00	65.	5.00	32. VL	1.00
N074	125.	11.50	80. 0	6.00	74. 0	3.00	59. 0	7.00	64. 0	7.00
N076	120.	9.00	76. 5	3.00	80. 8	7.00	71. 7	11.00	46. 7 VL	2.00
N120	106.	4.00	80. 9	8.00	82. 5	8.00	60. 6	4.00	80. 4	17.00
N120B	104.	3.00	80.	6.00	80.	6.00	58. 3	3.00	72.	13.00
N130	120.	9.00	80.	6.00	83.	9.00	70.	9.00	60.	15.00
N136	126.	13.00	90.	13.00	86.	12.00	75.	12.00	67.	10.00
N137	136.	15.00	91.	14.00	94.	10.00	78.	13.50	66.	8.00
MEDIAN	125.000		88. 850		85. 500		73. 350		69. 900	
X	126.58		91.96		89.23		76.64		72.08	
S	35.16		25.91		20.41		21.18		23.32	
n	22		22		22		22		22	
1	22		22		22		22		22	

Table A-18. Extractable Vanadium (pooled data)

SAMPLE LAB NO	REPORTED VALUE	1 RANK	REPORTED VALUE	2 RANK	REPORTED VALUE	3 RANK	REPORTED VALUE	4 RANK	REPORTED VALUE	5 RANK
N005	34. L	2.00	29.	2.00	30. L	2.00	23. L	2.00	33.	2.00
N010B	42.	3.00	43.	6.00	43.	5.00	43.	8.00	41.	4.00
N013	56. 0	6.00	43. 7	7.00	44. 9	6.00	37. 4	6.00	45. 0	6.00
N019C	78. 0 VH	10.00	49. 5	8.00	63. 3 H	9.00	37. 9	7.00	49. 0	8.00
N019D	63. 4	7.00	40. 1	5.00	49. 8	7.00	33. 2	4.00	46. 1	7.00
N030C	65.	8.00	69. H	10.00	70. VH	10.00	55. VH	3.00	60. H	10.00
N030D	45.	4.00	35. 5	3.00	39. 5	3.00	33.	3.00	40.	3.00
N058B	6. 43 VL	1.00	35. 59 VL	1.00	7. 79 VL	1.00	6. 08 VL	1.00	3. 71 VL	1.00
N067	54.	5.00	38.	4.00	42.	4.00	34.	5.00	42.	5.00
N119	73. H	9.00	54.	9.00	51.	8.00	58. VH	10.00	59. H	9.00
MEDIAN CONC.	55. 000		41. 550		43. 950		35. 700		43. 500	
$\bar{x}$	51.68		39.64		44.13		36.06		41.88	
S	21.04		15.56		17.21		14.85		15.78	
n	10		10		10		10		10	
l	10		10		10		10		10	

Table A-19. Total Zinc (pooled data)

SAMPLE	LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	
N003	266.	6.50	1	1380.	17.50	1500.	12.00	1080.	13.00	720.	6.50	266.00	1	
N006	280.	21.00	2	1480.	30.00	1620.	29.50	1160.	28.00	780.	28.00	280.00	2	
N008	260.	2.50	3	1540.	H	1680.	35.00	1280.	VH	248.	0.00	260.00	3	
N010	290.	21.00	4	1270.	34.00	1316.	VL	2.	0.00	98.	4.00	680.	4.00	
N010C	270.	11.00	5	1180.	VL	1.00	205.	VL	1.00	1005.	5.	800.	28.00	
N012	274.	14.50	6	1245.	L	3.00	1400.	4.50	985.	5.	648.	VL	274.00	
N015	305.	34.00	7	1560.	H	36.00	1660.	34.00	1260.	H	37.	0.00	305.00	
N019	270.	11.00	8	1210.	L	2.00	1340.	3.00	966.	1.	707.	VH	270.00	
N019B	290.	29.50	9	1370.	1250.	1510.	14.50	1100.	19.00	767.	18.50	290.00	9	
N023	782.	VH	10	1460.	1222.	1520.	17.50	1030.	7.00	948.	VH	338.00	10	
N024	299.	32.00	11	1420.	32.	1534.	21.00	1168.	30.00	793.	22.00	299.00	11	
N030	263.	5.00	12	1500.	33.	1690.	28.00	1200.	35.00	780.	20.00	263.00	12	
N030B	285.	24.50	13	1430.	226.	1555.	25.00	1110.	21.50	775.	20.00	285.00	13	
N041	275.	16.50	14	1620.	VH	37.	1510.	14.50	1085.	15.50	764.	17.50	275.00	14
N057	275.	24.50	15	1400.	21.	1560.	26.00	1130.	25.00	815.	22.50	275.00	15	
N057B	262.	16.50	16	1350.	12.	1630.	31.00	1170.	31.00	815.	22.50	262.00	16	
N058	268.	4.00	17	1370.	15.	1515.	16.00	1065.	10.00	752.	13.00	268.00	17	
N058C	315.	H	18	1497.	31.	1637.	32.00	1188.	11.00	831.	13.00	315.00	18	
N060	278.	36.00	19	1400.	21.	1650.	33.00	1150.	11.50	755.	14.00	278.00	19	
N062	268.	31.00	20	1470.	29.	1620.	29.50	1180.	32.00	786.	20.40	268.00	20	
N065	266.	19.00	21	1320.	7.	1532.	23.00	1030.	7.00	776.	21.00	266.00	21	
N073	274.	8.50	22	1386.	1300.	1600.	20.00	1120.	L	630.	VL	274.00	22	
N074	274.	6.50	23	1300.	19.	1400.	24.50	1070.	13.00	747.	12.00	274.00	23	
N074B	290.	14.50	24	1350.	12.	1490.	10.00	1080.	13.00	32.	5.00	290.00	24	
N080	270.	29.50	25	1520.	33.	1690.	H	1180.	7.00	725.	7.00	270.00	25	
N080B	260.	11.00	26	1320.	7.	1460.	8.00	1040.	7.00	720.	7.00	260.00	26	
N093	254.	2.50	27	1630.	38.	1520.	17.50	1080.	13.00	13.	5.00	693.	4.00	
N102	283.	1.00	28	1260.	L	4.	1409.	6.00	1050.	9.00	693.	L	283.00	28
N109	286.	23.00	29	1422.	25.	1584.	27.00	1118.	22.00	767.	18.50	286.00	29	
N109B	286.	26.00	30	1336.	9.	1463.	9.00	1093.	18.00	760.	16.00	286.00	30	
N111	280.	21.00	31	1400.	21.	1535.	22.00	1142.	26.00	818.	31.00	280.00	31	
N111B	276.	18.00	32	1337.	10.	1506.	13.00	1077.	11.00	745.	11.00	276.00	32	
N111B	288.	18.00	33	1350.	12.	1496.	11.00	1085.	15.50	738.	11.00	288.00	33	
N120	288.	28.00	34	1350.	12.	1496.	11.00	1085.	15.50	621.	32.00	288.00	34	
N120B	267.	27.00	35	1440.	127.	1690.	H	1100.	1120.	799.	27.00	267.00	35	
N130	271.	13.00	36	1380.	17.	1550.	24.00	1120.	123.	837.	35.00	271.00	36	
N136	300.	33.00	37	1410.	23.	1530.	19.00	1160.	28.00	892.	VH	33.00	37	
N137	339.	VH	38	1546.	H	35.00	1697.	H	1239.	H	1091.	755.	37.00	38
MEDIAN CONC.	279.000	1393.000			1531.000		1100.000			771.000				
$\bar{x}$	294.13	1400.58			1528.55		1107.86			772.37				
S	83.05	104.95			108.77		75.32			61.88				
n	38				38		38			38				
1	38				38		38			38				

Table A-20. Extractable Zinc (pooled data)

SAMPLE	REPORTED LAB NO	1 VALUE	RANK	REPORTED LAB NO	2 VALUE	RANK	REPORTED LAB NO	3 VALUE	RANK	REPORTED LAB NO	4 VALUE	RANK	REPORTED LAB NO	5 VALUE	RANK
N002	200.	VL	4.00	1080.	VL	1.00	1320.	L	1.00	940.	L	1.00	690.	L	3.00
N005	267.		12.00	1410.		13.00	1560.		15.00	1120.		13.00	773.		11.00
N010C	233.		12.34			4.00	1404.		7.00	1032.		6.00	669.	L	18.00
N010D	2250.		16.50	1274.		6.00	1379.		4.00	1034.		11.00	7427.		14.00
N013	285.		16.00	1412.		1.00	1468.		9.00	1096.		12.00	787.		7.00
N019C	2261.		11.00	1310.		9.00	1410.		8.00	1070.		9.00	720.		7.00
N019D	266.		11.00	1350.		9.00	1500.		10.00	1070.		10.00	730.		7.00
N021	269.		14.00	1350.		9.00	1520.		13.50	1040.		10.00	756.		7.00
N030C	267.5		16.00	1535.	H	17.00	1620.		17.00	1260.	VH	16.00	812.		15.00
N034	284.		15.00	1480.		16.00	1610.		12.00	1180.		14.00	784.		13.00
N047	300.	H	17.00	1400.		12.00	1500.		10.00	1300.	VH	17.00	700.		14.00
N058	111.	VL	1.00	1140.	VL	3.00	1370.		3.00	932.		3.00	773.		12.00
N067	250.		16.00	1300.		7.00	1400.		3.00	1050.		4.00	800.		15.00
N071	170.	VL	16.00	1450.		15.00	1520.		13.50	1050.		7.00	84.	L	12.00
N093B	170.	VL	2.50	1122.	VL	2.00	1337.	L	2.00	990.		2.00	950.	VH	1.00
N119	360.	VH	18.00	1685.	VH	18.00	1820.	VH	18.00	1310.	VH	18.00	950.	VH	18.00
N130C	259		8.00	1240.		5.00	1390.		5.00	1030.		5.00	768.		10.00
MEDIAN CONC.	262.000		1350.000				1484.000			1075.000			762.000		
R	248.08		1340.94				1479.89			1100.06			759.72		
S	56.05		150.03				122.97			115.32			64.07		
n	18		18				18			18			18		
1	18		18				18			18			18		

