GM 34038

REPORT ON LAKE SEDIMENT GEOCHEMICAL SURVEY, AREAS A AND B, JAMES BAY TERRITORY

Report on Lake Sediment Geochemical Survey-1975 Areas "A" and "B" James Bay Territory Quebec

by

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INTRODUCTION

During the 1975 field season regional lake sediment surveys were carried out over about 21000 square miles in James Bay Territory and some 8450 samples were taken.

The surveys were an extension to the east and north-east (figure 1) of those carried out in 1973 and 1974. To date about 41000 square miles have been covered and some 18450 samples have been taken.

Generally centre lake organic rich sediments were taken and analyzed for Cu, Pb, Zn, Ni, Co, Fe, Mn, As, U, Mo and Organic Material. This report will present and discuss these results and the regional metal trends. Recommendations will be made for follow-up work.

LOCATION

The areas are located about 40 to 70 miles east of James Bay and 600 miles north of Montreal (figure 1).

The areas covered have been divided into two and designated as areas "A" and "B". The former covers all or parts of NTS sheets 32O, 33B and 33G between lats 51°24' - 53°30' and longs. 74°00' - 76°00'. The latter covers parts of NTS sheets 23E, 23L, 33H, and 33I between lats 53°00' - 55°00' and longs. 70°00' - 73°00' (figure 2).

ACCESS

Access to the James Bay Territory is by the recently completed highway between Matagami and Fort George (figure 1).

Figure 1

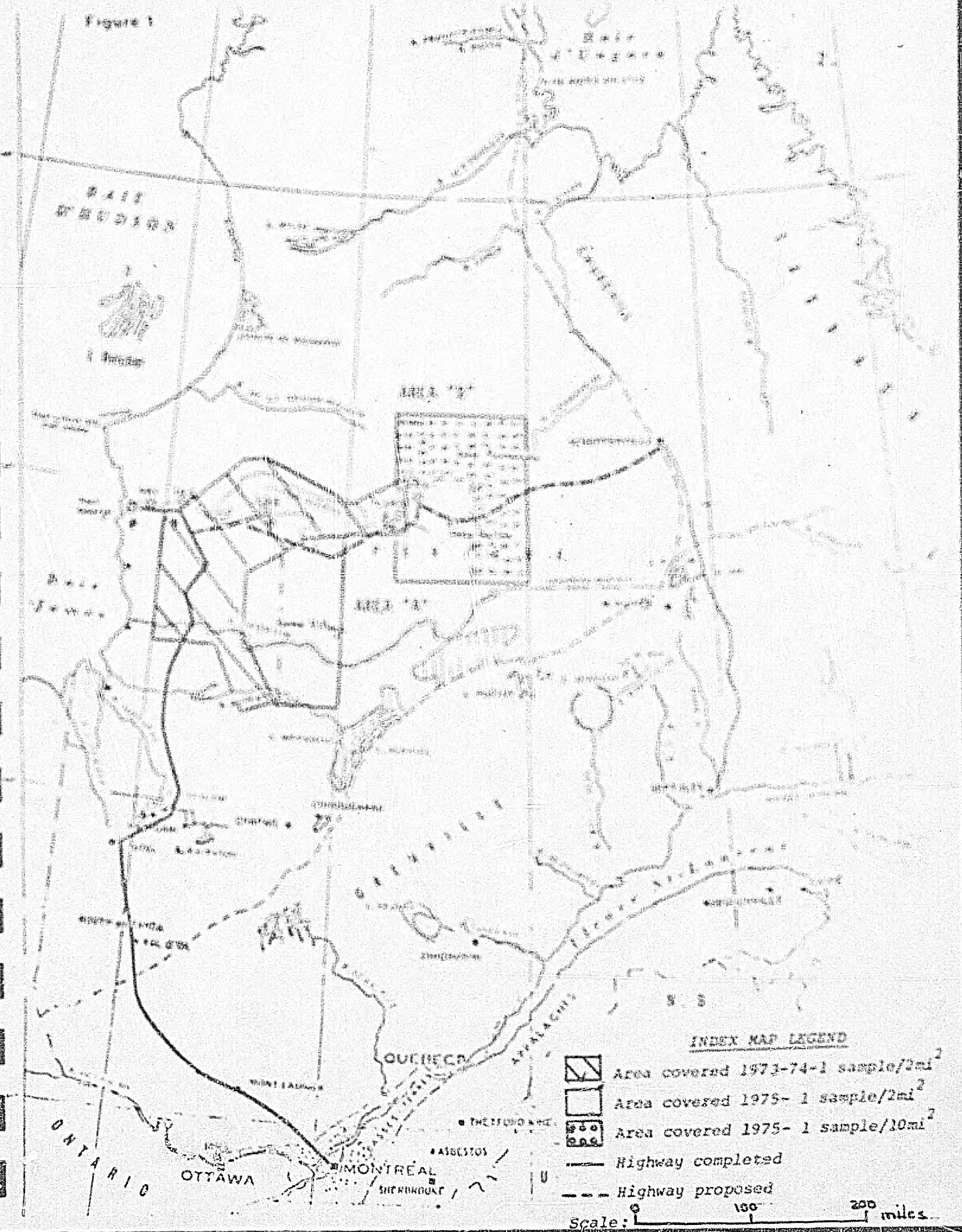
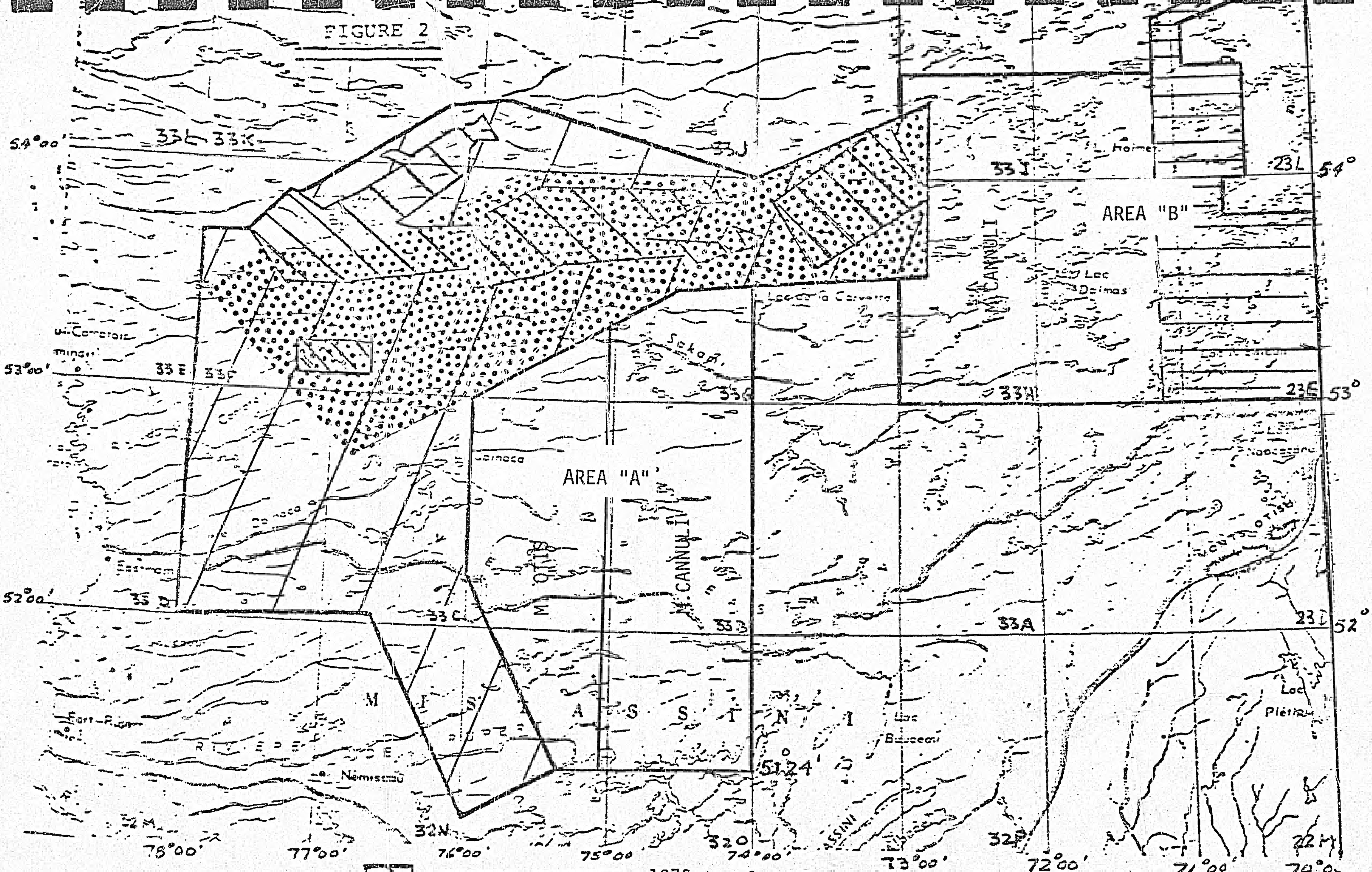

BAIE D'HUDSON
AREA "B"
AREA "A"
QUEBEC
MONTREAL
OTTAWA
ONTARIO
SHERBROOKE
ASBESTOS
APPALACHES
N. B.
INDEX MAP LEGEND
Area covered 1973-74-1 sample/2mi2
Area covered 1975- 1 sample/2mi2
Area covered 1975- 1 sample/10mi2
Highway completed
Highway proposed
Scale: 0 100 200 miles

FIGURE 2



SES PROJECT

REGION COVERED 1973
1 sample/2mi^2

REGION COVERED 1974
1 sample/2mi^2

REGION COVERED 1975
1 sample/2mi^2

REGION COVERED 1975
1 sample/10mi^2

Air transport to the James Bay Territory is efficient with regular flights (Montreal-Matagami, Montreal-LG2) scheduled almost every day. Within the territory there is daily DC-3 service between major hydro-electric sites (LG 2,3,4). Lac Fontanges (Area "B") is supplied by air both from Schefferville and LG4 by Otter aircraft.

The most efficient method of supply in the southern area (Area "A") is by float plane from Matagami or Chibougamau.

GLACIATION

The surficial geology of most of the area has been mapped and reported on by Hughes (1964) and Lee (1957).

In the south, glacial advance due to Wisconsinan movement was from the east and to the northeast (Area "B") it was from the northeast. Glaciation resulted in scouring of the rocks and deposition of various glacial deposits including lodgment and ablation till, ribbed moraine, drumlins, eskers and glacio-fluvial deposits.

GEOLOGY

Reconnaissance geological mapping of most of the area has been completed (Eade 1966) and a geological compilation at a scale of 1:250000 has been made for SDBJ by Marleau and Tremblay. For the most part, maps from this compilation have been used in the interpretation of the geochemical results.

Area "A"

Belts of Precambrian volcano-sedimentary rocks occur throughout the area sampled, the most prominent ones are as follows:

1. east-west trending belts in the vicinity of Lac Corvette

2. a large east-west belt along Eastmain River and in the vicinity of Lac Village

3. a northeast trending belt south of Riv. Nemiscau.

Mixed gneisses and schists derived mainly from sedimentary and volcanic rocks with interlayered granitic rocks from a horseshoe shaped area between Riv. Sakami and Riv. Opinaca.

Surrounding the greenstones and gneisses are a series of grantic and granodioritic rocks.

Gabbroic intrusions occur in the greenstones, also gabbro stocks occur in the granites and gneisses in the northwest and central parts of the area.

Two sets of northwest and northeast trending mafic dykes traverse the rocks in the region. Also major faults cut all rock types in a northwest and northeast direction.

Most of the known mineral occurrences consist of copper, copper-nickel and gold showings related to the greenstone belts. Sulphide iron formation also occurs in the volcano-sedimentary rocks south of Eastmain River. Lithium bearing pegmatites are known to occur north of Rupert River west of the southwest boundary of Area "A".

<u>Area "B"</u>

Volcano-sedimentary rocks are either known on interpreted to occur in the following parts of Area "B":

1. In the northwest corner of the sampled area (NTS 33I) there are two narrow northwest and west trending greenstone belts.

2. In the vicinity of La Grande Riv. (NTS 33H and 23E) there is an irregular shaped east-west trending belt.

3. Several bands occur south of La Grande Riv. (NTS 33H) and in the vicinity of Lac Dalmas (NTS 23E).

4. An east-west trending band of volcano-sedimentary rocks occur south of Riv. Sakami (NTS 33H).

Mixed gneisses and schists, probably derived from sedimentary and volcanic rocks, occur as irregular bands in the south part of the area (NTS 23E). Northwest trending narrow bands occur also in the northwest corner of the sampled region (NTS 33I).

The eastern part of Area "B" is underlain by granulites. Eade (1966) described these as being pyroxene bearing grano-diorites and gneisses containing accessory magnetite and apatite.

Mafic intrusions generally occur within the greenstone belts and small ultramafic bodies occur here and there throughout the region.

Granitic rocks border the west contact of the granulites and they surround the greenstone and gneisses in the rest of the area.

Mafic dykes trending northeast, northwest and north occur throughout the area.

Prominent fault directions are northeast and north however a number of east-west and northwest ones are present also.

No significant mineral deposits are known in Area "B". Eade (1966) reported the presence of pyrite and traces of arsenopyrite and chalcopyrite in the volcanic rocks west of Lac Dalmas (NTS 33H).

GEOCHEMICAL SURVEY

Field Procedure

The lake sediment surveys over Areas "A" and "B" were completed during the 1975 field season. The work east of long. 75°00 in Area "A" and all of Area "B" was carried out under the supervision of M. Cannuli; the western part of Area "A" was sampled under the supervision of M. Otis. Details on the logistics, production etc., can be found in separate reports by Cannuli (1975) and Otis (1975).

Cannuli's field party used an Alouette II and Otis's party used a Bell G4A helicopter to carry out the lake sediment sampling programs.

For the most part center lake, organic rich samples were taken using a cylindrical-type free fall sampler. Sample density for Area "A" was 1 sample per 2 square miles. For Area "B", east of about longitude 71°00, the sample density was 1 per 10 square miles,west of here it was 1 per 2 square miles. A total of some 8453 sites were sampled over a total area of about 21000 square miles. Initially the north halves of NTS 33I and 23L and the east halves of NTS 23L and 23E in Area "B" were sampled at a density of 1 per 10 square miles; unfortunately some 700 of these samples were burnt in the laboratory while being dried. Figure 2 shows the effective coverage obtained during the 1975 campaign.

Generally a duplicate sample was taken at each 25th site and 3 control samples were inserted with every 100 samples.

The samples were allowed to air-dry before they were packed for shipment.

All samples locations and numbers were plotted in the field on 1:50000 and 1:250000 scale topographic maps.

Laboratory Procedure

The samples were dispatched to Metriclab in Ste Marthe Sur Le Lac, Quebec where they were dried and sieved to -80 mesh and analyzed geochemically for Cu, Pb, Zn, Ni, Co, Fe, Mn, Mo, As, U and Organic Material.

The first 9 metals mentioned above were determined by absorption spectrophotometry after digestion of 1gm of sample with hot solutions of nitric and hydrochloric acids. Uranium was determined using a fluorimetric technique after digestion with nitric acid. Organic matter was estimated by measuring the color intensity of the nitric acid extractant.

Complete details on these analytical techniques are presented in Appendix I .

The limits of detectability claimed by Metriclab were as follows:

Pb, Ni, Co, Mn	- 2ppm
Cu, Zn, As	- 1ppm
Mo	-0.5ppm
U	-0.1ppm
Fe	-0.02%
Organic Material	- 1%

RELIABILITY OF DATA

To check the precision of the laboratory results 3 control (standard) lake sediment samples were included with every 100 samples.

Initially 3 bulk samples were dried, sieved and mixed and these made up standards Cannuli 1, 2 and 3 (C 1,2,3). When these standards were used up an additional 3 bulk samples were collected in the field and numbered Cannuli 10. 20 and 30 (C 10,20 and 30). In addition M. Otis collected 3 control samples from the western area and these were numbered Otis Bas, Otis Moyen and Otis Haut (OB, OM, OH). The analytical results means standards deviations and precisions from these samples have been tabulated in the accompanying computer report by L. Martin.

After about 2/3rds of the samples were analyzed it became obvious that the precision based on the above control samples was poor. All analytical work was stopped, new control samples were prepared, homogenized and introduced into the remainder (about 3350 samples) of the unanalyzed samples. The results of the new standards (NB, NM and HH) have been included in Appendix II along with the results of the field standards (C1X, C2X, C3X, C10X, C20X and C30X) for this series of 3350 samples.

A summary of the precision values calculated at the 95% confidence level is presented in Table 1 and it shows that the reporducibility of the analytical results based on the new standards is acceptable.

Generally,the reasons for the discrepancies in the original field standards were inhomogeneity and errors in numbering of the standards. For example at least 7 control samples submitted under Cannuli #2 had zinc values ranging from 395 to 745ppm and obviously these actually were Cannuli #1 standards. In general the worst precision was obtained on the OB, OM and OH standards and this can be attributed principally to the inhomogeneous nature of these control samples.

TABLE 1 .- Analytical Precision using SDBJs' 1975 Standards

COPPER			LEAD			ZINC			NICKEL			COBALT			IRON		
ppm Cu	% P	# Std.	ppm Pb	% P	# Std.	ppm Zn	% P	# Std.	ppm Ni	% P	# Std.	ppm Co	% P	# Std	% Fe	% P	# Std.
47	11	NM	37	8	NM	95	11	NH	122	8	NM	7	8	C20	1.4	10	NB
72	13	NH	9	11	C20X	75	14	NM	10	10	C20	7	10	C20X	4.0	11	NM
18	15	NB	10	13	C20	20	18	C20	10	10	C20X	28	13	NH	4.4	11	NH
6	27	C20	42	14	NH	35	19	NB	30	11	NB	30	13	NM	0.6	12	C20
5	30	C10X	11	15	NB	21	21	C20X	32	12	NH	12	16	NB	2.7	13	C3X
7	31	C30	17	15	C10X	16	21	C30	9	13	C10X	15	16	C3X	0.7	14	C10X
6	33	C20X	14	21	C10	55	25	C3X	7	15	C30	6	18	C10X	0.5	15	C20X
6	35	C30X	10	26	C30	16	26	C30X	7	15	C30X	4	23	C30X	0.3	18	C30X
3	38	OB	10	30	C30X	37	37	C2X	31	21	C1X	17	25	C1X	0.3	20	C30
13	40	C2X	52	40	C1X	412	41	C1X	17	22	C2X	5	29	C30	2.2	28	C1X
12	42	C1X	9	48	C3X	11	44	C10X	16	35	C3X	11	30	C2X	1.5	29	C2X
24	47	C3X	36	54	C2X	58	68	C3	32	56	C1	18	63	C1	0.1	38	OB
28	55	C1	8	63	C3	434	73	C1	17	59	C3	13	82	C2	2.4	46	C3
15	89	C2	6	63	OB	19	81	OM	4	73	OB	17	86	C3	0.4	47	OM
9	97	OM	52	67	C1	8	92	OB	7	75	OM	3	92	OB	1.9	52	C1
23	102	C3	9	69	OM	69	136	OH	10	76	C10	4	98	OM	1.5	66	C2
28	130	OH	37	77	C2	17	183	C10	25	96	OH	8	131	C10	2.8	92	C10
9	248	C10	17	126	OH	91	338	C2	20	99	C2	28	168	OH	3.9	161	OH

Note: % P = Precision at 95% confidence level ($2\sigma = 2 \times \frac{s}{\bar{x}} 100$)
C 1,2,3 = 1975 Cannuli standards 1,2,3 for all samples
C10,20,30 = 1975 Cannuli standards 10,20,30 for all samples
C1X,2X,3X = 1975 Cannuli standards 1,2,3, for last 3350 samples analyzed
C10X,20X,30X = 1975 Cannuli standards 10,20,30 for last 3350 samples analyzed
OB,OM,OH = 1975 Otis standards, bas, moyen, haut
NB,NM,NH = 1976 New standards bas, moyen, haut introduced into last 3350 samples analyzed

TABLE 1 - Analytical Precision using SDBJs' 1975 Standards

MANGANESE			ARSENIC			URANIUM			MOLYBDENUM			ORGANIC MATERIAL		
ppm Mn	% P	# Std.	ppm As	% P	# Std.	ppm U	% P	# Std	ppm Mo	% P	# Std	% OR	% P	# Std.
471	14	NH	0.5	0	C10	9.0	28	C20X	6.3	15	NM	80	22	C30X
34	14	10X	0.5	0	C20	13.0	29	NH	7.3	18	NH	50	35	C10X
656	17	NM	0.5	0	C30	9.6	31	C20	6.1	32	C3X	54	35	NH
61	24	C3X	0.5	0	C3X	23.0	34	C30X	1.9	43	C30	36	37	C3X
184	25	NB	0.5	0	C10X	24.5	37	C30	1.9	50	C30X	72	39	C30
57	26	C30	0.5	0	C20X	1.7	45	C3X	2.2	50	NB	37	44	NM
81	29	C20	0.5	0	C30X	2.8	63	C10X	5.9	53	C3	55	49	C10
56	32	C30X	0.5	0	NM	0.8	69	NM	1.9	57	C20	25	73	C2X
81	33	C20X	0.5	38	NB	1.3	123	C3	2.6	57	C10X	21	81	C20X
413	40	C1X	0.6	55	C2X	6.9	124	OM	2.0	61	C20X	19	82	C20
23	41	OB	0.6	61	NH	2.1	127	OB	2.9	63	OM	22	95	NB
29	51	OM	2.3	69	C1X	0.7	144	NB	2.4	68	C2X	26	108	C3
287	60	C2X	0.6	125	OB	0.8	148	C2X	2.6	80	C10	15	109	OB
357	65	C1	0.7	147	C3	3.3	159	C10	1.4	84	OB	18	123	C2
269	75	C2	3.1	153	C1	62.6	216	OH	2.2	109	C1	17	125	C1X
42	113	C10	1.4	194	C2	0.4	238	C1X	2.2	116	C2	26	128	OH
915	262	OH	0.8	213	OM	0.3	269	C1	3.1	126	C1X	21	129	OM
77	476	C3	2.9	404	OH	0.8	418	C2	10.2	178	OH	17	137	C1

Note: % P = Precision at 95% confidence level (2 = 2 x 100)
C 1,2,3 = 1975 Cannuli standards 1,2,3 for all samples
C10,20,30 = 1975 Cannuli standards 10,20,30 for all samples
C1X,2X,3X = 1975 Cannuli standards 1,2,3, for last 3350 samples analyzed
C10X,20X,30X = 1975 Cannuli standards 10,20,30 for last 3350 samples analyzed
OB,OM,OH = 1975 Otis standards, bas, moyen, haut
NB,NM,NH = 1976 New Standards bas, moyen, haut introduced into last 3350 samples analyzed

These results indicate the pitfalls that can result when insufficient care is exercised in preparing standard samples.

Although the reproducibilities of the laboratory results based on the new stnadards are generally acceptable the accuracy of the results for As and Organic Matter must be questioned. The new standards were submitted for analyses to three other laboratories and they gave the results shown in Table 2.

The results for Cu, Pb, Zn, Ni and Mo are similar for all laboratories. The results for Co, Fe, Mn and Organic Material from Metriclab are consistantly higher than the other laboratories. In fact the results for Organic Material from Metriclab are 2 to 5 times greater than the results for the other laboratories. This error is directly attributable to the analytical technique used by Metriclab. Their method consists of measuring the amount of light trnsmitted by a HNO_3 extract from the sample. As a result solutions from samples containing organic material frequently contain cellulose wood particles in suspension and hence erroneously higher readings results. Also color may be imparted to the solution by colored metallic ions such as Fe and Mn. Therefore Metriclabs' analyses of organic material are not acceptable and should not be used for interpreting the results.

Another problem element for Metriclab has been arsenic. The results from Table 2 show that the arsenic results from Metriclab are considerably lower than the other laboratories. Throughout the project Metriclab has had difficulty with their technique for arsenic. During the early phase of the project they claimed an error in calculations which resulted in too low values, when results were recalculated they appeared too high and for the final lot of 3350 samples the results consistantly fall around 0.5ppm. Obviously there is something seriously wrong with their technique for arsenic and hence the results presented here for this element should not be considered reliable.

TABLE 2-Comparative Analyses of New Standards

Laboratory	Cu	Pb	Zn	Ni	Co	Fe	Mn	As	U	Mo	OR	Std.
Bondar Clegg	15	11	34	29	8	0.95	140	1	1.8	2	11.4	NB
Geolab	15	10	35	30	7	1.02	148	4.3	0.45	1.5	10.2	NB
Barringer	16	3	34	29	8	0.9	110	<1	0.6	4	1.4	NB
Metriclab	18	11	35	30	12	1.35	184	0.5	0.7	2	22.2	NB
Bondar Clegg	43	18	68	111	21	3.00	540	1	2.5	5	9.3	NM
Geolab	41	16	70	107	23	2.85	515	8.1	0.35	13	15.4	NM
Barringer	46	9	76	130	23	3.20	440	4	1.0	6	4.3	NM
Metriclab	47	18	75	122	30	3.99	656	0.5	0.8	6	36.7	NM
Bondar Clegg	70	22	89	29	19	3.31	380	3	23.5	6	16.9	NH
Geolab	63	18	86	29	20	3.15	358	10.5	4.7	8	25.6	NH
Barringer	71	14	97	31	19	3.30	330	8	15	8	10.3	NH
Metriclab	72	21	95	32	28	4.36	471	0.6	13	7	54.1	NH

Note 1: Fe and OR(Organic Material) in %, all other elements in ppm

Note 2: Analyses from Metriclab represents the arithmetic means from 24 to 29 samples while the analyses from the other laboratories are from one sample of each standard.

Except for Geolab, results for uranium presented in Table 2 are comparable. From past experience it is known that uranium analyses obtained from Geolab on lake sediments have proven to be incorrect (Gleeson 1975).

As an additional check on combined analytical and sampling errors, duplicate samples were taken at 351 sites. Means, standard deviations and range of values have been calculated for each set of duplicates (Table 3). These show comparable results for each element. Analysis of variance was computed (Table 4) and generally the results show that at the 95% confidence level the variance due to sampling and analytical errors fall within limits specified for all elements (VT/VI $\lesssim$ 1.14) except arsenic.

In summary the geochemical analyses presented here are acceptable for Cu, Pb, Zn, Ni, Mo and U, they may be slightly too high for Co, Fe and Mn and they are not acceptable for As and Organic Matter.

STATISTICS

The basic statistical parameters have been calculated using the results of samples collected from Areas "A" and "B".

The geometric means, standard deviations and probable anomalous values are listed in Table 5. Histograms for each metal are shown in Figures 3 to 13. Complete listings of all data can be found in the accompanying computer report by L. Martin (1976).

Correlation Coefficients

Table 6 shows the correlation coefficients between

TABLE 3-Means, standard deviations and range of values for 351 pairs of duplicate samples

	DUPLICATE 1			DUPLICATE 2		
Metal	Geom. Means	Std. Dev.	Range	Geom. Means	Std. Dev.	Range
Cu	25	21	3-230	25	22	3-225
Pb	10	9	2-108	9	6	2- 63
Zn	48	37	8-300	47	38	10-330
Ni	21	17	5-116	21	17	5-114
Co	13	23	1-183	13	21	1-183
Fe	1.2	2.1	0.05-12.4	1.2	2.2	0.04-1.22
Mn	107	542	8-4330	105	420	7-5200
Mo	3.8	3.9	0.4-33	4.0	4.6	0.6-37
U	1.2	7.2	0.05-68	1.1	9.4	0.05-85
As	0.8	2.6	0.5-21	0.8	3.2	0.5-33
OR	32	25	1-96	32	26	1-95

Fe and OR in %, all other elements in ppm

TABLE 4 - Variance Test on Duplicate Samples

1975 JAMES BAY GEOCHEMISTRY VARIANCE TEST ON DUPLICATE SAMPLES

DEFINITIONS (LOG TRANSFORM USED IN VARIANCES)
VT= VARIANCE OF TOTAL SAMPLES
NT= NUMBER OF TOTAL SAMPLES,INCLUDING ONE FROM EACH DUPLICATE PAIR
VI= VARIANCE OF DUPLICATED SAMPLES INCLUDED IN TOTAL,ONE PER PAIR
NI= NUMBER OF DUPLICATED SAMPLES INCLUDED IN TOTAL,ONE PER PAIR
VD= VARIANCE WITHIN DUPLICATE PAIRS
ND= NUMBER OF DUPLICATE PAIRS

ELEMENT	VT	NT	VI	NI	VD	ND	VT/VI	VI/VD
CU	0.38	8452	0.37	351	0.04	351	1.039	9.787
PB	0.24	8452	0.28	351	0.05	351	0.858	5.173
ZN	0.41	8452	0.39	351	0.03	351	1.043	12.816
NI	0.35	8452	0.33	351	0.02	351	1.048	15.258
CO	0.74	8452	0.74	351	0.05	351	1.006	14.419
FE	1.26	8452	1.24	351	0.07	351	1.012	18.253
MN	1.28	8452	1.35	351	0.12	351	0.947	11.284
AS	0.78	8452	0.65	351	0.16	351	1.205	3.995
U	2.50	8453	2.57	351	0.42	351	0.971	6.132
MO	0.53	8452	0.49	351	0.09	351	1.076	5.316
OR	0.58	8453	0.66	351	0.09	351	0.879	7.500