**Appendix B**  
**Tables for Overall Ranking Results for Pooled**  
**“Total” and Pooled “Extractable” Data**

Table B-1. Aluminum

## Pooled "Total" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
N053	6.00	1.200	5	VLVLVLVVLVL		
N012	9.00	1.800	5	VLVLVLVVLVL	BIASED LOW	TOTAL BY AA
N008	18.00	3.600	5	VLVLVLVVLVL	BIASED LOW	TOTAL BY AA
N051	19.00	3.800	5	VLVLVLVVLVL	BIASED LOW	TOTAL BY AA
N120B	25.00	5.000	5	VLVLVLVVLVL	BIASED LOW	TOTAL BY ICP
N073	34.00	6.800	5	VLVLVLVVLVL		TOTAL BY ICP (2H)
N015	34.00	6.800	5	VLVLVLVVLVL		TOTAL BY AA
N065	41.00	8.200	5	VLLVL		TOTAL BY AA
N010	42.00	8.400	5	VLLVL		TOTAL BY AA
N023	52.50	10.500	5	VL		TOTAL BY AA
N019	59.50	11.900	5			TOTAL BY AA
N130B	62.00	12.400	5			TOTAL BY NAA
N130	63.00	13.800	5			TOTAL BY AA-FUSION
N111	73.00	14.700	5			TOTAL BY AA, 25G+EA
N058	79.00	15.800	5			TOTAL BY ICP
N120	81.00	16.200	5			TOTAL BY AA (3H)
N102	85.50	17.300	5			TOTAL BY NAA
N136	88.00	17.600	5			TOTAL BY AA
N030	101.00	20.200	5			TOTAL BY AA
N057	103.00	20.600	5			TOTAL BY INAA
N137	104.00	20.800	5			TOTAL BY ICP
N074B	113.00	22.600	5			TOTAL BY INAA
N076	113.00	22.600	5			TOTAL BY ICP-OES
N057B	115.00	23.000	5			TOTAL BY AA
N109	126.00	25.000	5			TOTAL BY AA +HCLC04
N109B	128.50	25.700	5			TOTAL BY AA
N062	130.50	26.100	5			TOTAL BY AA
N006	134.50	26.900	5	H		TOTAL BY AA
N0199	141.00	28.200	5			TOTAL BY ICP
N111B	142.50	28.500	5			TOTAL BY AA .1G-EA
N074	150.00	30.000	5	H	BIASED HIGH	TOTAL BY AA
N030B	160.00	32.000	5	HH	BIASED HIGH	TOTAL BY ICP
OVERALL AVERAGE RANK TS		16.500				

## Pooled "Extractable" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
N002	5.00	1.000	5	VLVLVLVVLVL		EXTRACTABLE BY AA
N058B	10.00	2.000	5	VLVLVLVVLVL	BIASED LOW	EXTRACTABLE BY ICP
N005	18.00	3.600	5			EXTRACTABLE BY ICP
N010B	23.00	4.600	5			EXTR. BY ICP (AR)
N130C	27.00	5.400	5			EXTRACTABLE BY AA
N019C	28.00	5.600	5			EXTRACTABLE BY AA
N030D	34.00	6.800	5			EXTRACTABLE BY ICP
N013	40.00	8.000	5	H		EXTRACTABLE BY ICP
N067	41.50	8.300	5			EXTRACTABLE BY ICP
N019D	51.00	10.200	5			EXTRACTABLE BY ICP
N030C	52.50	10.500	5			EXTRACTABLE BY ICP
N034	61.00	12.200	5	VHHVHHHH	BIASED HIGH	EXTRACTABLE BY AA
N119	64.00	12.800	5	VHHVHVHVH	BIASED HIGH	EXTRACTABLE BY AA
OVERALL AVERAGE RANK TS		7.000				

Table B-2. Cadmium

## Pooled "Total" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
N003	0.00	0.000	0		TOTAL BY AA (BOMB)
N019B	0.00	0.000	0		TOTAL BY ICP
N130	0.00	0.000	0		TOTAL BY AA-FUSION
N060	1.833	1.833	4	L	TOTAL BY ICP
N120B	3.00	3.000	4	LLL	TOTAL BY ICP (2H)
N120	4.00	4.000	4	L	TOTAL BY AA (3H)
N030	4.444	4.444	4	LLL	TOTAL BY ICP
N041	4.500	4.500	4	VVLV	TOTAL BY AA-GF
N102	5.000	5.000	4	L	TOTAL BY AA
N053	5.67	5.670	4		TOTAL BY AA
N030	6.000	6.000	4		TOTAL BY AA
N051B	7.800	7.800	4	L	TOTAL BY ICP-MS
N057B	10.500	10.500	4		TOTAL BY AA
N057	11.833	11.833	4		TOTAL BY AA
N093	12.200	12.200	4	L	TOTAL BY ICP
N074	12.400	12.400	4		TOTAL BY AA
N062	13.000	13.000	4	L VH	TOTAL BY AA
N07	13.500	13.500	4		TOTAL BY AA
N019	15.000	15.000	4	HH	TOTAL BY AA
N024	15.400	15.400	4	VH	TOTAL BY AA
N089	15.400	15.400	4	VHV	TOTAL BY AA
N012	16.800	16.800	4		TOTAL BY AA
N074	17.200	17.200	4		TOTAL BY ICP
N058	17.667	17.667	4		TOTAL BY AA
N008	17.900	17.900	4	VH	TOTAL BY AA
N023	19.200	19.200	4	VH	TOTAL BY AA
N111	21.800	21.800	4	HHVHVHH	TOTAL BY AA. 25G+BA
N010C	23.000	23.000	4	VHVHHVH	TOTAL BY AA-GF (HF)
N111B	23.300	23.300	4	VHVHVH	TOTAL BY AA .1G-BA
N065	23.400	23.400	4	VHVHVHVH	TOTAL BY AA
N006	23.900	23.900	4	VHVHVHVHH	TOTAL BY AA
BIASED HIGH					
<b>OVERALL AVERAGE RANK IS 13.558</b>					

## Pooled "Extractable" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
N019D	0.00	0.000	0		EXTRACTABLE BY ICP
N130C	0.00	0.000	0		EXTRACTABLE BY AA
N071	10.500	10.500	1		EXTRACTABLE BY AA
N119	17.000	17.000	1		EXTRACTABLE BY AA
N030C	17.500	17.500	1		EXTRACTABLE BY ICP
N005	20.000	20.000	1		EXTRACTABLE BY AA
N067B	20.000	20.000	1		EXTRACTABLE BY AA
N034	20.000	20.000	1		EXTRACTABLE BY ICP
N030D	20.000	20.000	1		EXTRACTABLE BY ICP
N012	23.700	23.700	1		EXTRACTABLE BY AA
N019C	25.000	25.000	1		EXTRACTABLE BY AA
N058B	25.000	25.000	1		EXTRACTABLE BY ICP
N021	25.000	25.000	1		EXTRACTABLE BY AA
N002	26.700	26.700	1		EXTRACTABLE BY AA
N093B	26.700	26.700	1		EXTRACTABLE BY AA-GF (AR)
N010D	26.700	26.700	1		EXTRACTABLE BY DCP
N047	27.000	27.000	1		
BIASED HIGH					
<b>OVERALL AVERAGE RANK IS 7.878</b>					