Ratios acceptable at 95% level if ≤ 1.14 ≥ 1.17

TABLE 5 - Statistical Summary of 1976 Lake Sediment Geochemical Results

Element	Geometric Mean	Range	Standard Deviation	Anomalous Values (M + 3σ)
Cu	22	0.5 - 230	12	58
Pb	9	2 - 440	4	21
Zn	45	3 - 2080	27	126
Ni	19	2 - 190	11	52
Co	12	1 - 709	12	48
Fe	1.2	0.1 - 46.1	1.5	5.7
Mn	92	2 - 48500	138	506
Mo	3.8	0.4 - 170	3.0	12.8
U	1.0	0.05 - 945	2.8	9.4
As	0.7	0.5 - 575	1.1	4.0
OR	29	1 - 96	22	95

Fe and OR in %, all other values in ppm

FIGURE 3 - JAMES BAY GEOCHEMISTRY 1975 DATA
CU HISTOGRAM
8452 SAMPLES

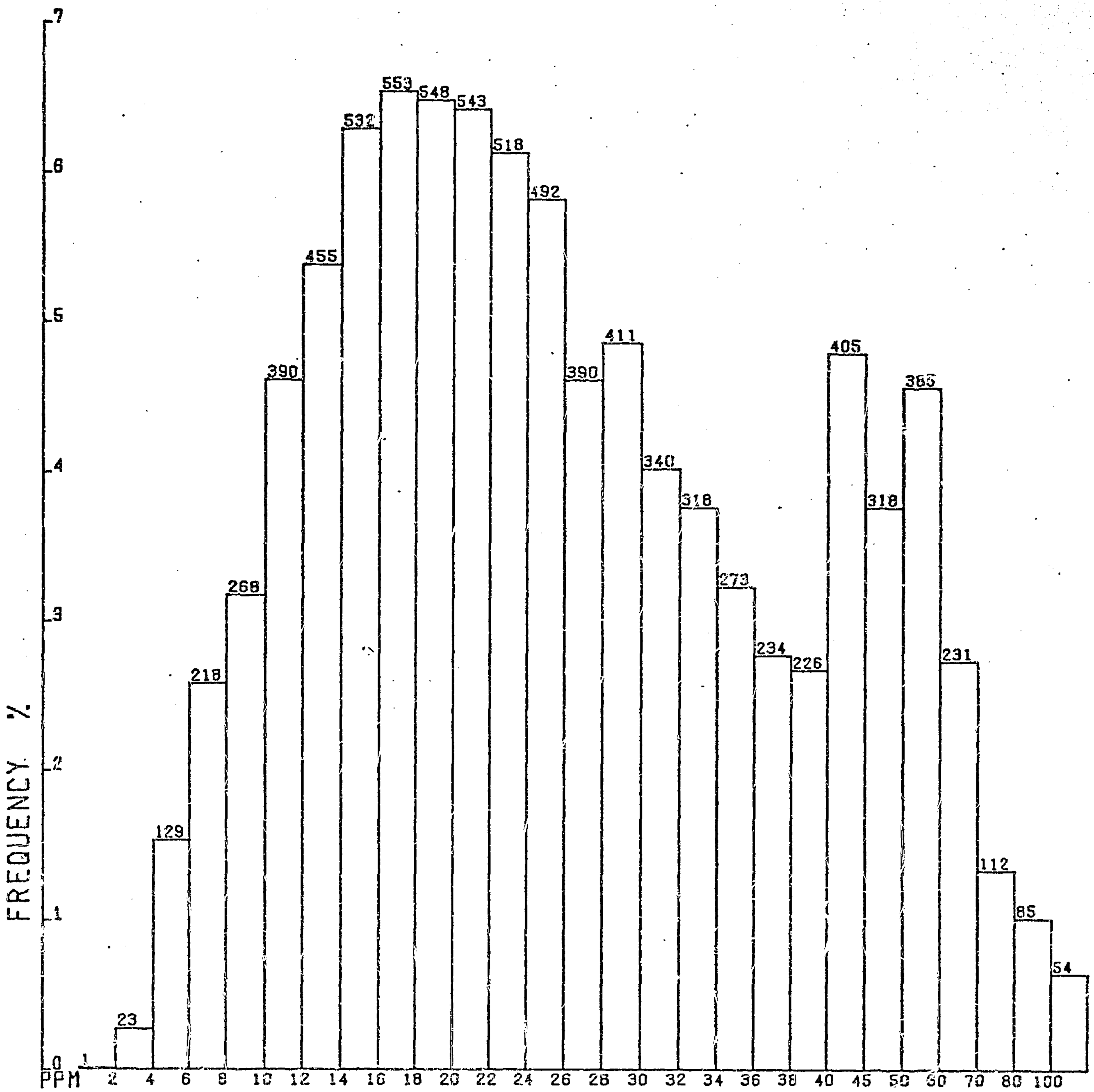


FIGURE 4 - JAMES BAY GEOCHEMISTRY 1975 DATA
PB HISTOGRAM
8452 SAMPLES

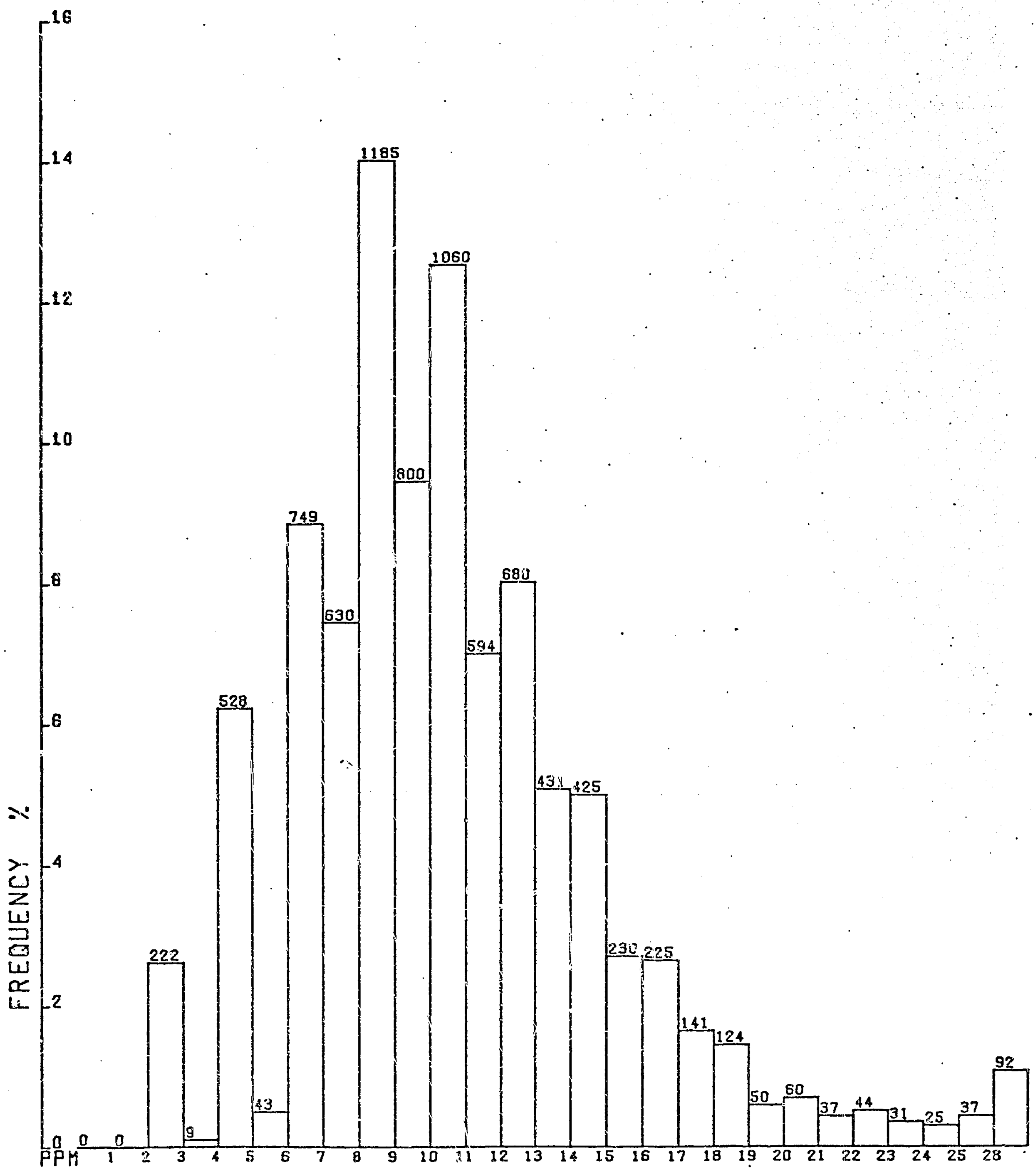


FIGURE 5 - JAMES BAY GEOCHEMISTRY 1975 DATA
ZN HISTOGRAM
8452 SAMPLES

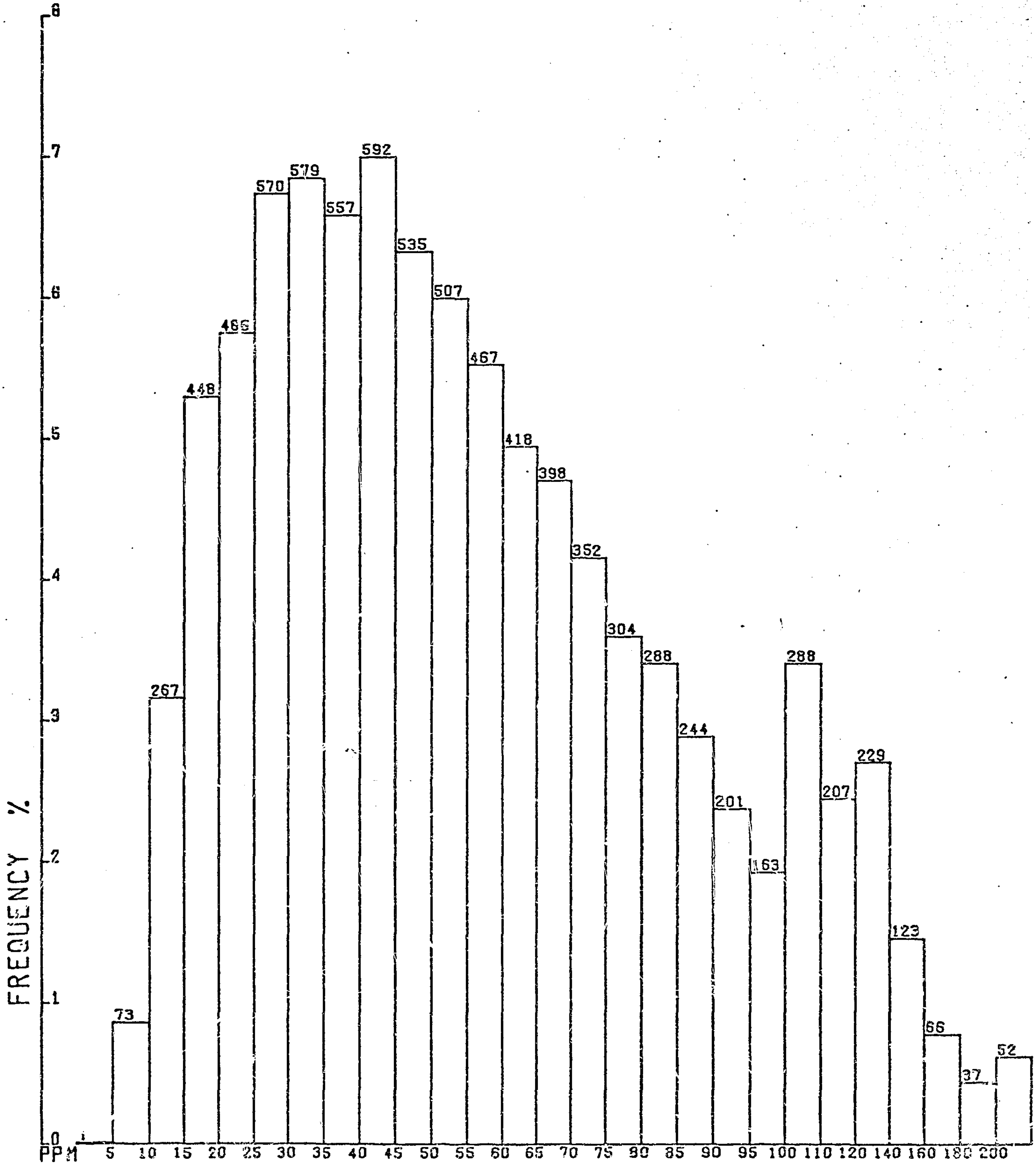


FIGURE 6 - JAMES BAY GEOCHEMISTRY 1975 DATA

NI HISTOGRAM

8452 SAMPLES

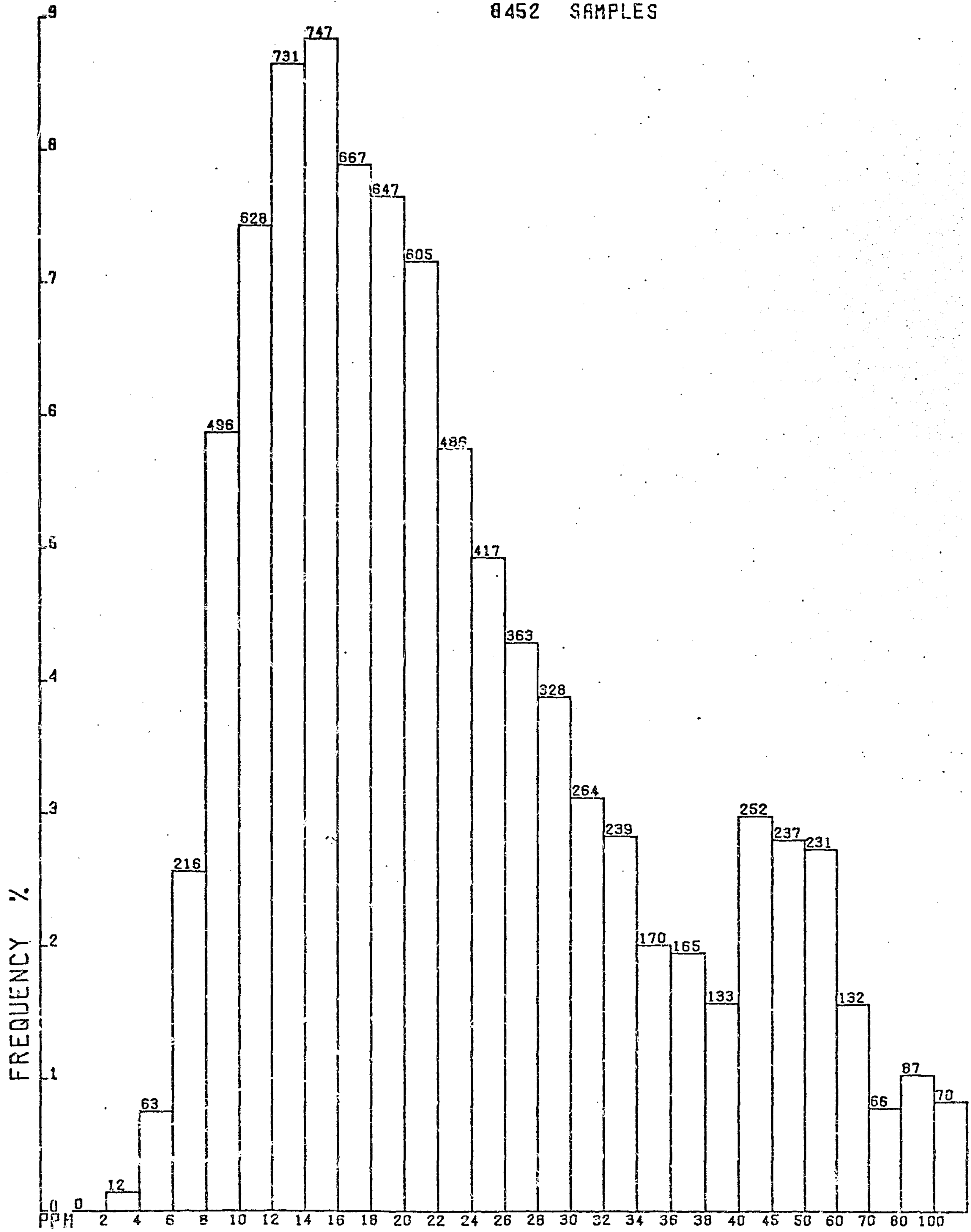
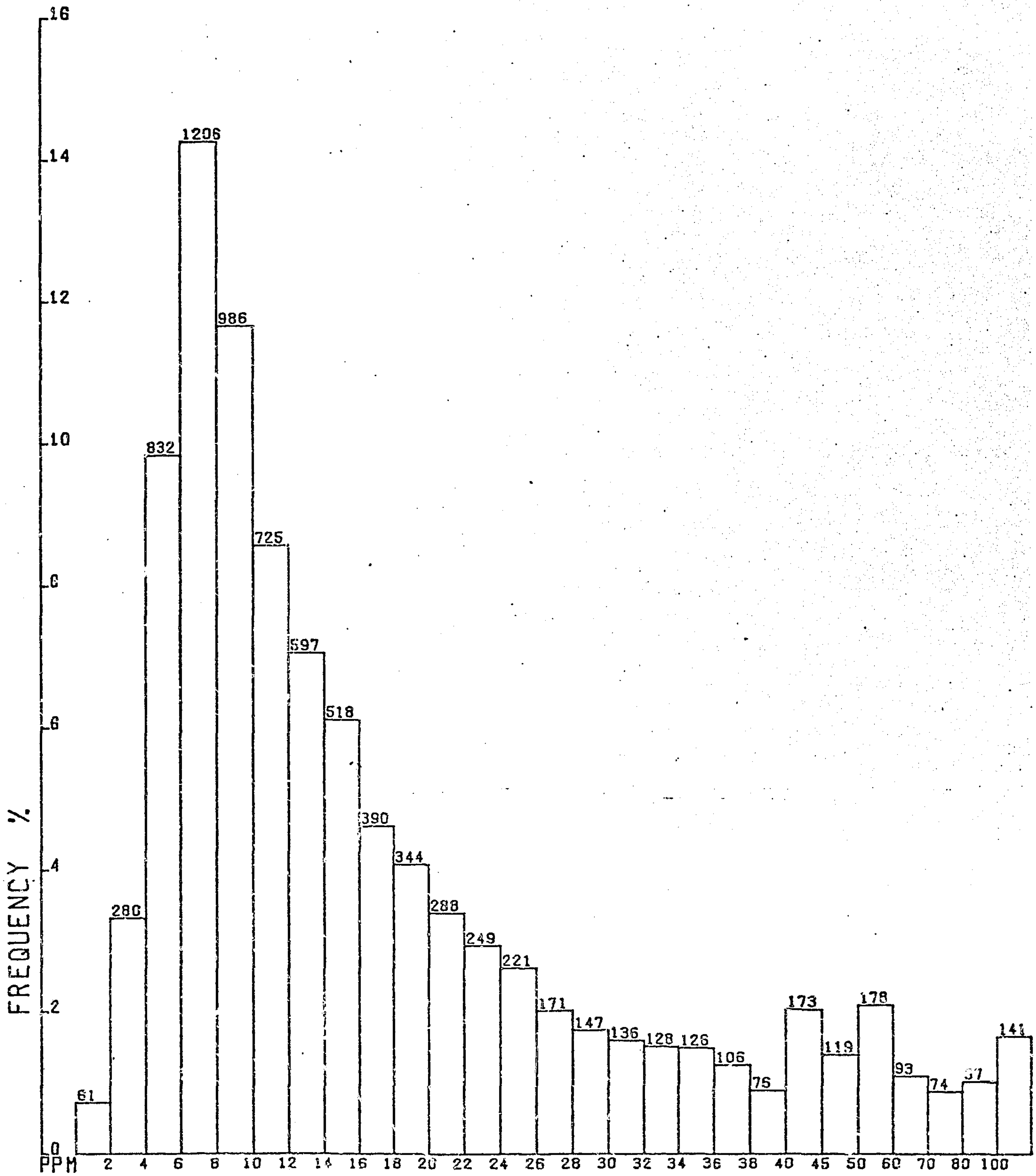


FIGURE 7 - JAMES BAY GEOCHEMISTRY 1975 DATA
CO HISTOGRAM
8452 SAMPLES



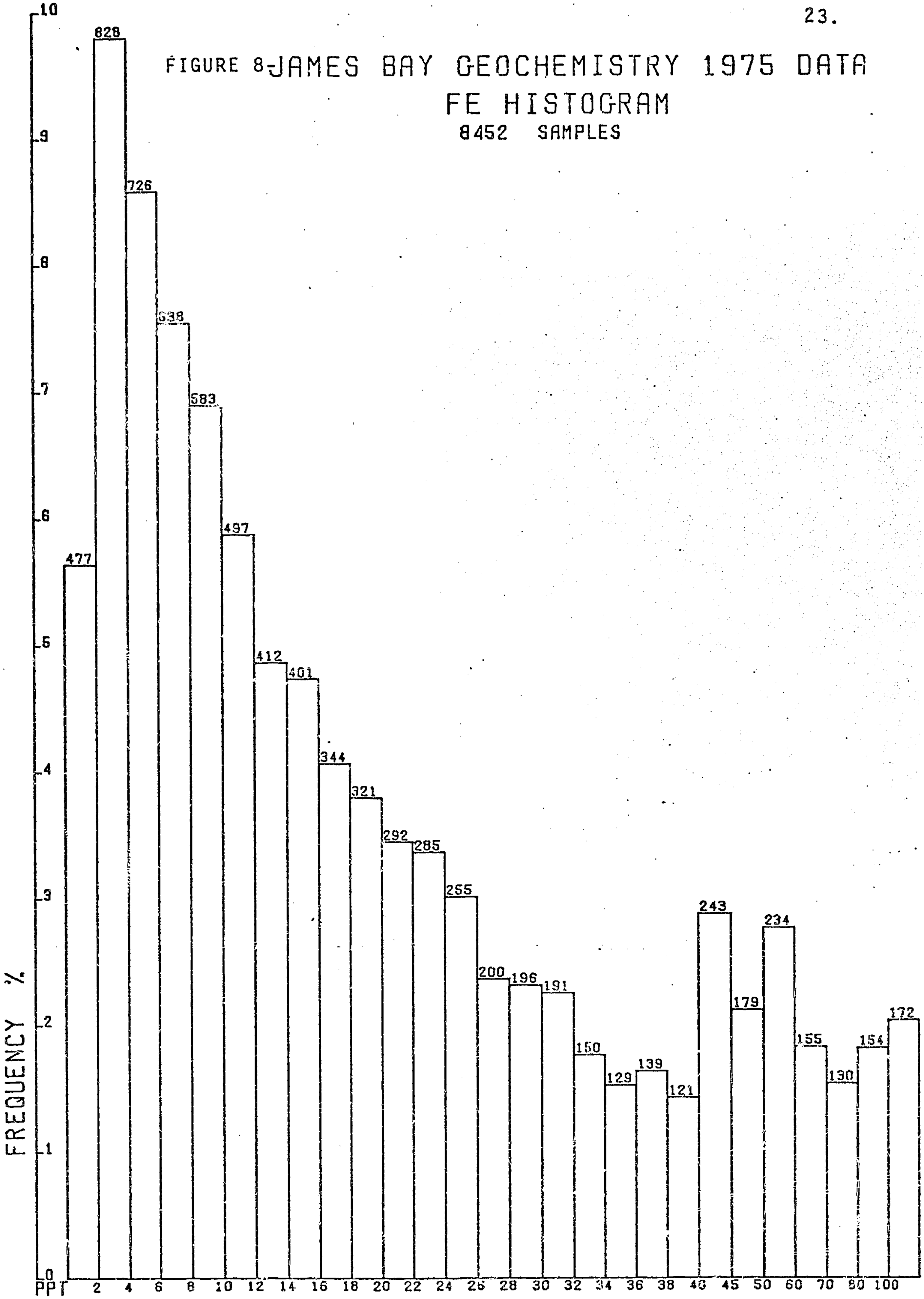


FIGURE 8-JAMES BAY GEOCHEMISTRY 1975 DATA
FE HISTOGRAM
8452 SAMPLES
FREQUENCY %
PPT
477
828
726
638
583
497
412
401
344
321
292
285
255
200
196
191
150
129
139
121
243
179
234
155
130
154
172
0 .1 .2 .3 .4 .5 .6 .7 .8 .9 10
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 45 50 60 70 80 100