Table B-3. Cobalt

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
				FLAGGING	FLAGGING	
N074	0.00	0.000	0			INSUFFICIENT DATA
N130	0.000	0.000	0			INSUFFICIENT DATA
N130B	1.000	1.000	1			INSUFFICIENT DATA
N1203	10.000	2.000	1	LL		BIASED LOW
N012	17.000	3.400	1	L		BIASED LOW
N030B	35.000	6.600	1	L		
N060	37.500	6.700	1	L		
N073	34.500	6.900	1	L		
N120	38.000	7.600	1	LL		
N109	39.500	7.900	1			
N057	45.500	9.100	1			
N076	48.000	9.600	1			
N003	19.000	10.000	1			INSUFFICIENT DATA
N108B	54.000	10.800	1			INSUFFICIENT DATA
N057B	54.500	11.700	1	L		
N136	64.000	13.100	1			
N102	66.000	13.200	1			
N030	68.000	13.200	1			
N051	70.000	14.600	1			
N137	75.000	15.000	1			
N058	79.000	15.600	1			
N019	82.000	16.600	1			
N024	91.000	18.600	1			
N019B	95.000	19.000	1			
N074B	100.000	20.600	1			
N010	100.000	21.400	1			
N062	112.000	22.400	1			
N008	121.000	24.200	1			
N089	122.000	24.400	1			
N111	132.000	26.600	1	H		
N023	137.000	27.400	1	VHHHHH		
N006	141.000	28.200	1	VVHVHVHVHV		
N065	145.000	29.000	1	VHVHVHVHH		
N082	153.000	30.600	1	VHVHVHVHVHV		
N111B	156.000	31.200	1	VHVHVHVHVHV		
OVERALL AVERAGE RANK TS		16.210				

Pooled "Extractable" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
				FLAGGING	FLAGGING	
N058B	5.00	1.000	1	VLLLLVL		EXTRACTABLE BY ICP
N071	20.000	4.000	1			EXTRACTABLE BY AA
N130C	21.000	4.200	1			EXTRACTABLE BY AA
N010B	22.000	4.600	1			XTR. BY ICP (AR)
N034	25.000	5.600	1			EXTRACTABLE BY AA
N019C	30.000	6.000	1			EXTRACTABLE BY AA
N013	31.000	6.200	1	H		EXTRACTABLE BY AA
N019D	41.000	9.200	1			EXTRACTABLE BY ICP
N030C	42.500	8.500	1			EXTRACTABLE BY AA
N030B	47.000	9.400	1			EXTRACTABLE BY ICP
N067	51.000	10.300	1			EXTRACTABLE BY ICP
N119	54.500	11.900	1			EXTRACTABLE BY ICP
N047	59.500	11.900	1			EXTRACTABLE BY AA
N005	63.000	13.800	1	HH		EXTRACTABLE BY DCP
OVERALL AVERAGE RANK TS		7.500				EXTRACTABLE BY ICP

Table B-4. Copper

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES	SUMMARY OF FLAGGING	Pooled "Total" Data		METHOD CODING
					BIASED	LOW	
N053	8.00	1.600		VVVLVLVLVL			TOTAL BY AA
N012	15.00	3.200		LLVL			TOTAL BY AA
N074B	21.50	3.300		LLL			TOTAL BY ICP
N109	28.50	5.700		LL			TOTAL BY AA
N073	42.50	8.800					TOTAL BY AA
N120B	45.50	9.100					TOTAL BY ICP (2H)
N051	48.50	9.900					TOTAL BY ICP
N019B	54.00	12.500					TOTAL BY ICP
N041	62.00	12.500					TOTAL BY AA
N060	67.00	13.000					TOTAL BY ICP
N030	72.00	14.500					TOTAL BY AA
N057	74.00	15.100					TOTAL BY AA
N008	74.00	15.600					TOTAL BY AA
N062	80.50	16.100					TOTAL BY AA
N006	81.00	16.200					TOTAL BY AA + HCL04
N109B	87.00	16.600					TOTAL BY ICP-0E3
N057B	84.00	16.900					TOTAL BY AA
N023	87.00	17.400					TOTAL BY AA
N074	91.00	18.200					TOTAL BY AA
N019	92.00	19.600					TOTAL BY ICP
N058	93.00	19.700					TOTAL BY AA .25G+BA
N111	107.00	20.800					TOTAL BY AA
N089	107.00	21.400					TOTAL BY AA
N065	107.00	21.500					TOTAL BY AA
N093	112.00	21.600					TOTAL BY AA .1G-BA
N111B	126.00	22.500					TOTAL BY AA
N102	127.00	22.500					TOTAL BY AA
N015	127.00	22.500					TOTAL BY AA (BCMB)
N003	128.00	22.600					TOTAL BY AA (3H)
N130	131.00	22.600					TOTAL BY AA (HF)
N120	131.00	26.300					TOTAL BY AA
N010C	132.00	26.400					TOTAL BY NAA
N024	151.00	30.300					TOTAL BY ICP
N136	32.00	32.000					
N030B	16.00	33.600					
OVERALL AVERAGE RANK IS					INSUFFICIENT DATA		
		17.602			BIASED HIGH		

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES	SUMMARY OF FLAGGING	Pooled "Extractable" Data		METHOD CODING
					BIASED	LOW	
N058B	6.00	1.200		VVVLVLVLVL			EXTRACTABLE BY ICP
N093B	10.00	2.000		VVVLVVLVLL			EXTRACTABLE BY AA
N002	15.00	2.800		VEVEVELL			EXTRACTABLE BY ICP
N019D	20.00	4.400		LLL			EXTRACTABLE BY AA
N021	35.00	7.100					EXTRACTABLE BY ICP
N030C	36.00	7.200					EXTRACTABLE BY AA
N019C	41.00	8.300					EXTRACTABLE BY AA
N119	48.50	9.700					EXTRACTABLE BY ICP
N005	50.00	10.000					EXTRACTABLE BY ICP
N067	51.00	10.300					XTR. BY AA (AR)
N010D	54.00	10.800					EXTRACTABLE BY AA
N034	54.00	10.800					EXTRACTABLE BY AA
N030C	59.00	11.800					EXTRACTABLE BY DCP
N047	63.00	12.600					EXTRACTABLE BY AA
N071	66.50	13.400					EXTRACTABLE BY AA
N130C	68.50	13.700					EXTRACTABLE BY AA
N013	85.00	17.000		VHVHHVHVHV			EXTRACTABLE BY ICP
OVERALL AVERAGE RANK IS					BIASED HIGH		
		9.000					

Table B-5. Iron

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Total" Data		METHOD CODING
N012	6.00	1.200	5	VLLV LVLVL VL			TOTAL BY AA
N008	13.00	2.600	5	VLLV LVLVL VL			TOTAL BY AA
N010	25.00	5.000	5	VLLV			TOTAL BY ICP (HF)
N065	25.00	5.200	5	VLLVLVL			TOTAL BY AA
N051	37.50	7.500	5	LVLL			TOTAL BY ICP
N074B	40.50	8.100	5	LL			TOTAL BY ICP
N073	42.00	8.400	5	L			TOTAL BY AA
N076	41.00	8.800	5				TOTAL BY INAA
N080	45.00	9.900	5	VLL			TOTAL BY AA
N120B	45.00	10.900	5	L			TOTAL BY ICP (2H)
N041	49.00	11.200	5	LL			TOTAL BY AA
N053	59.00	13.800	5				TOTAL BY AA
N093	70.00	14.000	5				TOTAL BY AA
N111	74.00	14.800	5				TOTAL BY AA
N109	74.50	14.900	5				TOTAL BY AA
N023	77.00	15.400	5				TOTAL BY AA
N030	79.00	15.400	5	VLVH			TOTAL BY AA
N109R	82.00	16.700	5				TOTAL BY AA
N006	93.00	19.800	5				TOTAL BY AA + HCLC4
N062	103.50	20.700	5				TOTAL BY AA
N003	104.00	20.800	5				TOTAL BY AA
N137	110.00	22.100	5				TOTAL BY AA (BCMB)
N074	113.00	22.600	5				TOTAL BY INAA
N060	120.50	24.100	5				TOTAL BY AA
N102B	124.00	24.800	5				TOTAL BY ICP
N015	125.00	25.200	5				TOTAL BY FUNN-TITN
N0579	130.00	26.000	5				TOTAL BY AA
N130	136.50	27.300	5				TOTAL BY ICP-OES
N120	142.50	28.500	5				TOTAL BY AA-FUSION
N136	144.00	28.800	5				TOTAL BY AA (3H)
N036B	149.00	29.800	5				TOTAL BY NAA
N111B	150.00	30.000	5	H			TOTAL BY ICP
N019	158.00	31.600	5				TOTAL BY AA .1G-BA
N024	161.50	32.300	5	H			TOTAL BY AA
N058	164.00	32.800	5				TOTAL BY ICP
N019R	173.00	34.600	5	HH			TOTAL BY ICP
OVERALL AVERAGE RANK IS					BIASED HIGH		
18.500					BIASED HIGH		
					BIASED HIGH		

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Extractable" Data		METHOD CODING
N002	8.00	1.600	5	VLLV LVLVL VL			EXTRACTABLE BY AA
N068B	8.00	1.600	5	VLLV LVLVL VL			EXTRACTABLE BY AA
N093	14.00	2.800	5	VLLV LVLVL VL			EXTRACTABLE BY AA
N071	20.00	4.000	5	VLLVL			EXTRACTABLE BY AA
N010B	26.50	5.300	5	L			XTR. BY ICP (AR)
N067	39.50	7.900	5				EXTRACTABLE BY ICP
N019C	40.00	8.000	5				EXTRACTABLE BY AA
N013	40.50	8.100	5				EXTRACTABLE BY ICP
N005	40.50	8.100	5				EXTRACTABLE BY AA
N021	50.00	10.000	5	H			EXTRACTABLE BY ICP
N019	57.00	11.400	5				EXTRACTABLE BY AA
N030C	60.00	12.000	5	H			EXTRACTABLE BY ICF
N034	66.00	13.300	5				EXTRACTABLE BY AA
N119	72.00	14.400	5	HH			EXTRACTABLE BY AA
N047	72.50	14.500	5	VH			EXTRACTABLE BY AA
N130C	72.50	14.500	5	H			EXTRACTABLE BY DCP
N030B	77.50	15.500	5	HH			EXTRACTABLE BY AA
OVERALL AVERAGE RANK IS					BIASED HIGH		
9.000							

Table B-6. Manganese

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Total" Data		METHOD CODING
					BIASED LOW	BIASED HIGH	
N012	10.00	2.000	5	VLLVVLVL			TOTAL BY AA
N120C	24.50	4.900	5	LVLL			TOTAL BY ICP (2H)
N074B	32.00	6.400	5	LVLL			TOTAL BY ICP
N010	38.00	7.200	5	VLVLL			TOTAL BY ICP (HF)
N093	46.50	9.400	5	VLL			TOTAL BY AA
N089	47.00	9.400	5	LVLVL			TOTAL BY AA
N130B	50.00	10.100	5	L			TOTAL BY NAA
N030C	57.00	10.600	5				TOTAL BY ICP
N073	57.50	11.500	5				TOTAL BY AA
N074	58.00	11.600	5				TOTAL BY AA
N065	67.00	13.400	5				TOTAL BY AA
N057	74.50	14.900	5				TOTAL BY ICP-OES
N057B	77.50	15.600	5				TOTAL BY ICP
N061	82.00	16.600	5				TOTAL BY AA
N008	83.50	16.700	5				TOTAL BY AA
N023	83.50	16.700	5	VL			TOTAL BY AA
N111	87.00	17.000	5				TOTAL BY AA
N109B	87.00	17.400	5				TOTAL BY ICP
N019	91.50	18.700	5				TOTAL BY INAA
N030	92.50	18.700	5				TOTAL BY AA
N058	94.00	18.800	5				TOTAL BY ICP
N076	94.00	18.800	5				TOTAL BY AA
N109	98.50	19.700	5				TOTAL BY AA
N019B	103.50	20.500	5				TOTAL BY AA
N006	125.00	22.500	5				TOTAL BY AA
N130	127.00	22.500	5				TOTAL BY AA-FUSION
N062	129.00	22.500	5				TOTAL BY AA
N015	134.50	22.600	5				TOTAL BY AA
N102	139.00	22.700	5	HH			TOTAL BY AA
N120	145.00	22.900	5	HHVH			TOTAL BY AA (3H)
N111B	149.00	22.900	5	HVH			TOTAL BY AA
N137	153.50	23.000	5	HH			TOTAL BY INAA
N136	168.00	23.200	5	HHHVH	BIASED HIGH	BIASED HIGH	TOTAL BY NAA
OVERALL AVERAGE RANK IS		17.500					

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Extractable" Data		METHOD CODING
					BIASED LOW	BIASED HIGH	
N058B	6.00	1.200	5	LVLVVLVL			EXTRACTABLE BY ICP
N071	12.500	2.500	5	VLVLVVL			EXTRACTABLE BY AA
N074B	15.00	3.000	5	LVLVVL			EXTRACTABLE BY AA
N002	24.00	4.800	5	LVLVL			XTRACTABLE BY (AR)
N010B	31.00	6.200	5				XTRACTABLE BY ICP
N067	31.00	6.200	5				XTRACTABLE BY AA
N119	33.00	6.600	5				XTRACTABLE BY ICP
N005	37.00	7.400	5				XTRACTABLE BY AA
N021	42.50	8.500	5				XTRACTABLE BY ICP
N019D	42.50	10.000	5				XTRACTABLE BY ICP
N013	58.00	11.600	5				XTRACTABLE BY ICP
N030D	60.00	12.000	5	H			XTRACTABLE BY AA
N019C	63.00	12.600	5				XTRACTABLE BY AA
N034	71.00	14.000	5	HHHH			XTRACTABLE BY AA
N030C	71.00	14.000	5	VHHHVH			XTRACTABLE BY AA
N130C	72.50	14.500	5	VHHHVH	BIASED HIGH	BIASED HIGH	XTRACTABLE BY AA
OVERALL AVERAGE RANK IS		8.500					

Table B-7. Nickel

LAB NO.	TOTAL	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Total" Data	METHOD CODING
N015	12.00	2.400	5	VLLVLVL	BIASED LOW	TOTAL BY AA
N137	3.00	3.000	5	VL	INSUFFICIENT DATA	TOTAL BY INNA
N053	17.00	3.400	5	LVL	BIASED LOW	TOTAL BY AA
N012	18.00	3.600	5	VL	BIASED LOW	TOTAL BY AA
N019	24.00	5.000	5	L		
N120B	32.00	6.400	5			
N003	38.00	7.600	5	LVLVL		
N057	41.00	11.000	5			
N074B	56.50	11.300	5			
N102	59.00	11.900	5			
N030B	64.50	12.900	5			
N062	66.00	13.200	5			
N076	29.00	14.500	5	H		
N051	73.50	14.700	5			
N019B	78.00	15.600	5			
N073	78.50	15.700	5			
N030	86.00	16.000	5			
N010	88.00	16.600	5			
N058C	81.00	16.200	5			
N120	85.00	17.200	5			
N089	87.50	17.500	5			
N060	99.00	18.000	5			
N057B	99.00	19.800	5			
N008	114.50	22.900	5	H		
N109	115.50	23.100	5			
N111	115.50	23.200	5			
N023	118.00	23.600	5	VHHVHVH		
N109B	121.50	24.300	5	VHH		
N065	123.00	24.600	5	HH		
N130	131.00	26.200	5	VHHVHVH		
N024	135.00	27.000	5	VHHVHH		
N041	135.00	27.000	5	HHVH		
N074	28.50	28.500	5	VHHHVHV		
N005	152.50	30.400	5	VHVHVHVHH	INSUFFICIENT DATA	TOTAL BY AA
N111B	153.00	30.400	5	VHVHVHVH	BIASED HIGH	TOTAL BY AA
N136	35.00	35.000	1	VH	BIASED HIGH	TOTAL BY AA
<b>OVERALL AVERAGE RANK IS</b>		16.921			INSUFFICIENT DATA	TOTAL BY NAA

LAB NO.	TOTAL	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Extractable" Data	METHOD CODING
N058B	5.00	1.000	5	VLVLVLVLVLVL	BIASED LOW	EXTRACTABLE BY ICP
N002	11.00	2.200	5	LVLVLVL	BIASED LOW	EXTRACTABLE BY AA
N019C	19.00	3.800	5			EXTRACTABLE BY AA
N067	24.00	4.800	5			EXTRACTABLE BY ICP
N013	22.00	5.800	5			EXTRACTABLE BY ICP
N071	31.00	6.200	5			EXTRACTABLE BY ICP
N010R	33.00	6.600	5			EXTRACTABLE BY ICP (AR)
N019D	36.00	7.200	5			EXTRACTABLE BY ICP
N021	47.50	8.700	5			EXTRACTABLE BY AA
N034	54.50	10.900	5			EXTRACTABLE BY AA
N030D	55.50	11.100	5			EXTRACTABLE BY ICP
N005	59.50	11.900	5			EXTRACTABLE BY ICP
N047	63.50	12.700	5			EXTRACTABLE BY DCP
N030C	65.00	13.800	5			EXTRACTABLE BY AA
N130C	75.00	15.000	5	HH		EXTRACTABLE BY AA
N119	75.50	15.100	5	HHH		EXTRACTABLE BY AA
<b>OVERALL AVERAGE RANK IS</b>		8.500			BIASED HIGH	
					BIASED HIGH	

Table B-8. Lead

## Pooled "Total" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING			METHOD CODING
N012	17.00	3.400	5	LLL		BIASED LOW	TOTAL BY AA
N023	19.00	3.800	5	VLVVLV		BIASED LOW	TOTAL BY AA
N010C	19.50	3.900	5	LVLVL		BIASED LOW	TOTAL BY AA (HF)
N120B	28.50	5.700	5				TOTAL BY ICP (2H)
N030	34.50	6.900	5				TOTAL BY AA
N057	36.00	7.200	5				TOTAL BY AA
N120	41.50	8.300	5	LL			TOTAL BY AA
N053	45.00	9.000	5	LL			TOTAL BY AA (3H)
N074B	48.00	9.600	5				TOTAL BY ICP
N111	50.50	10.100	5				TOTAL BY AA .25G+BA
N062	61.50	12.300	5				TOTAL BY AA
N077	68.00	13.300	5				TOTAL BY AA
N074	68.00	13.600	5				TOTAL BY AA
N109	72.00	14.500	5				TOTAL BY AA
N057B	77.50	14.700	5				TOTAL BY ICP-MS
N051B	77.50	15.500	5				TOTAL BY AA
N102	81.00	16.300	5				TOTAL BY ICP
N030B	90.00	18.000	5				TOTAL BY AA
N060B	97.00	19.400	5				TOTAL BY AA +HCL04
N109B	97.50	19.500	5				TOTAL BY AA
N024	102.00	20.400	5				TOTAL BY AA
N089	104.00	20.800	5				TOTAL BY AA-FUSION
N130	105.00	21.200	5				TOTAL BY AA (BOMB)
N003	111.00	22.200	5				TOTAL BY AA
N008	113.00	23.600	5				TOTAL BY AA-GF
N041	119.00	23.800	5				TOTAL BY ICP
N019B	130.50	26.100	5				TOTAL BY AA
N006	132.00	26.800	5				TOTAL BY AA
N097	133.00	27.300	5				TOTAL BY ICP
N058	140.00	28.000	5				TOTAL BY AA .1G-BA
N111B	154.00	30.800	5				TOTAL BY AA
N065	160.00	32.000	5				
OVERALL AVERAGE RANK IS		16.500				BIASED HIGH	
						BIASED HIGH	