FIGURE 9 - JAMES BAY GEOCHEMISTRY 1975 DATA
MN HISTOGRAM
6452 SAMPLES

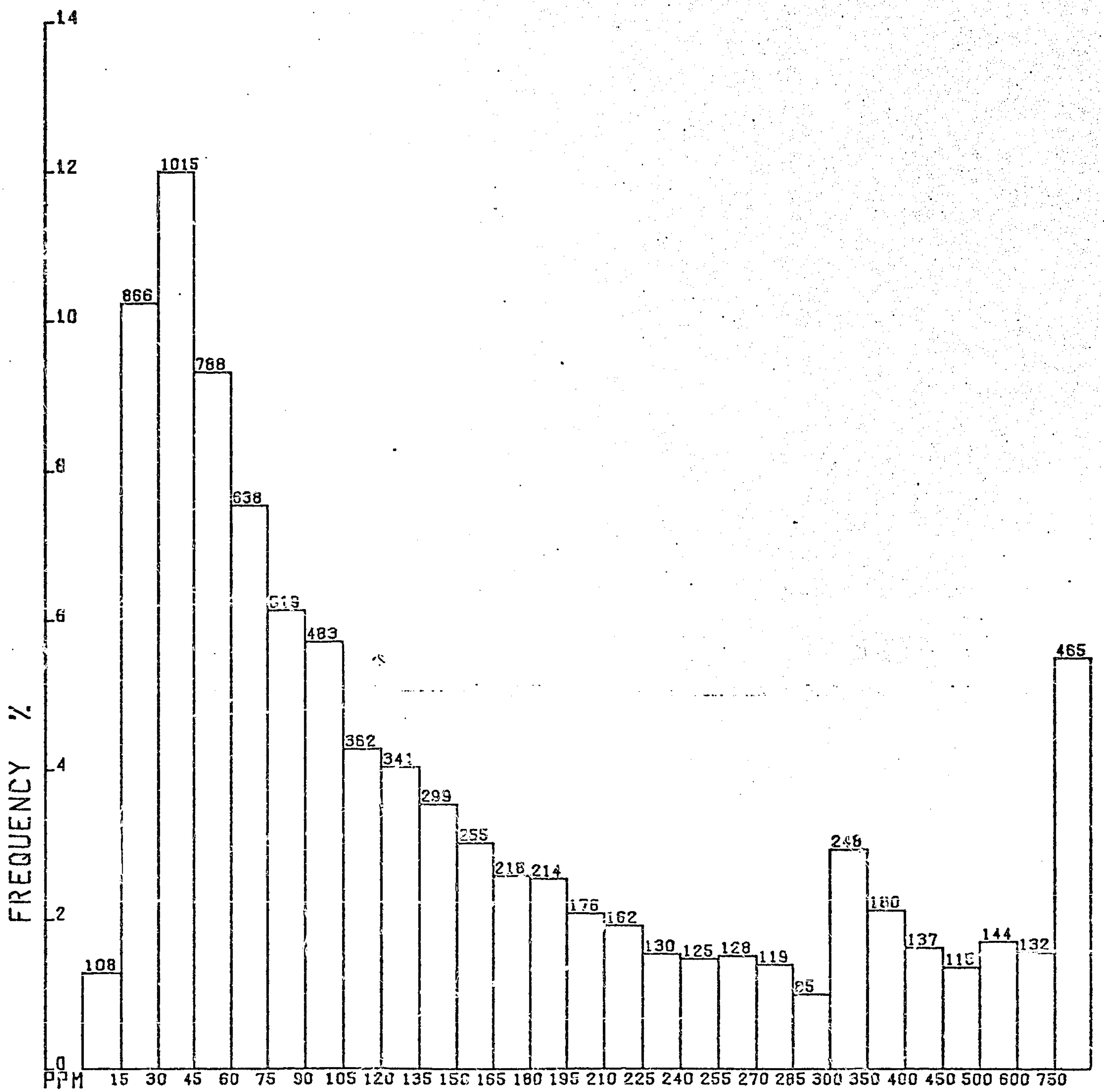


FIGURE 10 - JAMES BAY GEOCHEMISTRY 1975 DATA

MO HISTOGRAM

8452 SAMPLES

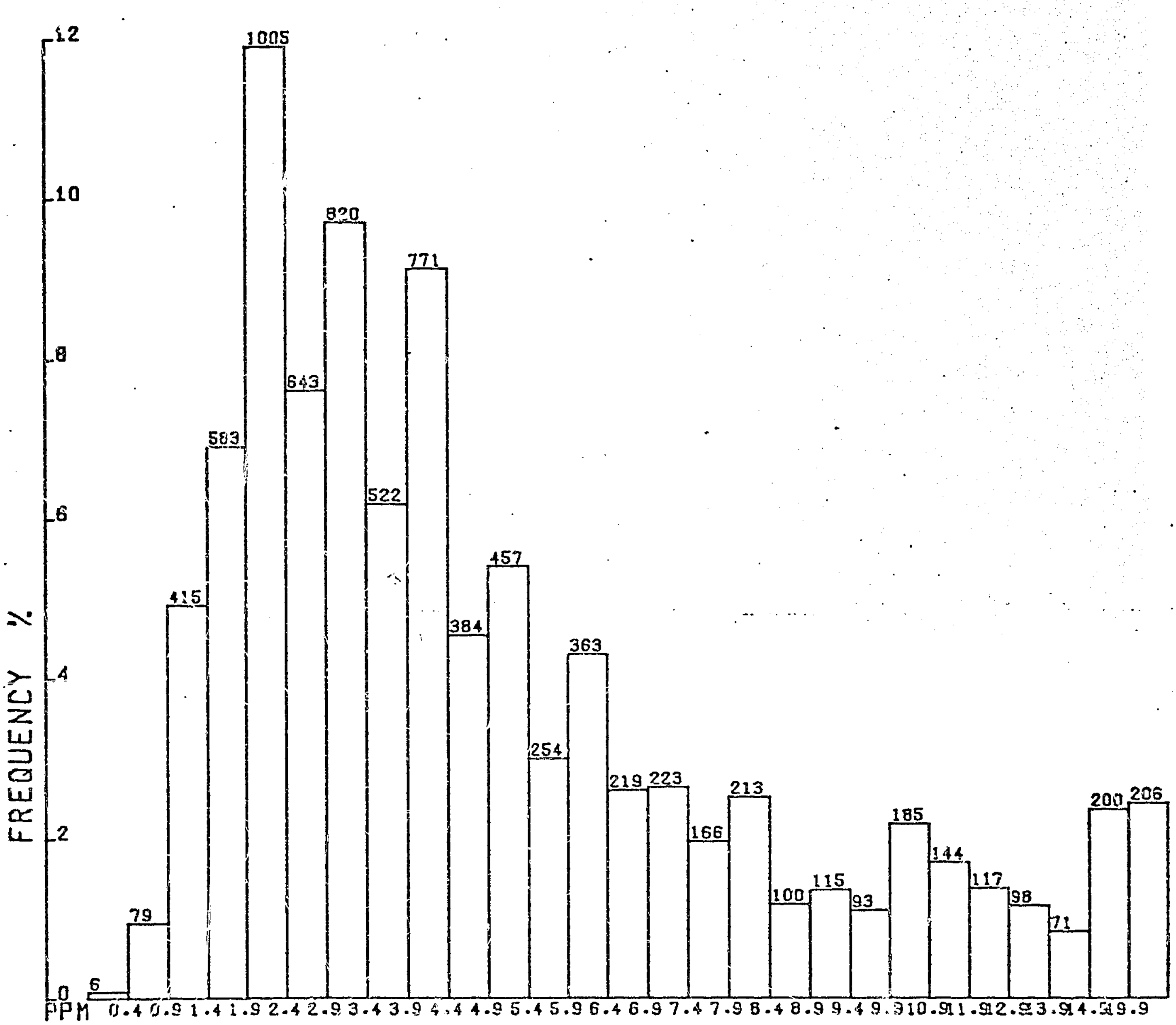


FIGURE 11 - JAMES BAY GEOCHEMISTRY 1975 DATA

U HISTOGRAM

8453 SAMPLES

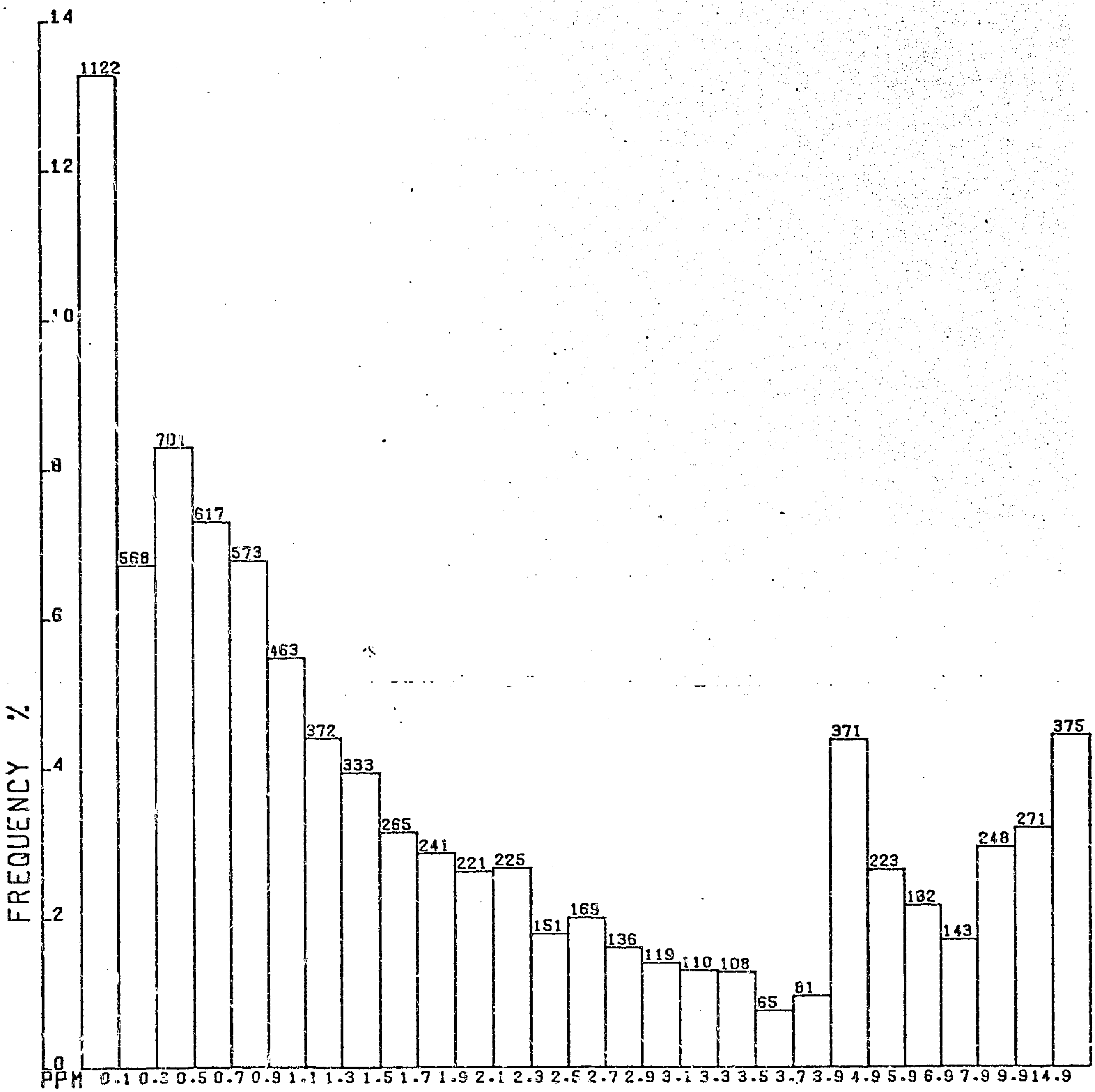


FIGURE 12 - JAMES BAY GEOCHEMISTRY 1975 DATA
AS HISTOGRAM
8452 SAMPLES

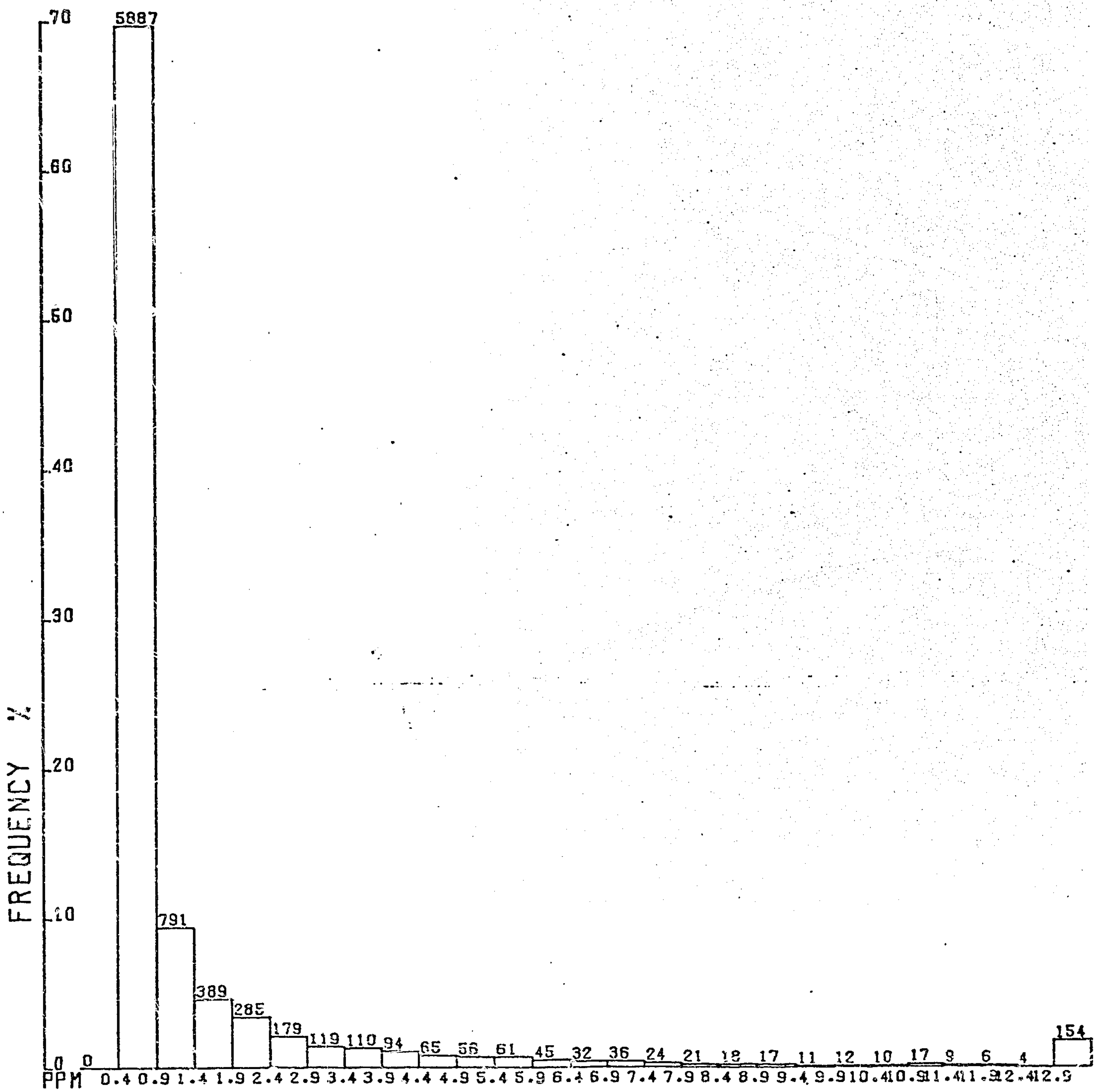


FIGURE 13-JAMES BAY GEOCHEMISTRY 1975 DATA OR HISTOGRAM 8453 SAMPLES

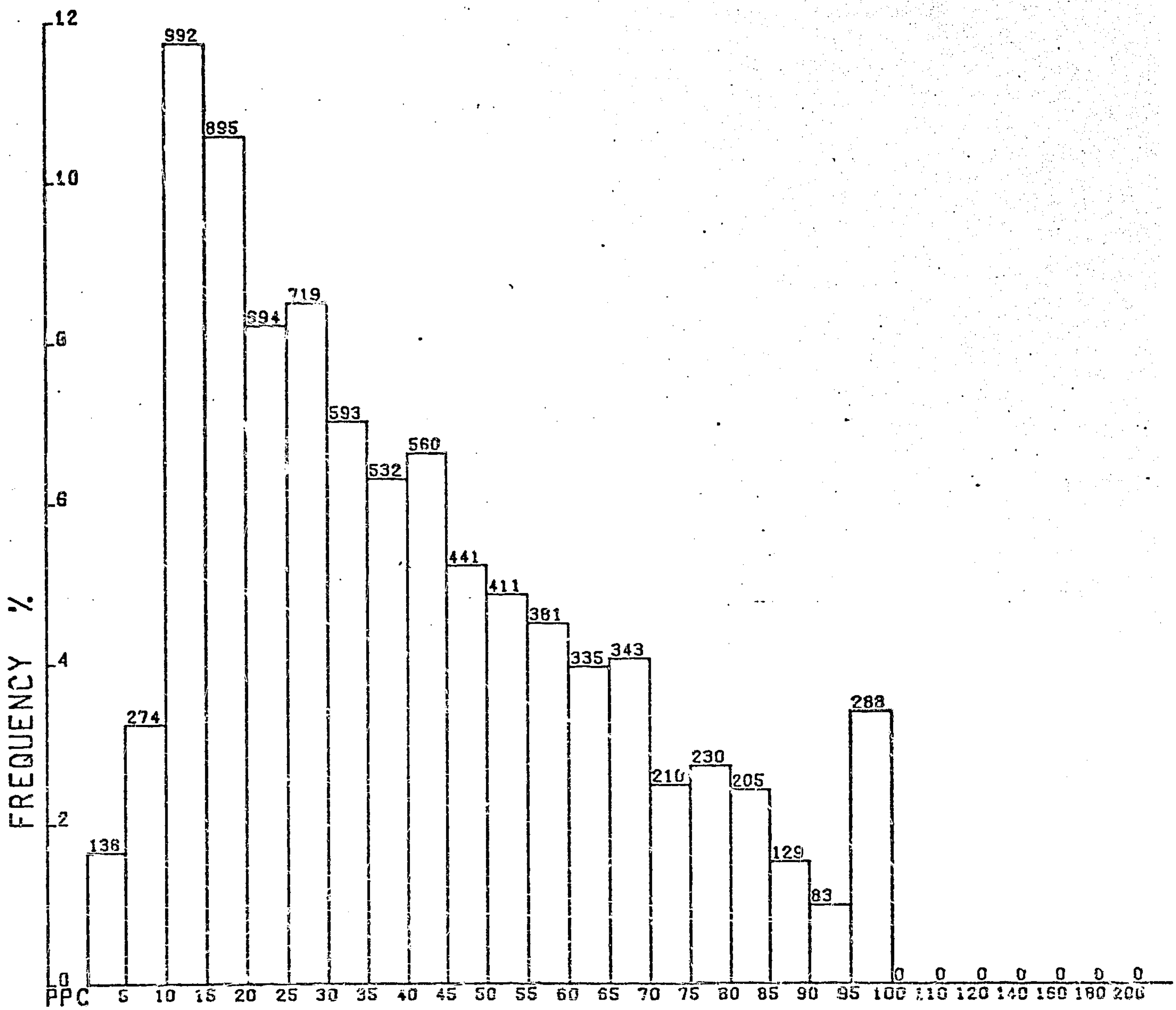


TABLE 6 -

JAMES BAY GEOCHEMISTRY 1975 DATA

CORRELATION COEFFICIENTS

	CU	PB	ZN	NI	CO	FE	MN	AS	U	MO	OR
CU	1.00										
PB	0.28	1.00									
ZN	0.47	0.25	1.00								
NI	0.57	0.29	0.56	1.00							
CO	0.43	0.33	0.52	0.73	1.00						
FE	0.38	0.26	0.53	0.58	0.73	1.00					
MN	0.23	0.12	0.30	0.36	0.43	0.43	1.00				
AS	0.05	0.02	0.06	0.06	0.08	0.11	0.03	1.00			
U	0.15	0.11	0.08	0.10	0.10	0.08	0.04	0.02	1.00		
MO	0.30	0.17	0.40	0.41	0.45	0.47	0.24	0.07	0.12	1.00	
OR	0.42	0.28	0.13	0.19	0.18	0.16	0.02	-0.02	0.11	0.05	1.00