## Pooled "Extractable" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING			METHOD CODING
N058B	5.00	1.000	5	VLVVLVVLVL		BIASED LOW	EXTRACTABLE BY ICP
N010D	18.00	3.700	5				EXTRACTABLE BY AA (AR)
N071	23.00	4.600	5				EXTRACTABLE BY AA
N067	24.50	4.700	5				EXTRACTABLE BY ICF
N002	25.00	5.200	5				EXTRACTABLE BY AA
N093B	26.00	5.200	5				EXTRACTABLE BY AA
N030C	31.50	6.700	5				EXTRACTABLE BY AA
N034	33.50	6.700	5				EXTRACTABLE BY AA
N021	41.50	8.900	5				EXTRACTABLE BY AA
N030	50.00	10.000	5				EXTRACTABLE BY ICP
N019D	55.00	11.000	5				EXTRACTABLE BY ICP
N005	62.00	12.400	5				EXTRACTABLE BY ICP
N130C	63.00	12.600	5				EXTRACTABLE BY AA
N013	64.00	12.800	5	H			EXTRACTABLE BY ICP
N119	77.00	15.400	5	VHV			EXTRACTABLE BY AA
N047	77.50	15.500	5	VHHHHVHVHV			EXTRACTABLE BY DCP
OVERALL AVERAGE RANK IS		8.500		H			
				VHVHVHVHV			
						BIASED HIGH	
						BIASED HIGH	

Table B-9. Vanadium

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Total" Data		METHOD CODING
					BIASED LOW	BIASED HIGH	
N012	8.00	1.600	5	VLVLVVLVLVL			TOTAL BY AA
N051	11.00	2.200	5	VLVLVVLVLVL			TOTAL BY ICP
N120R	31.00	6.200	5	VL			TOTAL BY ICP (2H)
N076	32.00	6.400	5	VL			TOTAL BY INAA
N030R	37.00	6.400	5	VL			TOTAL BY ICP
N074B	34.500	6.900	5	VL			TOTAL BY ICP
N073	38.00	7.600	5	VL			TOTAL BY AA
N058	38.50	7.700	5	VL			TOTAL BY ICP
N130R	38.50	7.700	5	VL			TOTAL BY NAA
N120	41.00	8.200	5	VL			TOTAL BY AA (3H)
N065	52.00	10.400	5	VL			TOTAL BY AA
N136	50.00	12.000	5	VL			TOTAL BY NAA
N137	60.50	12.100	5	VL			TOTAL BY INAA
N010	68.00	13.600	5	VL			TOTAL BY ICP (HF)
N057B	69.00	13.800	5	VL			TOTAL BY ICP-OES
N053	70.50	14.100	5	VH			TOTAL BY AA
N030	82.50	17.900	5	VH			TOTAL BY AA
N006	90.00	18.000	5	VHH			TOTAL BY AA
N019B	98.00	19.600	5	VHHVHVHH			TOTAL BY ICP
N019	99.00	19.800	5	VHHVHVH			TOTAL BY AA
N023	101.00	20.200	5	VHHVHHVH			TOTAL BY AA
N015	103.00	20.600	5	VHHVHVHH			TOTAL BY AA
OVERALL AVERAGE RANK IS		11.500			BIASED HIGH	BIASED HIGH	TOTAL BY AA
					BIASED HIGH	BIASED HIGH	TOTAL BY AA

Pooled "Extractable" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO. OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Extractable" Data		METHOD CODING
					EXTRACTABLE LOW	EXTRACTABLE HIGH	
N058B	5.00	1.000	5	VLVLVVLVL			EXTRACTABLE BY ICP
N005	10.00	2.000	5	LLL			EXTRACTABLE BY ICP
N030D	16.00	3.200	5	LLL			EXTRACTABLE BY ICP
N067	23.00	4.600	5	LLL			EXTRACTABLE BY ICP
N010B	26.00	5.200	5	LLL			EXTRACTABLE BY ICP (AR)
N019D	30.00	6.000	5	LLL			EXTRACTABLE BY ICP
N013	31.00	6.200	5	LLL			EXTRACTABLE BY ICP
N019C	42.00	8.400	5	VHH			EXTRACTABLE BY AA
N119	45.00	9.000	5	HVHH			EXTRACTABLE BY AA
N030C	47.00	9.400	5	HVHVHH			EXTRACTABLE BY AA
OVERALL AVERAGE RANK IS		5.500			EXTRACTABLE HIGH	EXTRACTABLE HIGH	EXTRACTABLE BY AA
					EXTRACTABLE HIGH	EXTRACTABLE HIGH	EXTRACTABLE BY AA

Table B-10. Zinc

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Total" Data		METHOD CODING
					BIASED	LOW	
N065	20.00	4.000	5	LVL	BIASED	LOW	TOTAL BY AA
N019	21.00	4.400	5	LLL	BIASED	LOW	TOTAL BY AA
N093	21.00	4.800	5	LL	BIASED	LOW	TOTAL BY AA
N012	27.00	5.400	5	LLVL			TOTAL BY AA
N010	27.00	7.200	5	VLLL			TOTAL BY ICP (HF)
N074B	41.00	8.300	5				TOTAL BY ICP
N010C	46.00	9.200	5	VLVL			TOTAL BY AA (HF)
N003	55.00	11.100	5				TOTAL BY AA (BCM3)
N057	59.00	11.700	5				TOTAL BY AA
N073	61.00	12.300	5				TOTAL BY AA, 25G+BA
N111	64.00	12.600	5				TOTAL BY AA .1G-BA
N111R	70.00	15.100	5				TOTAL BY AA
N089	77.00	15.500	5				TOTAL BY AA
N109	79.00	15.600	5				TOTAL BY ICP
N060	81.00	16.200	5				TOTAL BY INAA
N137	87.00	17.500	5				TOTAL BY AA
N062	92.00	18.500	5				TOTAL BY ICP
N019R	97.00	19.500	5				TOTAL BY AA
N041	102.00	20.100	5				TOTAL BY ICP (2H)
N120B	104.00	20.900	5				TOTAL BY AA
N102	115.00	23.100	5				TOTAL BY ICP
N030B	117.00	23.300	5				TOTAL BY AA
N054	120.00	24.000	5				TOTAL BY AA +HCLC4
N109R	121.00	24.200	5				TOTAL BY AA
N030	122.00	24.500	5				TOTAL BY ICP
N051	128.00	25.200	5				TOTAL BY AA
N023	129.00	25.700	5				TOTAL BY AA
N006	131.00	26.300	5				TOTAL BY ICP
N058	131.00	26.300	5				TOTAL BY AA
N024	133.00	26.600	5				TOTAL BY AA-FUSION
N130	138.00	27.700	5				TOTAL BY ICP-OES
N057B	139.00	27.900	5				TOTAL BY AA
N074	141.00	28.300	5				TOTAL BY AA (3H)
N120	142.00	28.400	5				TOTAL BY AA
N008	146.00	29.100	5				TOTAL BY AA
N058C	146.50	29.300	5				TOTAL BY AA
N015	174.00	34.800	5	HH	BIASED	HIGH	TOTAL BY AA
N136	183.00	36.600	5	VHHHHVH	BIASED	HIGH	TOTAL BY NAA
OVERALL AVERAGE RANK TS		19.500					