● > 0.50

● 0.40 - 0.49

● 0.30 - 0.39

● 0.20 - 0.29

○ 0.10 - 0.19

○ < 0.10

each pair of variables using all samples. The most significant correlations are listed in Table 7. The best correlations appear to be the following: Cu vs Ni, Zn vs Ni-Fe-Co, Ni vs Co-Fe-Cu-Zn, Co vs Ni-Fe-Zn, Fe vs Co-Ni-Zn. Metallogenically these associations are suggestive of metal deposits associated with volcanic and/or mafic intrusions Correlations between metals for specific anomalies will becone more evident when the results from the geochemical maps are discussed.

RESULTS OF GEOCHEMICAL SURVEY

All geochemical maps accompanying this report have been machine plotted and drawn using a flat-bed plotter. For each of the 11 elements there are 3 sets of maps: Measured Value, Regional and Residual. The Regional and Residual maps have been plotted together on a scale of 1:250000, the Measured Value maps have been plotted at 1:125000. All of the computer work was carried out by Mr. L. Martin of CASE and the following comments are excerpted from his report.

Sample positions were digitized with a resolution of 0.01cm from manually plotted sample number maps which accompany this report. Due to some instability and creasing of the original maps and some splicing shifts in the base maps, absolute accuracy of co-ordinates and registration may not always reflect the digitizing resolution. It is therefore recommended that to define the most precise sample locations for follow-up work, reference should be made to the original 1:50000 sample numbers maps.

Value Groupings. Class boundaries for symbol sizes are normally set by starting at the non-anomalous geometric mean and upward in units of geometric deviation as computed in the statistical evaluation. However, there is a great variation in the frequency distributions among the various elements and strict conformance to the "rule" of class selection can produce poor reflection in the distribution by the different symbol sizes. The final choice of class values was therefore made by combining the normal rule with an attempt to set class limits to reflect cumulative frequency percentages of approximately 35, 65, 75 and 85.

TABLE 7 - Significant Positive Correlations Between Elements Using all Samples

Element	Group 1 0.50	Group 2 0.4-0.49	Group 3 0.3-0.39	Group 4 0.2-0.29	Group 5 0.1-0.19
Cu	Ni	Zn-Co-OR	Fe-Mo	Pb-Mn	U
Pb			Co	Ni-Cu-Fe-OR-Zn	Mo-Mn-U
Zn	Ni-Fe-Co	Cu-Mo	Mn	Pb	OR
Ni	Co-Fe-Cu-Zn	Mo	Mn	Pb	OR-U
Co	Ni-Fe-Zn	Mo-Mn-Cu	Pb		OR-U
Fe	Co-Ni-Zn	Mo-Mn	Cu	Pb	OR-As
Mn		Co-Fe	Ni-Zn	Mo-Cu	Pb
Mo		Fe-Co-Ni-Zn	Cu	Mn	Pb-U
U					Cu-Mo-Pb-OR-Ni-Co
As					Fe
OR		Cu		Pb	Ni-Co-Fe-Zn-U

For Cu the classes were set as for 1974 data to try for continuity with the 1974 maps. It is important to note that the groupings are flexible and are intended to provide a good guideline on the distribution of values; it is unwise to blindly use the various classes to discriminate between anomalous and non-anomalous values.

Regional Countour maps represent values of a specially weighted moving average computed on a grid pattern at intervals of 5 km in both directions. The circular window normal radius is 10 km. Data from 1973, 74 was combined with the new 1975 values to obtain continuity at the boundaries. Since the new maps have data from both sides of the boundary, their contours are the "correct" ones.

Residual class boundaries were set with objectives similar to the measured value maps but using the statistical parameters and distributions computed for the Positive Residuals.
It should be noted that for some elements the distributions and parameters vary considerably from Region A to Region B.
It was considered best to use the same class intervals in both regions, the choice being based on "average" parameters.

Measured and residual values for each element at each sample point have been compiled and listed in numerical order in the accompanying computer data report for this project.

In the interpretations that follows the Regional Contour Metal Maps have been used to establish regional metal trends and the correlations with regional geological features Residual Metal Maps have been used in the discussions on the anomalies and the maximum residual metal values have been compiled on the 1:250000 scale geological base maps which accompany this report.

DISCUSSION OF RESULTS

Area "A" - N½

Regional Copper:

A northeast trending regional Cu increase in the northeast sector of this sheet (north of Riv. Corvette) corresponds to a volcanic-granite contact. The central part of this regional high occurs over an area where a Cu-Ni occurrence has been found.

A large irregular shaped regional copper high (>30ppm) occupies the central and western parts of region "A". There appears to be little correlation between the metal trends and lithology. The regional copper high is underlain by mixed gneisses-schists and granitic rocks.

Residual Copper:

Many of the residual copper anomalies are associated with high residual values in other metals such as, Pb-Zn-Ni-Co, and to the west and south many residual copper anomalies are high in uranium also.

The maximum residual copper values (143-167ppm) in this area are found in the southwest corner of the map sheet and they warrant follow-up as do the multi-element base metal and uranium anomalies.

Coincident Cu-Ni-Co-U anomalies appear to be particularly abundant in the southwest part of this map sheet and they warrant follow-up.

Several residual copper anomalies (up to 106ppm) occur in the northeast corner of the map sheet and they may be due to base metal mineralization in the volcano-sedimentary rocks of this area. South of Riv. Corvette several of the Cu anomalies are associated with high residual metal values such as U, Pb-Ni-Co, Pb-Zn-Ni-Co-Fe-U-Mo and Fe-Ni-Co-U. The highest residual Cu value (106ppm) north of Riv. Corvette is also associated with anomalous values in Pb-Ni-U.

Regional Lead:

-There are several high (>12ppm) metal trends for lead in the north half of region "A". There is one in the central part of the map sheet that trends north-south and it is underlain by granite. While in the south part of the sheet the regional lead pattern trends east-west across an area underlain by granitic rocks and gneisses.

Residual Lead:

Anomalous residual lead values (>7ppm) occur associated with other anomalous base metal values in the northeast sector of the map sheet and in places uranium also increases with lead.

In the central part of the map sheet there is a grouping of residual lead values ranging from 8 to 40ppm. Granitic rocks are present in this area.

In the southeast corner of the map sheet anomalous residual lead values varying from 9 to 86ppm are concentrated. These values are underlain by a mixed gneiss-schist sequence. The association of many of these lead anomalies with other residual base metal anomalies is interesting and they should be followed-up.

In the southwest corner of the sheet residual lead anomalies are underlain by granitic rocks and mixed gneisses and schists. Frequently the residual lead anomalies are associated with high values in one or more of the following elements: Cu-Zn-Ni-Co-Fe-Mn-Mo and U. Such multi-element anomalies warrant follow-up.

Regional Zinc:

A regional increase in zinc (>45ppm) occurs in the northeast corner of the map sheet where the zinc trend is east-west along a volcanic-granite contact. In the central portion of the sheet the zinc trend appears to have a northwest configuration, this parallels a major fault direction and the attitude of diabase dykes in this area. Rocks under the zinc high are granites and mixed gneisses-schists.

A lobate NE-NW regional zinc trend is evident in the southeast corner of the sheet. Mixed gneisses and schists predominate here and they are cut by major NE and NW trending faults. These regional highs for zinc could be related to sulphide zones in these structures.

In the southwest the regional trend for zinc is east-west and overlies granites and mixed gneisses and schists.

Residual Zinc:

High residual values (155 and 157ppm) coincident with high Cu-Pb-Ni-Co-Fe-Mn-Mo values occur in the northeast corner of the map sheet where volcano-sedimentary rocks are present.

The anomalous residual values for zinc in the vicinity of Riv. Corvette are frequently associated with residual anomalies in Cu-Pb-Ni-Co and in places with U. Granitic rocks underlie this area.

Residual anomalies for zinc west of Frigate lake range from 70-110ppm, the highest values (97 and 110ppm) are associated with anomalous residual copper. Granitic rocks and in some places mixed gneisses and schist underlie this area.

A series of residual zinc anomalies (74-135ppm) in granitic terrain are grouped around a northwest fault about 23 miles southwest of Frigate Lake. Associated with these high zinc values are residual anomalies in Pb-Ni-Co-Fe-Mn-Mo.

In the southeast quarter of this sheet there are many residual zinc anomalies underlain, for the most part, by mixed gneisses and schists. The highest values (ie > 100ppm) frequently are grouped around northwest faults, the anomalies tend to be associated with high values in Pb-Ni-Co-Fe and Mn and occasionaly Mo and U.

In the southwest quarter of this map sheet residual zinc values in excess of 100ppm also tend to be multi-element in nature. Frequently they are associated with anomalies in Cu-Ni-Co-Fe and in places U and Mo. The underlying rocks are granites and mixed gneisses and schists, however the presence of abnormal amounts of Ni-Co-Fe suggest the presence of mafic and/or ultramafic rocks.

Regional Nickel:

A regional increase in nickel (> 35ppm) occurs at the west edge of the map sheet in an area underlain by granite and mixed gneiss-schist. The high nickel values here suggest the presence of mafic and/or ultramafic rocks.

In the southwest part of the map sheet a large east-west regional nickel high is underlain by granites and gneisses, several gabbroic intrusions are indicated in this area. The anomalous regional trend for nickel suggests that more gabbroic rocks are probably present.

Isolated regional nickel highs (>30ppm) are scattered about the southeast sector of the map sheet. They appear to be centered over northwest faults cutting granite.

Residual Nickel:

Several residual nickel anomalies (>30ppm) are present in the northeast corner of the area, north of Riv. Corvette. A Cu-Ni showing is present in the volcanic rocks of this area. Most of the nickel anomalies are associated with other base metal highs and one also is high in U.

South of Riv. Corvette several other multi-element residual anomalies are present, a small band of volcano-sedimentary rocks in granitic terrain occurs in this area.

A group of residual nickel values are centered over a northwest fault about 23 miles southwest of Frigate Lake. Residual nickel anomalies occur over or near northwest faults in several places in the southeast sector of the map sheet. Most of these anomalies are associated with high base metal values.

Near the west central part of this map sheet several residual nickel anomalies occur. Some of these are also high in Co and in places Pb- Zn and Cu are also abnormally high. Granites and gneisses are the rock types found in this area.

Many residual nickel anomalies (30-162ppm) are located in the southwest corner of the map sheet south of Opinaca River. Most of the anomalies are associated with high Cu-Co-U values and in places Pb-Zn-Mo is also anomalous. Gneisses and granites underlie the area but these high Ni-Co values indicate that mafic rocks are also present. Follow-up work is warranted here.

Regional Cobalt:

In the southeast portion of this sheet there is a regional north-west cobalt trend outlined by the 20ppm contour. The regional cobalt highs are located in terrain underlain by granite and gneisses and the cobalt trends coincide with major fault zones in the region.

Another large regional cobalt anomaly occurs in the southwest corner of the map sheet. The trend of the zone is east-west and it coincides with an anomalous nickel trend. Although the region is supposedly underlain by granite and gneiss the presence of these major Ni-Co trends indicates that mafic rocks probably occur here.

Residual Cobalt:

Several residual cobalt anomalies (>45ppm) are present in the north-east sector of the map sheet. The ones north of Riv. Corvette are associated with anomalies in other metals such as: Cu-Pb-Zn-Ni-Fe and Mn. These anomalies are probably related to sulphide mineralization in the nearby greenstone belt.

South of Riv. Corvette residual cobalt anomalies (58-123ppm) are associated with high values in Cu-Pb-Zn-Ni and in several places U. Granitic rocks underlie the area.

In the southeast sector of the map cobalt anomalies (44-189ppm) frequently associated with base metal and nickel highs cluster about northwest trending faults which cut the granites and gneisses of this area. Similar clustering about faults is also evident about 23 miles southwest of Frigate Lake and to the southeast. In places U is also high.

Residual cobalt anomalies are plentiful in the southwest quarter of the map sheet. Anomalous residual values (48-143ppm) are invariably associated with high nickel values and frequently they are coincident with anomalous values in Pb-Zn-Fe-Mn-U and in places Mo. Geologically, granites and gneisses underlie the area. The source of the metallic mineralization causing these anomalies is not known but could be related to mineralized fault zones and/or basic rocks. Follow-up work will be required to determine the cause of these anomalies.

Regional Iron:

A regional increase (>1.8%) is evident north of Lac Corvette. This high is associated with sulphide bearing volcano-sedimentary rocks.

Another regional increase occurs over Riv. Corvette and straddles a belt of volcano-sedimentary rocks in granitic terrain cut by north trending diabase dykes.

In the southeast a large northwest trending regional iron high occurs in mixed gneisses and schists. The northwest lobate character of this anomaly suggest it is related to a set of northwesterly trending faults which traverse the rocks of the region.

In the southwest sector of the map a regional increase in iron occurs over terrain underlain by gneisses-schists and granitic rocks. This anomaly forms the north end of a much larger regional iron trend which extends southward into the south half of Area "A".

Residual Iron:

The association of many residual iron anomalies (>7%) with base metal anomalies suggests that one source of the iron is probably sulphides in the underlying rocks. The presence of high iron with nickel and cobalt indicates also that mafic rocks are more plentiful in the region than indicated on the geological map.

Regional Manganese:

The regional distribution pattern for manganese is similar to that of iron. Areas containing in excess of 180ppm regional manganese outline the same areas as regions containing greater than 18000ppm iron. The bedrock sources of the manganese are probably the same as the iron.

Residual Manganese:

Many of the residual manganese anomalies (>650ppm) are coincident with high iron values as well as other metals such as Cu-Pb-Zn-Ni-Co and in places Mo. Follow-up field work will have to be done in the anomalous areas to determine the sources of these metals.

Regional Molybdenum:

Regional increases in molybdenum in the northeast sector of the map are related to granitic rocks and north of Lac Corvette the increase straddles a greenstone-granite contact. These anomalies probably represent molybdenum mineralization in pegmatites and granitic rocks.

In the southwest, south of Opinaca River, a regional molybdenum anomaly is centered over a group of gneisses-schists and granites. This anomaly is actually the north end of a much more extensive one which continues south onto the adjoining sheet. The molybdenum trend does not appear to correlate with any known geological feature. Additional field work will be required to evaluate its significance.

Residual Molybdenum:

Two high residual molybdenum values (18, 23ppm) are present in the northeast corner of the map sheet. These samples are high also in Cu-Pb-Zn-Fe-Mn and warrant follow-up work. Geologically the area is underlain by greenstones surrounded by granitic rocks. Similar multi-element anomalies occur between Sakami River and Riv. Corvette in terrain underlain by granite.

About 20 miles southwest of Frigate Lake another group of anomalous residual molybdenum values (10.5 to 32.5ppm) occur. In this area granites are cut by northwest faults and the anomalies are in close proximity to these faults. The highest molybdenum values are associated with high base metal results. Pegmatites and/or mineralized fault zones are probably the cause of the anomalies.

In the southeast part of the map sheet, along Opinaca River and south of the west end of Lac Pacifique, residual molybdenum highs (11-27ppm) group around northwest fault zones. Pegmatite dykes and/or mineralized fracture zones in the granites and gneisses of the region may be the cause of these anomalies.

Some of the highest residual molybdenum values (11-44ppm) on this sheet occur in the southwest quarter. They may occur singly or with other elements such as the base metals, Fe, Mn and in places U. The rocks underlying the anomalies are granites or gneisses. These multi-element anomalies would be worth following up for possible sulphide and/or uranium mineralization.

Regional Uranium:

In the northeast sector of the map two east trending regional uranium highs (>4ppm) occur along Riv. Corvette and south of Lac Corvette. Granite underlies both of these anomalies.

In the northwest quarter of the map a northwest trending regional uranium high occurs. The terrain is underlain by granite and gneiss cut by northwest faults. The trend of the anomaly suggest that these faults probably control the uranium distribution in the bedrock.

In the southeast quarter of this map sheet there is another easterly oriented regional uranium high. Mixed gneisses and schists cut by northwest and northeast faults underlie the anumalous area.

An intense regional increase in uranium occurs in the southwest quarter of the map sheet. The central portion of the anomaly has an easterly trend and occurs in an area of granitic rocks, the outer part of the anomaly occurs in an area underlain by gneisses and locally by gabbroic rocks.

Residual Uranium:

Residual uranium anomalies occur within each of the regional highs and follow-up work is required to determine their sources.

In the northeast a single high value (38ppm) occurs associated with anomalous values in Cu-Pb-Ni. This sample is underlain by greenstones.

Residual uranium values ranging from 8ppm to 118ppm are present in the vicinity of Riv. Corvette. Granitic rocks underlie the area. Most of the high samples are singly anomalous in uranium but several have associated high base metal values. The area warrants prospecting.

Several anomalous uranium values (7-36ppm) are scattered about an area 12 to 15 miles south of Lac Corvette. The anomalies in the vicinity of Lac Chabran are underlain by gneisses and schsits, while anomalies east of here are in granitic terrain and follow-up work is required to explain them.

In the northwest sector of the map sheet and southwest of Riv. Sakami there are some 20 samples containing 7 to 23ppm residual uranium. The anomalies are spread over about 300 square miles and most of them occur in granitic terrain cut by northwest faults and diabase dykes trending northwest and northeast. Most of the anomalies are singly high in uranium but several are associated with above normal copper.

In the southeast quarter of the map there are about 16 samples containing from 7 to 78ppm residual uranium. The anomalous area covers about 200 square miles and it is underlain by mixed gneisses and schists. Northwest trending faults are common in the region and some of the high samples are located on/or close to these faults. In places, high lead values occur with the uranium anomalies.

In the southwest quarter of the map residual uranium anomalies are abundant, a large area of about 700 square miles has over 50 samples containing from 7 to 148ppm residual uranium. The area is underlain by gneissic and granitic rocks. Some of the anomalies are probably related to uraniferous pegmatite dykes, however many of the residual anomalies are associated with anomalies in one or more elements such as Cu-Pb-Zn-Ni and Co and it is possible that these anomalies could have their source in vein-type deposits. Follow-up work is warranted here.

Area "A" S½

Regional Copper:

In the northeast sector of this map sheet there is an easterly oriented regional copper anomaly (>35ppm) which straddles granitic rocks and mixed gneisses and schists. Northwest trending faults and diabase dykes cut the country rocks.

A small northwest oriented regional copper high occurs east of the above anomaly. Its orientation would suggest that the regional distribution of copper is related partially to the northwest fault system.

Another irregularly shaped regional copper high occurs in the northwest corner of the map sheet. This is a continuation from the north half of the area of a large regional copper trend. When the whole zone is studied it has a north-south trend which changes to a slightly north of east trend on the north sheet. The latter changes to a north-south trend in the central part of the north sheet and continues into the south sheet where it changes direction to a slightly south of east direction. This metal trend does not appear to be controlled by any particular geological unit; greenstones, granites and gneisses are intersected by it and all these units are cut by northwest faults and diabase dykes.

In the south part of the south central part of the sheet, some 10 miles south of Eastmain River, a regional increase in copper overlies two belts of volcano-sedimentary rocks.

In the southeast quarter of the map sheet two less intense (26ppm) regional copper anomalies occur. Both of them are underlain by granitic rocks and the granites are cut by northeast and northwest striking diabase dykes.

Residual Copper:

In the northeast sector of the map sheet many residual copper anomalies (>35ppm) are scattered about. A large number of them are solely anomalous in copper however a number of them over 70ppm copper occur associated with high values in one or more of the following elements: Zn-Pb-Ni-Co-Mn and in places Fe and U. There is also a tendency for many of the multi-element anomalies to cluster near northwest faults and diabase dykes. Hence it is postulated that some of the copper mineralization in this area is controlled by such features. Follow-up work should concentrate on these multi-element anomalies.

In the northwest sector of this map sheet, west of Lichteneger Lake, southeast of Lac Le Caron and south of Eastmain River many of the residual copper highs occur over or in close proximity to volcano-sedimentary rocks. In places the copper anomalies are associated with high values in lead and/or zinc and south of Eastmain River there is a Cu-Zn-Ni-Co association. Near Lac Natel there is a copper showing and high residual Cu-Pb values nearby. The copper anomalies in this area are derived probably from base metals mineralization in the greenstones and they warrant detailed follow-up work.

Other copper anomalies in this quarter sector of the map are underlain by granites and gneisses cut by northwest faults and northeast trending diabase dykes. Several of them, especially in the northwest corner of the map, are coincident with anomalous residual uranium values. The proximity of many of the high copper values to the fault zones indicates that these structures may be the sources of the anomalies.

In the southeast quarter of the maps sheet, some 15 miles east of Lac Cabot, high copper residual values frequently occur with high values in one or more of the following elements: Pb-Zn-Ni-Co-Fe-Mn-Mo-U. Most of this area is underlain by granites and a series of northeast and northwest diabase dykes cut these rocks. The presence of nickel with most of the copper anomalies in this area suggests that the source of the anomalies are probably basic rocks.

In the southwest quarter of the map sheet there is a group of 3 residual copper values varying from 37 to 75ppm. Granites supposedly make up the bedrock here.

South of Lac Le Vilin (51^{o}35', 75^{o}05') there are 3 residual copper values (36,40 and 46ppm) associated with anomalous U. Granitic rocks occur here and follow-up work is required to evaluate the significance of these anomalies.

Regional Lead:

A regional build up of lead (>12ppm) extends north-south along the full length of the east side of the map sheet. The trend is not related to any known geological feature and it is underlain mainly by granites and gneisses.

Two more circular regional lead anomalies occur in the south half of the map sheet west of the above one. These are also underlain by granitic rocks and the one in the vicinity of Lac Le Vilin coincides with regional increases in Cu-Fe-Mn-U.

Residual Lead:

Many of the anomalous residual lead values (7-105ppm) in the northeast corner of the map sheet are interesting because frequently they are accompanied by high values in other metals. Cu and/or Zn, Ni-Co-Fe-Mn are the most commonly associated metals, however high residual values in U and/or Mo also may occur with the lead anomalies. The source of these anomalies may be fracture fillings or vein-type mineralization related to northwest trending structures. Many of the multi-element anomalies occur over or near these structures which intersect the gneisses and granites of the area.

In the northwest quarter of the map sheet there are few residual lead values greater than 10ppm. The highest values (13-61ppm) appear to occur north and south of Lichteneger Lake in terrain underlain by granites. The highest residual value is anomalous also in molybdenum suggesting a possible relationship with pegmatite dykes.

In the southeast quarter of the map sheet several very anomalous lead values (25-419ppm) occur. The highest values are solely anomalous in lead, two of them are anomalous also in copper and to the east one sample has coincident high values in Pb-U-Mo. Granites form the bedrock of the area and they are cut by a northwest and northeast sets of diabase dykes and faults. Additional field work will be required to evaluate the significance of these lead anomalies.

Regional Zinc:

Regionally zinc is high in the east half of the area. Concentrations greater than 55ppm occur in the northeast corner, here the anomaly trends east and then changes to a north-south orientation. The east-west portion corresponds to regional increases in Cu-Pb-Ni-Co. Granites and gneisses cut by northwest faults and diabase dykes occur in the area.

In the central part of the map sheet southeast of Riv. Nemiscau the regional zinc anomaly has a northeast trend which changes to an easterly direction west of Eastmain River. The anomaly follows and straddles a belt of volcano-sedimentary rocks.

In the southeast corner of the map another regional increase in zinc occurs over granitic terrain; the granites are cut by sets of northwest and northeast diabase dykes. Regional increases in Cu-Pb-Ni-Co-Mn-U occur here also.

Coincident with the regional zinc high (>55ppm) in the northwest corner of the area are areal increases in Cu-Fe-Mn. A variety of rocks including gneisses, granites and greenstones occur in this area.

Residual Zinc:

Residual zinc values (70-172ppm) lie within the regional zinc anomaly in the northeast sector of the map sheet. Coincident multi-element anomalies in one or more of the following elements commonly occur with the zinc highs: Cu-Pb-Ni-Co-Fe-Mn. These anomalies frequently occur in proximity to northwest faults and dykes which cut the gneisses and granites here.

Residual zinc anomalies in the northwest sector of the map sheet are generally high in other metals also; in the areas of granitic and gneissic rocks these may be one or more of the following: Cu-Pb-Fe-Mu-Mo. Over the greenstones south of Eastmain River Cu-Zn-Ni-Co anomalies are usually coincident.

In the southeast sector of the map sheet, 7 to 14 miles southwest of Lac Nasacauso, a good correlation between residual zinc anomalies and Pb-Ni-Co-Fe-Mn and in places Mo-U exists. The mineralization causing these anomalies could be related to mafic dykes in granitic rocks; however follow-up work will be required to confirm this.

Regional Nickel:

The regional nickel highs (>30ppm) are concentrated in the northeast part of the map sheet and they occur in gneissic-granitic terrain cut by northwest faults and dykes. Cu-Pb-Zn-Co also show regional increases in the anomalous nickel areas.

Residual Nickel:

In the northeast quarter of the map sheet residual nickel anomalies, frequently associated with high base metal values, occur over and close to northwest faults and mafic dykes. Southeast of Eastmain River uranium and base metal anomalies frequently occur with the nickel highs. The mineralization causing these anomalies is related probably to northwest faults and/or mafic dykes, follow-up work is required here.

In the northwest sector of the map sheet anomalous nickel residual values are spread about greenstone areas. Associated base metal anomalies are common with the nickel ones and they should be followed-up.

In the southeast quarter of the map sheet residual nickel anomalies similar to those found in the northeast sector occur. Follow-up work is required to determine their significance.

Regional Cobalt:

A north-south trending regional cobalt anomaly (>20ppm) occupies the full length of the east half of this sheet. Its configuration is similar to that of zinc. Regional increases to 25ppm cobalt match regional copper highs (>40ppm) in the north, lead (>14ppm) in the north and south, zinc (>55ppm) throughout the length of the cobalt high, nickel (>30ppm) in the north, iron (> 2%) in the south, center and partly in the north and manganese (>200ppm) throughout. The geological factors controlling the regional distribution of cobalt are not known but it is speculated that the control is northwest and northeast trending mafic dykes and faults.

In the west half of the map sheet two circular regional cobalt highs (>25ppm) straddle Riv. Nemiscau. Underlying these areas are greenstones and granitic rocks.

Residual Cobalt:

Within the regional cobalt highs residual cobalt anomalies are common, they vary in mangitude from 46 to 693ppm. In the northeast sector residual cobalt anomalies occur in terrain underlain by granite and gneisses. Some of the strongest anomalies are multi-element and frequently they appear to be related to northwest faults and mafic dykes.

A similar correlation is evident in the northwest sector of the map sheet. South of Eastmain River the residual cobalt anomalies appear to be related to greenstones. Interesting base metal and nickel anomalies are associated with the high cobalt values here. Follow-up work is necessary to establish the economic significance of these anomalies.

In the southeast quarter of the map sheet cobalt residual anomalies occur in geological settings similar to those found in northeast sector. Coincident multi-element base metal Ni-Co-Fe- and Mn anomalies are also common in this area and in places Mo and/or U occur with the high cobalt values. Additional field work will be required to evaluate these anomalies.

Regional Iron:

In the northeast quarter of the map sheet a regional iron anomaly (>2%) trends south of east and the core (>2.5%) straddles a gneiss-granite contact.

In the northwest a large circular shaped regional iron high is the southerly extension of a similar anomaly to the north. The central portion (>2.5%) does not correlate with any particular geological unit or feature. Hence one must conclude that there are probably multiple sources for the iron.