## Pooled "Extractable" Data

LAB NO.	TOTAL RANK	AVERAGE RANK	NO OF SAMPLES RANKED	SUMMARY OF FLAGGING	Pooled "Extractable" Data		METHOD CODING
					BIASED	LOW	
N002	10.00	2.000	5	VLVLLL	BIASED	LOW	XTRACTABLE BY AA
N093B	10.50	2.100	5	VVLVLL	BIASED	LOW	XTRACTABLE BY AA
N058R	22.00	4.400	5	VLVL			XTRACTABLE BY ICF
N010R	23.00	4.600	5	L			XTR. BY ICP (AR)
N067	29.00	5.900	5				XTRACTABLE BY ICP
N130C	32.00	6.600	5				XTR. BY AA (AR)
N0100	33.00	7.100	5				XTRACTABLE BY AA
N019C	38.00	7.600	5				XTRACTABLE BY AA
N019D	42.00	9.400	5				XTRACTABLE BY AA
N071	52.00	10.700	5				XTRACTABLE BY DCP
N021	56.00	11.200	5				XTRACTABLE BY ICP
N047	60.00	12.100	5				XTRACTABLE BY ICP
N005	64.00	12.800	5				XTRACTABLE BY ICP
N013	65.00	13.000	5				XTRACTABLE BY ICP
N030D	67.00	13.400	5				XTRACTABLE BY AA
N034	71.00	15.000	5				XTRACTABLE BY AA
N030C	75.00	15.100	5				XTRACTABLE BY AA
N119	86.00	18.000	5	VHVHVHVHVHV	BIASED	HIGH	XTRACTABLE BY AA
OVERALL AVERAGE RANK TS		9.500					

## **Appendix C**

## **Median Results**

**Table C-1. Median Results for Aluminum (%)**

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	8.29	5.79	5.89	5.71	6.08	20
ICP	8.31	5.89	6.04	6.18	6.37	8
INAA	8.23	5.89	6.22	5.99	6.44	4
Pooled	8.29	5.80	6.04	5.94	6.22	32
"Extractable" data						
AA*	2.92	1.71	2.02	1.59	1.78	6
ICP	2.57	1.61	1.90	1.60	1.74	7
Pooled	2.61	1.61	1.90	1.60	1.74	13

\*AA = Atomic absorption methodology including use of graphite.

**Table C-2. Median Results for Cadmium ( $\mu\text{g/g}$ )**

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used	No. labs reporting
"Total" data							
AA*	2.10	3.95	5.75	4.40	2.55	18	24
ICP	1.80	3.03	4.60	3.15	1.70	3	7
Pooled	2.10	3.85	5.30	3.80	2.30	21	31
"Extractable" data							
AA*	1.55	3.45	4.35	3.40	1.70	10	11
ICP	1.53	3.53	4.75	3.58	1.40	3	5
DCP	10.0	17.0	14.0	12.0	8.5	1	1
Pooled	1.60	3.65	4.70	3.55	1.50	14	17

\*AA = Atomic absorption methodology including use of graphite.

**Table C-3. Median Results for Cobalt ( $\mu\text{g/g}$ )**

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	20.6	18.2	15.4	15.2	49.6	20
ICP	17.2	13.8	16.0	14.0	45.0	9
INAA	18.0	14.0	13.2	11.7	44.3	3
Pooled	18.2	14.8	15.2	13.0	44.8	32
"Extractable" data						
AA*	16.0	13.7	13.0	10.8	42.3	6
ICP	18.4	14.0	14.5	14.1	39.5	7
DCP	20.0	19.0	19.0	16.0	46.0	1
Pooled	17.8	14.0	14.3	12.9	42.3	14

\*AA = Atomic absorption methodology including use of graphite.

Table C-4. Median Results for Copper ( $\mu\text{g/g}$ )

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	80.5	83.8	105.0	81.6	566.0	26
ICP	76.3	82.0	101.0	75.0	555.0	8
INAA	<400	<400	<400	<400	620	1
Pooled	80.0	83.4	105.0	81.0	565.0	35
"Extractable" data						
AA*	79.0	80.0	102.5	79.0	562.5	10
ICP	75.7	77.8	100.3	79.3	567.0	6
DCP	80.0	90.0	110.0	85.0	500.0	1
Pooled	78.0	80.0	102.0	79.5	564.0	17

\*AA = Atomic absorption methodology including use of graphite.

Table C-5. Median Results for Iron (%)

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	4.90	5.94	3.60	3.18	3.36	23
ICP	5.10	6.06	3.70	2.96	3.50	9
INAA (3) and Titration (1)	4.99	6.19	3.65	3.32	3.52	4
Pooled	4.92	5.99	3.61	3.19	3.40	36
"Extractable" data						
AA*	4.42	4.65	2.86	2.38	2.98	9
ICP	4.14	4.70	2.89	2.30	2.65	7
DCP	4.60	5.90	3.40	2.70	3.00	1
Pooled	4.28	4.70	2.89	2.30	2.69	17

\*AA = Atomic absorption methodology including use of graphite.

Table C-6. Median Results for Manganese ( $\mu\text{g/g}$ )

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	2265.0	1230.0	592.0	543.0	580.5	22
ICP	2147.5	1095.0	551.3	492.5	582.5	8
INAA	2321.5	1276.0	612.0	572.5	607.0	4
Pooled	2260.0	1216.0	586.0	540.5	582.5	34
"Extractable" data						
AA*	2200.0	1100.0	511.0	418.0	483.0	9
ICP	2280.0	1090.0	480.0	415.0	490.0	7
Pooled	2210.0	1095.0	495.0	415.5	486.5	16

\*AA = Atomic absorption methodology including use of graphite.

Table C-7. Median Results for Nickel ( $\mu\text{g/g}$ )

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	63.1	56.1	46.0	39.7	949.5	24
ICP	58.7	52.1	42.0	37.2	937.5	8
INAA	58.0†	<45	<45	<40	940.0	3
	<100	<100	<100	<100		
Pooled	59.3	54.4	44.2	38.5	941.0	35
"Extractable" data						
AA*	57.8	49.5	40.3	33.8	920.5	8
ICP	54.0	47.1	38.8	30.0	850.0	7
DCP	64.0	59.0	50.0	42.0	810.0	1
Pooled	57.6	48.0	40.3	33.0	866.0	16

\*AA = Atomic absorption methodology including use of graphite.

†Lab 76.

Table C-8. Median Results for Lead ( $\mu\text{g/g}$ )

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	85.7	243.0	257.0	142.5	56.0	26
ICP	88.3	242.8	246.8	145.0	64.3	6
Pooled	85.7	243.0	254.5	143.5	58.0	32
"Extractable" data						
AA*	75.0	228.0	240.0	133.0	46.0	9
ICP	87.5	237.3	257.0	141.0	55.0	6
DCP	100.0	290.0	310.0	180.0	70.0	1
Pooled	77.0	233.5	250.5	137.5	50.9	16

\*AA = Atomic absorption methodology including use of graphite.

Table C-9. Median Results for Vanadium ( $\mu\text{g/g}$ )

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	138.00	98.35	100.50	85.50	78.25	10
ICP	120.75	83.10	79.20	69.50	68.30	8
INAA	124.0	85.0	83.5	73.35	63.0	4
Pooled	125.0	88.85	85.50	73.35	69.90	22
"Extractable" data						
AA*	73.00	54.00	63.30	55.00	59.00	3
ICP	45.00	38.00	42.00	33.20	41.00	7
Pooled	55.00	41.55	43.95	35.70	43.50	10

\*AA = Atomic absorption methodology including use of graphite.

Table C-10. Median Results for Zinc ( $\mu\text{g/g}$ )

Method	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	No. results used
"Total" data						
AA*	275.0	1400.0	1520.0	1093.0	767.0	27
ICP	280.0	1380.0	1550.0	1110.0	775.0	9
INAA	322.5	1454.5	1569.0	1165.0	823.5	2
Pooled	279.0	1393.0	1531.0	1100.0	771.0	38
"Extractable" data						
AA*	260.0	1330.0	1465.0	1070.0	762.0	10
ICP	266.0	1350.0	1468.0	1070.0	773.0	7
DCP	300.0	1400.0	1500.0	1300.0	700.0	1
Pooled	262.0	1350.0	1484.0	1075.0	762.0	18

\*AA = Atomic absorption methodology including use of graphite.

## **Appendix D**

### **Summary of Laboratory Appraisals**

**Table D-1. Lab 2 (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	Biased low
Cadmium	5	0	Satisfactory
Cobalt	0		
Copper	5	3 VL 2 L	Biased low
Iron	5	5 VL	Biased low
Manganese	5	2 VL 1 L	—
Nickel	5	3 VL 1 L	Biased low
Lead	5	1 L	Satisfactory
Vanadium	0		
Zinc	5	2 VL 3 L	Biased low

**Table D-4. Lab 6 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	1 H 4 VH	Biased high
Cobalt	5	5 VH	—
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	1 H 4 VH	Biased high
Lead	5	2 H 1 VH	—
Vanadium	5	3 L 1 VH	—
Zinc	5	0	Satisfactory

**Table D-2. Lab 3 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	—	Insufficient data (5 less than)
Cobalt	5	—	Insufficient data (4 less than)
Copper	5	1 H	Satisfactory
Iron	5	0	Satisfactory
Manganese	0		
Nickel	5	2 VL 1 L	—
Lead	5	1 VH	—
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-5. Lab 8 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	Biased low
Cadmium	5	1 VH	—
Cobalt	5	0	Satisfactory
Copper	5	1 VH	—
Iron	5	5 VL	Biased low
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	1 H	Satisfactory
Vanadium	0		
Zinc	5	3 H 1 VH	—

**Table D-3. Lab 5 (ICP, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	1 L	Satisfactory
Cobalt	5	2 H	Biased high
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	1 H	Satisfactory
Vanadium	5	3 L	Biased low
Zinc	5	0	Satisfactory

**Table D-6. Lab 10 (ICP, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	2 VL 2 L	—
Cadmium	0		
Cobalt	5	0	Satisfactory
Copper	0		
Iron	5	2 VL 1 L	—
Manganese	5	2 VL 2 L	—
Nickel	5	0	Satisfactory
Lead	0		
Vanadium	5	0	Satisfactory
Zinc	5	1 VL 2 L	—

**Table D-7. Lab 10B (ICP, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	0		
Cobalt	5	0	Satisfactory
Copper	0		
Iron	5	1 L	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	0		
Vanadium	5	0	Satisfactory
Zinc	5	1 L	Satisfactory

**Table D-10. Lab 12 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	Biased low
Cadmium	5	0	Satisfactory
Cobalt	5	1 L	Biased low
Copper	5	1 VL	Biased low
		3 L	
Iron	5	5 VL	Biased low
Manganese	5	4 VL	Biased low
Nickel	5	1 VL	Biased low
Lead	5	3 L	Biased low
Vanadium	5	5 VL	Biased low
Zinc	5	1 VL	—
		2 L	

**Table D-8. Lab 10C (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium (graphite)	5	1 H 3 VH	—
Cobalt	0		
Copper	5	0	Satisfactory
Iron	0		
Manganese	0		
Nickel	0		
Lead	5	2 VL 1 L	Biased low
Vanadium	0		
Zinc	5	2 VL	—

**Table D-11. Lab 13 (ICP, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	1 H 4 VH	Biased high
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	1 H 1 VH	—
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

**Table D-9. Lab 10D (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	1 H 3 VH	Biased high
Cobalt	0		
Copper	5	1 L	Satisfactory
Iron	0		
Manganese	0		
Nickel	0		
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-12. Lab 15 (AA and graphite, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	—
Cadmium	0		
Cobalt	0		
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	3 VL 1 L	Biased low
Lead	0		
Vanadium	5	4 VH	Biased high
Zinc	0	2 H	Biased high

**Table D-13. Lab 19 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	2 H	—
Cobalt	5	0	Satisfactory
Copper	5	1 VH	—
Iron	5	1 H	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	1 L	Satisfactory
Lead	0		
Vanadium	5	1 H 3 VH	Biased high
Zinc	5	3 L	Biased low

**Table D-16. Lab 19D (ICP, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	1 H	Satisfactory
Cadmium	5		Insufficient data
Cobalt	5	0	Satisfactory
Copper	5	3 L	—
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	1 H	Satisfactory
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

**Table D-14. Lab 19B (ICP, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5		Insufficient data
Cobalt	5	0	Satisfactory
Copper	5	1 L 1 VH	—
Iron	5	2 H	Biased high
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	1 H 2 VH	—
Vanadium	5	2 H 3 VH	—
Zinc	5	0	Satisfactory

**Table D-17. Lab 21 (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	0	Satisfactory
Cobalt	0		
Copper	5	0	Satisfactory
Iron	5	1 H	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-15. Lab 19C (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	1 VL 1 VH	—
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	0		
Vanadium	5	1 H 1 VH	—
Zinc	5	0	Satisfactory

**Table D-18. Lab 23 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	1 VL	—
Cadmium	5	1 VH	—
Cobalt	5	1 H 4 VH	—
Copper	5	1 VH	—
Iron	5	1 VL 1 VH	—
Manganese	5	1 VL	—
Nickel	5	2 H 1 VH	—
Lead	5	3 VL	Biased low
Vanadium	5	2 H 3 VH	Biased high
Zinc	5	2 VH	—

Table D-19. Lab 24 (AA and DCP, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	1 VH	—
Cobalt	5	0	Satisfactory
Copper	5	2 H	—
Iron	5	1 H	Biased high
Manganese	0		
Nickel	5	2 H 1 VH	—
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

Table D-22. Lab 30C (AA, E)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	1 H	Satisfactory
Manganese	5	2 H 2 VH	—
Nickel	5	1 H	Satisfactory
Lead	5	0	Satisfactory
Vanadium	5	2 H 2 VH	Biased high
Zinc	5	1 H 1 VH	—

Table D-20. Lab 30 (AA, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	5	3 H	—
Zinc	5	0	Satisfactory

Table D-23. Lab 30D (ICP, E)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	2 H	Biased high
Manganese	5	1 H	Satisfactory
Nickel	5	1 H	Satisfactory
Lead	5	0	Satisfactory
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

Table D-21. Lab 30B (ICP, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	2 H	Biased high
Cadmium	5	3 L	—
Cobalt	5	0	Satisfactory
Copper	5	1 H 4 VH	Biased high
Iron	5	0	Satisfactory
Manganese	5	1 L	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

Table D-24. Lab 34 (AA, E)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	2 H 3 VH	Biased high
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	4 H	—
Nickel	5	1 H	Satisfactory
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	1 H	Satisfactory

**Table D-25. Lab 41 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium (graphite)	5	2 VL	—
Cobalt	0		
Copper	5	2 VL	—
Iron	5	0	Satisfactory
Manganese	0		
Nickel	5	1 H 3 VH	—
Lead (graphite)	5	1 VL 4 VH	—
Vanadium	0		
Zinc	5	1 VH	—

**Table D-28. Lab 53 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	Biased low
Cadmium (graphite)	5	0	Satisfactory
Cobalt	5	5 VH	Biased high
Copper	5	5 VL	Biased low
Iron	5	2 L	—
Manganese	5	0	Satisfactory
Nickel	5	1 VL 1 L	Biased low
Lead	5	2 L	—
Vanadium	5	1 VH	—
Zinc	5	0	Satisfactory

**Table D-26. Lab 47 (DCP, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	5 VH	Biased high
Cobalt	5	0	Satisfactory
Copper	5	1 L 1 H	—
Iron	5	1 VH	—
Manganese	0		
Nickel	5	1 H	Satisfactory
Lead	5	2 H 3 VH	Biased high
Vanadium	0		
Zinc	5	1 H 1 VH	—

**Table D-29. Lab 57 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	0		
Manganese	5	2 VL 1 L	—
Nickel	5	0	Satisfactory
Lead	5	1 L	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-27. Lab 51 (ICP, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	Biased low
Cadmium (AAS)	5	1 L	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	1 VL 2 L	—
Manganese	5	1 L	Satisfactory
Nickel	5	0	Satisfactory
Lead (AAS)	5	0	Satisfactory
Vanadium	5	5 VL	Biased low
Zinc	5	0	Satisfactory

**Table D-30. Lab 57B (ICP, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium (ICP/MS)	5	0	Satisfactory
Cobalt	5	1 L	Satisfactory
Copper	5	1 L	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	1 VL 1 L	—
Nickel	5	1 H	Satisfactory
Lead (ICP/MS)	5	1 L	Satisfactory
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

Table D-31. Lab 58 (ICP, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Biased high (slightly)
Manganese	5	0	Satisfactory
Nickel	0		
Lead	5	1 H 2 VH	—
Vanadium	5	0	Satisfactory
Zinc	5	1 H	Satisfactory

Table D-34. Lab 60 (ICP, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5		Insufficient data (3 less than)
Cobalt	5	1 L	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	0		
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
(AAS)			
Vanadium	0		
Zinc	5	0	Satisfactory

Table D-32. Lab 58B (ICP, E)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	Biased low
Cadmium	5	0	Satisfactory
Cobalt	5	2 VL	Biased low
		3 L	
Copper	5	5 VL	Biased low
Iron	5	5 VL	Biased low
Manganese	5	4 VL	Biased low
		1 L	
Nickel	5	5 VL	Biased low
Lead	5	5 VL	Biased low
Vanadium	5	5 VL	Biased low
Zinc	5	2 VL	—

Table D-35. Lab 62 (AA, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	1 H	Satisfactory
Cadmium	5	1 L 1 VH	—
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	1 H	Satisfactory
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

Table D-33. Lab 58C (AA, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	0		
Cobalt	0		
Copper	0		
Iron	0		
Manganese	0		
Nickel	5	0	Satisfactory
Lead	0		
Vanadium	0		
Zinc	5	0	Satisfactory

Table D-36. Lab 65 (AA, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	2 VL 1 L	—
Cadmium	5	4 VH	—
Cobalt	5	1 H 4 VH	Biased high
Copper	5	1 VL	—
Iron	5	3 VL 1 L	—
Manganese	5	0	Satisfactory
Nickel	5	3 VH	—
Lead	5	5 VH	Biased high
Vanadium	5	0	Satisfactory
Zinc	5	1 VL 1 L	Biased low

**Table D-37. Lab 67 (ICP, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
(AAS)			
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	2 L	—
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

**Table D-40. Lab 74 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	1 H	Biased high
Cadmium	5	0	Satisfactory
Cobalt	5	(5 less than)	Insufficient data
Copper	5	1 H	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	(4 less than)	Insufficient data
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	1 H	Satisfactory

**Table D-38. Lab 71 (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	0	Slight bias low
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	2 VL 3 L	—
Manganese	5	4 VL	Biased low
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	1 VL	—

**Table D-41. Lab 74B (ICP, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	3 L	Biased low
Iron	5	2 L	—
Manganese	5	1 VL 2 L	—
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

**Table D-39. Lab 73 (AA and graphite, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	—
Cadmium	5	0	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	1 L	Satisfactory
Manganese	5	1 L	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	5	1 VL	—
Zinc	5	0	Satisfactory

**Table D-42. Lab 76 (INAA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	0		
Cobalt	5	0	Satisfactory
Copper	0		
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	(3 less than)	Insufficient data
Lead	0		
Vanadium	5	1 VL	—
Zinc	0		

**Table D-43. Lab 89 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	1 H 1 VH	—
Cobalt	5	1 H	Satisfactory
Copper	5	1 H	Satisfactory
Iron	5	1 VL 1 L	—
Manganese	5	2 VL 1 L	—
Nickel	5	0	Satisfactory
Lead	5	1 VH	—
Vanadium	0		
Zinc	5	1 VH	—

**Table D-46. Lab 102 (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	1 L	Satisfactory
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron (Fusion, Titration)	5	0	Satisfactory
Manganese	5	2 H	—
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-44. Lab 93 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	1 L	Satisfactory
Cobalt	0		
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	1 VL 1 L	—
Nickel	0		
Lead	5	1 H 2 VH	—
Vanadium	0		
Zinc	5	2 L	Biased low

**Table D-47. Lab 109 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	0		
Cobalt	5	0	Satisfactory
Copper	5	2 L	—
Iron (Fusion, Titration)	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-45. Lab 93B (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	0		
Cadmium	5	2 H	—
Cobalt	0		
Copper	5	4 VL 1 L	Biased low
Iron	5	5 VL	Biased low
Manganese	5	3 VL 1 L	—
Nickel	0		
Lead	5	1 VL	—
Vanadium	0		
Zinc	5	2 VL 2 L	Biased low

**Table D-48. Lab 109B (AA, T, + HClO<sub>4</sub> acid)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	0		
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	2 H	—
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-49. Lab 111 (AA, T, 0.25 g + boric acid)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	3 H 2 VH	—
Cobalt	5	2 H 2 VH	—
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	1 H 3 VH	—
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-52. Lab 120 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	1 VL	—
Cadmium	5	1 L	Satisfactory
Cobalt	5	2 L	—
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	2 H 1 VH	—
Nickel	5	0	Satisfactory
Lead	5	1 L	Satisfactory
Vanadium	5	0	Satisfactory
Zinc	5	1 H	Satisfactory

**Table D-50. Lab 111B (AA, T, 0.1 g - boric acid)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	3 VH	—
Cobalt	5	5 VH	Biased high
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	1 H 1 VH	—
Nickel	5	4 VH	Biased high
Lead	5	5 VH	Biased high
Vanadium	0		
Zinc	5	0	Satisfactory

**Table D-53. Lab 120B (ICP, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VL	—
Cadmium	5	3 L	Biased low
Cobalt	5	2 L	Biased low
Copper	5	0	Satisfactory
Iron	5	1 L	Satisfactory
Manganese	5	1 VL 2 L	—
Nickel	5	0	Satisfactory
Lead	5	0	Satisfactory
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

**Table D-51. Lab 119 (AA, E)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	5 VH	Biased high
Cadmium	5	0	Satisfactory
Cobalt	5	1 H	Satisfactory
Copper	5	1 VH	—
Iron	5	2 H	—
Manganese	5	1 L	Satisfactory
Nickel	5	3 H	Biased high
Lead	5	1 H 4 VH	Biased high
Vanadium	5	2 H 1 VH	Biased high
Zinc	5	5 VH	Biased high

**Table D-54. Lab 130 (AA, T)**

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5	(5 less than) data	Insufficient
Cobalt	5	(5 less than) data	Insufficient
Copper	5	0	Satisfactory
Iron	5	0	Satisfactory
Manganese	5	0	Satisfactory
Nickel	5	1 H 2 VH	—
Lead	5	0	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

Table D-55. Lab 130B (INAA, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	0		
Cobalt	5 (5 less than)		Insufficient data
Copper	0		
Iron	0		
Manganese	5	0	Satisfactory
Nickel	0		
Lead	0		
Vanadium	5	0	Satisfactory
Zinc	0		

Table D-57. Lab 136 (INAA, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	0		
Cobalt	5	0	Satisfactory
Copper	5 (4 less than)		Insufficient data
Iron	5	0	Satisfactory
Manganese	5	3 H 1 VH	Biased high
Nickel	5 (4 less than)	1 VH	Insufficient data
Lead	0		
Vanadium	5	0	Satisfactory
Zinc	5	3 H 2 VH	Biased high

Table D-56. Lab 130C (AA, E)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	5 (5 less than)		Insufficient data
Cobalt	5	0	Satisfactory
Copper	5	0	Satisfactory
Iron	5	1 H	Satisfactory
Manganese	5	2 H 2 VH	Biased high
Nickel	5	2 H	Biased high
Lead	5	1 H	Satisfactory
Vanadium	0		
Zinc	5	0	Satisfactory

Table D-58. Lab 137 (INAA, T)

Metal	No. of results reported	No. and type of flags	Appraisal
Aluminum	5	0	Satisfactory
Cadmium	0		
Cobalt	5	0	Satisfactory
Copper	0		
Iron	5	0	Satisfactory
Manganese	5	2 H	Biased high
Nickel	5 (4 less than)	1 VL	Insufficient data
Lead	0		
Vanadium	5	0	Satisfactory
Zinc	5	0	Satisfactory

## **Appendix E**

## **List of Participants**

## APPENDIX E

### LIST OF PARTICIPANTS

#### *Agriculture Canada*

Canadian Forestry Service, Chemical & Physical Analysis Laboratory, St. John's, Newfoundland

#### *Environment Canada*

##### Environmental Conservation Service

Atlantic Region, Water Quality Branch Laboratory, Moncton, New Brunswick  
National Water Quality Laboratory, Water Quality Branch, Burlington, Ontario

##### Environmental Protection Service

Atlantic Region, Chemistry Laboratory, Dartmouth, Nova Scotia  
EPS Newfoundland, St. John's, Newfoundland  
Northern Forest Research Centre, Edmonton, Alberta  
Pacific Region, Laboratory Services, West Vancouver, British Columbia  
Scientific Programs Branch, Analytical Services Lab, Edmonton, Alberta  
SPE Laboratoire, Longueuil, Québec  
Wastewater Technology Centre, Laboratory Services Section, Burlington, Ontario

##### Canadian Forestry Service

Great Lakes Forest Research Centre, Sault Ste. Marie, Ontario  
Laurentian Forest Research Centre, Ste-Foy, Québec

#### *Provincial Government Laboratories*

B.C. Ministry of the Environment, Environmental Laboratory, Vancouver, British Columbia  
Manitoba Department of Environment, Technical Services Laboratory, Winnipeg, Manitoba  
New Brunswick Department of Environment, Municipal Affairs and Environmental Laboratory, Fredericton, New Brunswick  
Ontario Ministry of Agriculture and Food, Agricultural Labs Services Branch, Guelph, Ontario  
Ontario Ministry of Environment, Inorganic Trace Contaminants Section, Rexdale, Ontario  
Ontario Ministry of Environment, Thunder Bay Laboratory, Thunder Bay, Ontario

Ontario Ministry of Northern Development and Mines,  
Ontario Geological Survey, Geoscience Laboratories, Toronto, Ontario

Québec Ministère de l'environnement, Section assurance de la qualité, Ste-Foy, Québec

#### *Municipal Laboratories*

City of Winnipeg, Laboratory Services Division, Winnipeg, Manitoba  
Greater Vancouver Regional District, Main Laboratory, Burnaby, British Columbia

#### *Industrial and Consulting Laboratories*

Atlantic Analytical Services Ltd., St. John, New Brunswick  
Barringer Magenta Ltd., Rexdale, Ontario  
Beak Consultants Ltd., Mississauga, Ontario  
Bondar Clegg & Co. Ltd., Ottawa, Ontario  
Brenda Mines Ltd., Peachland, British Columbia  
Chemex Labs Alberta (1984) Ltd., Calgary, Alberta  
Chemex Labs Ltd., North Vancouver, British Columbia  
Chemical and Geological Labs Ltd., Edmonton, Alberta  
Cominco Ltd., Exploration Research Laboratories, Vancouver, British Columbia  
Cominco Ltd., Analytical Services, Trail, British Columbia  
École Polytechnique, Campus de l'université de Montréal, Montréal, Québec  
Eco-recherches (Canada) Inc., Pointe-Claire, Québec  
Enviroclean Ltd., London, Ontario  
Enviro-Test Labs, Edmonton, Alberta  
Monenco Analytical Laboratories, Calgary, Alberta  
Noranda Mines Ltd., Noranda, Québec  
Nuclear Activation Services Ltd., Hamilton, Ontario  
Ontario Hydro, Etobicoke, Ontario  
Shell Canada Ltd., Calgary Research Centre, Calgary, Alberta

#### *University Laboratories*

University of Alberta, Slowpoke Reactor Facility, Edmonton, Alberta



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