However in the southern part of the map sheet the regional iron anomalies are lobate to the northwest and northeast thus corresponding to the strike of the major faults and mafic dykes in the area.

Residual Iron:

Residual iron values greater than 7% are plentiful throughout the map sheet and the majority of them are associated with anomalies in one or more of the other analyzed elements. The iron in such cases probably has sources in common with the other metals. However samples singly anomalous in iron may reflect the presence of iron formation in the volcano-sedimentary sequences or concentrations of iron in the gneissic and igneous rocks of the region.

Residual iron anomalies found near Ruis. de l'Aviron-Brisé in the northwest, and southeast of Riv. Nemiscau in the southwest corner of the map sheet might be an indication of iron formations in the underlying volcano-sedimentary rocks.

Regional Manganese:

As with iron, the regional increase in the manganese in the northwest quarter of the map sheet is an extension southward of a similar one in the north half of Area "A". Gneisses, granites and greenstones predominate in this area. Northwesterly trending faults and northeasterly striking diabase dykes cut the aforementioned rocks. The somewhat lobate character of the anomalous zone as outlined by the 200ppm contour suggests a possible relation between the regional distribution of manganese and the northwest trending faults. From the northwest sector of the map sheet the anomalous (>100ppm) regional increase in manganese continues eastward to the east boundary of the map, from there it swings south to the southeast corner of the map. There is no apparent correlation with this metal trend and any feature shown on the geological map. However in the southeast corner of the map the maximum area build-up of manganese occurs in an area of where northwest and northeast sets of mafic dykes intersect.

A northwesterly trend of the regional manganese anomaly is evident in the southwestern sector of the map sheet. This trend also crosses a variety of rock types and shows little correlation with the underlying rocks. The only known features with this trend are the major faults which traverse the rocks in this quarter of the map.

On this map sheet regional increases in manganese are frequently matched by regional increases in iron and to a lesser extent by anomalous metal trends in Cu-Pb-Zn-Ni-Co-Mo and U.

Residual Manganese:

Residual Manganese anomalies may occur singly or accompanied by one or more metals. The anomalies by themselves are of little economic significance but because of its affinity for other metals the presence of large quantities of manganese may cause enhancement of metal values. However the presence of high manganese in a sample should not be used as a club to eliminate multi-element anomalies, only serious follow-up work in the field can effectively do this. Throughout the map sheet residual manganese anomalies have been found associated with one or more of the metals analyzed. In the north half of the map it appears that anomalies in the base metals, Ni, Co and Fe are frequently associated with high manganese. This relationship appears to continue into the southeast sector of the map also.

Regional Molybdenum:

In the northwest quarter of the map sheet a regional increase (>6ppm) in molybdenum trends north-south, this is a continuation of the molybdenum trend found on the map sheet to the north. For the most part the anomaly is confined to granitic rocks. The source of the molybdenum is probably molybdenite in the granite and/or pegmatite dykes. Similar remarks apply to a smaller northwest trending regional molybdenum trend 20 miles to the east.

South of Riv. Nemiscau a regional molybdenum anomaly (>6ppm) trends northeast to the edge of the map. Most of the anomaly is underlain by granitic rocks and the source of the molybdenum is in the granite and/or pegmatite dykes.

Residual Molybdenum:

Groupings of anomalous residual molybdenum values (10-148ppm) occur in several places in the northwest sector of the area from north of Riv. Nemiscau north to the edge of the map. The origins of these anomalies are probably fault zones and/or pegmatite dykes. Follow-up work will be required to determine the economic significance of these anomalies.

Residual molybdenum anomalies within the regional molybdenum high south of Riv. Nemiscau vary from 10 to 33ppm. The anomalies in the southwest 2/3rds of the regional high are frequently anomalous in uranium as well as Cu-Pb-Zn-Ni-Co-Fe and Mn. Follow-up work is required to determine the economic significance of these anomalies.

Regional Uranium:

The northwest sector of the map is marked by a regional uranium high (>3ppm) which is a continuation of a much larger anomaly to the north. The anomaly trends east and it has at least 2 northwest-southeast trending lobes which coincides with the direction of faulting in this area. The anomaly is not confined to any specific lithologic unit and probably it is derived from several sources such as pegmatites, granites and faults.

To the south the area is dominated by an intense regional uranium anomaly which covers some 1500 square miles, the core of the zone averages greater than 10ppm uranium. The trend is northeasterly with northwesterly lobes at either end of the anomaly. The majority of the zone is confined to granitic rocks.

In the northwest there appears to be a correlation between the regional distribution of uranium and Cu-Zn-Fe. In the south central area there is a correlation between the regional trend of uranium and Zn-Co and in part with Fe and Mo. In the southeast, regional increases in Cu-Pb-Zn-Co and in part Fe coincide with the uranium build up.

Residual Uranium:

In the northwest, residual uranium anomalies ranging from 7 to 144ppm frequently occur unassociated with other metals. However east of the north end of Clarkie Lake some of the uranium highs are anomalous in Cu and/or Ni. The cause of the uranium anomalies in the northwest sector of this map sheet is not known and follow-up work will be required to evaluate them.

In the northeast corner of the sheet there are three residual uranium anomalies with values of 9, 30 and 60ppm. Gneisses underlie the area and the two highest values correspond to anomalous values in Pb. The lowest value (9ppm) is associated with high residual values in Zn, Ni and Co.

Within the large regional anomaly in the south central part of the area thete are numerous residual uranium anomalies varying from 7 to 174ppm. Again many of these samples are solely anomalous in uranium but associated anomalies with one or more of the following elements may occur: Cu-Pb-Zn-Ni-Co-Mn-Mo. For the most part, granitic rocks underlie this area and many of the anomalies may be caused by radioactive pegmatites and/or granites however the presence of associated metals such as Cu-Ni-Co suggests also the presence of vein-type uranium deposits. Careful and thorough geological evaluation should be carried out over this large anomaly.

Several residual uranium anomalies occur in the south-east corner of the map, residual values here range from 9 to 25ppm. Granitic rocks underlie the area and a geological assessment should be made to determine the significance of the uranium highs.

Area "B" NTS 23E

Regional Copper:

The east half of this sheet is underlain by granulites and it is marked by a regional increase in copper (>30ppm). Also a northwest trending regional increase (>26ppm) in copper cuts across several greenstone belts in granitic terrain in the west sector of the map sheet. In general these areal increases in copper also correspond to regional highs in Pb-Zn-Ni-Co-Fe and Mn.

Residual Copper:

In the north part of NTS sheet 23E several anomalous residual copper values (48-168ppm) occur. These are underlain by granulites and those west of Lac Lataignant are anomalous also in Zn-Ni-Co-Mn; samples east of this lake have coincident anomalies in Pb-Zn.

A single high residual copper value associated with anomalous Pb-Zn-Ni-Co-Mn occurs in the northeast quarter of the sheet north of Presqu'ile Péré. Granulites, cut by northeast faults, are suppose to occur here. This area has been sampled at a density of 1 per 10 mi^2 and the samples north of this site have been accidently burnt in the laboratory. Hence the first stage of follow-up work should entail more detailed lake sediment sampling and re-sampling of the northeast corner of the area.

Several residual copper anomalies are scattered about the west part of the map sheet in the vicinity of Lac Laribosière, many of them are also anomalous in one or more of the following elements: Pb-Zn-Ni-Co-Fe-Mn-Mo. Several bands of greenstones in granitic rocks occupy this sector of the map. Geological assessment of the anomalous areas is warranted.

Regional Lead:

Regional increases in lead (>12ppm) occur over the granulites in the east half of the map sheet and a less intense (11ppm) north-south regional anomaly is present in the west sector north of Lac Dalmas. The latter area is underlain by narrow greenstone belts in granitic rocks. Both of these areas are regionally high also in Cu-Zn-Ni-Co-Fe and Mn.

Residual Lead:

Significant residual lead values appear restricted to the granitic areas in the west half of the area. Additional prospecting and geological follow-up work is required to assess the importance of these anomalies.

Regional Zinc:

The regional pattern for zinc is similar to the other base metals. The maximum build-up (>80ppm) is restricted to the granulite areas and a less marked (60ppm) north-south trend is present over the granites and greenstones in the west sector of the map north of Lac Dalmas.

Residual Zinc:

Anomalous residual zinc values (70-2022ppm) are common in the north part of the area and frequently they are associated with other metal highs such as Cu-Ni-Co-Fe-Mn and Mo. Most of the anomalies are underlaim by granulites and additional field work will be required to evaluate the significance of these metal highs.

Residual zinc anomalies (98-672ppm) occur in the east part of the area around Lac Vimond. Associated anomalies in one of more of the other elements such as Cu-Pb-Ni-Co-Fe-Mn-Mo occur with the zinc. Granulites cut by northwest faults underlie the area. This region has been sampled at a density of 1 per 10 square miles, more detailed lake sediment sampling (1 per 2 square miles) and geological assessment should be completed in the area.

Regional Nickel:

Increases (>40ppm) in the regional trend for nickel are evident in the north, east central and southern sectors of the maps sheet. All of these areas are underlain predominantly by granulites.

In the west central portion of the area a circular regional nickel anomaly occurs over two bands of greenstones enclosed by granitic rocks. At the east end of the more southerly volcanic belt is a gabbroic intrusion.

The regional nickel anomalies over the east half of this sheet appear to be related to granulites while in the west gabbroic and/or volcanic rocks are the source of the nickel increases. Similar metal trends in Cu-Zn-Co occur in the east while the western nickel build up corresponds to highs in Pb-Zn-Co-Mn.

Residual Nickel:

Residual nickel anomalies (>30ppm) are spread through the areas that are regionally high in nickel. Many of them are associated with coincident highs in cobalt and one or more of the base metals. Because the geology is not well known in this area the first stage of follow-up work should include a geological assessment of the anomalous area.

Some of the areas worth checking include:

1. The southwest corner of the map where residual nickel anomalies (32-122ppm) occur in an area of mixed gneiss and schist and granitic rocks cut by north trending mafic dykes. The latter could be the source of the anomalies.

2. Multi-element residual anomalies in nickel (32-110ppm) associated with high cobalt and base metals should be followed up in and around greenstone-gabbroic rocks in the western part of the map north of Lac Dalmas.

3. In the east half and north portion of the map the residual nickel anomalies (30-117ppm) are underlain by granulites and frequently they are associated with anomalous values in other metals such as Cu-Pb-Zn-Co. Most of the eastern portion of the map was sampled at a density of 1 sample per 10 square miles and therefore more detailed lake sediment sampling would be required to better localize the anomalies.

Regional Cobalt:

The areas showing regional increases (>25ppm) in cobalt are similar to those for nickel and the same comments apply.

Residual Cobalt:

Many of the residual cobalt anomalies over 100ppm are located in the granulite areas which underlie the north and east portions of the map sheet. Most of these are associated with anomalous nickel and/or base metal values. Geological assessment and more detailed lake sediment sampling is required in these areas.

Similar residual cobalt anomalies (48-111ppm) in the west part of the region north of Lac Dalmas should be evaluated. Volcanic and gabbroic rocks occur here and associated anomalies in nickel and base metals suggests that the cobalt anomalies may be related to sulphide mineralization in the surrounding rocks.

Regional Iron:

The regional iron anomalies (>3%) underlying the east and north parts of the map sheets show that the underlying granulites are iron rich.

A circular regional iron anomaly occurs in the west sector of the area and it is probably related to concentrations of iron in the greenstone-gabbroic rocks.

Residual Iron:

Residual iron anomalies (>7%) are common in the north part of the map sheet where granulites occur. Most of them are associated with anomalous Zn-Mn values and in places Cu-Ni-Co is also high.

Anomalous residual iron values associated with high Zn-Mn also occur over a greenstone belt in the southwest quarter of the map sheet.

Regional Manganese:

The patterns for the regional distribution of manganese are similar to those of iron. Regional values in excess of 350ppm appear related, for the most part, to the granulites. A more restricted regional increase in manganese (>250ppm) occurs north of Lac Dalmas in the west sector of the map. This circular high is underlain by greenstones, gabbros and granites.

Residual Manganese:

Residual manganese values in excess of 1000ppm are more or less confined to the two regionally high areas mentioned above, most of the manganese anomalies are associated with high values in other metals. Hence enhancement of these metals may be partially due to manganese and this should be kept in mind when follow-up work is done.

Regional Molybdenum:

The northeast quarter of the area is regionally high in molybdenum. Granulites cut by northeast faults underlie this area.

In the south, a regional high (>10ppm) in molybdenum occurs over both granites and migmatites.

Regional anomalies in molybdenum are probably related to molybdenite mineralization in granites and/or pegmatites of the area.

Residual Molybdenum:

There are some very high residual molybdenum values in the area. One of the most anomalous sectors is in the south in the vicinity of Lac Taffanel and Lac Nichicun.

Values vary from 20 to 100ppm and granitic rocks underlie most of the anomalies. The molybdenum anomalies may or may not be multi-element. The most commonly associated elements appear to be Zn-Mn-Ni-Co-Fe-Pb. The sample density in this area is 1 per 10 square miles, hence follow-up work should include geological evaluation and fill-in lake sediment sampling (eg. 1 per 2 square miles).

Within the granulites, groups of molybdenum anomalies (residual values from 11 to 43ppm) occur around Lac Vimond, Lac Larivé and Lac Berdier. Frequently these are associated with high values in Zn-Mn-Ni-Co-Fe and additional field work is necessary to evaluate the significance of these anomalies.

Residual molybdenum anomalies also occur over granitic rocks in the west and southwest sectors of the map. Many of these are singly anomalous in molybdenum,however, others are high also in base metals.

Regional Uranium:

In the east half of the map sheet regional uranium highs (>4ppm) are centered over granulites cut by northeast trending faults.

In the west part of the area south of Fort George River a circular regional uranium anomaly is centered over granitic and volcanic rocks cut by northeast faults. In the southwest quarter of the map a low intensity (>2ppm) regional increase in uranium trends northward over all rock types which include greenstones, granites and gneisses.

Residual Uranium:

In the east protion of the area significant uranium anomalies occur east of Eagle River (26-90ppm) and north of Lac Montbrillant (29ppm). Both of these areas are underlain by granulites cut by northeast trending faults. More detailed lake sediment sampling and geological evaluation is warranted over these anomalies.

In the west sector of the map, in the vicinity of Fort George River, anomalous reisudal uranium values vary from 6 to 316ppm. Many of the anomalies appear associated with granitic rocks cut by northeast trending faults. Associated anomalies may include elements such as Cu-Ni and Mo, such multi-element anomalies are worth following-up.

Several uranium anomalies occur in the southwest corner of the map area. These are usually singly anomalous in uranium and they appear in part to be associated with north-south faults.

Area "E" NTS 23L

The southwest quarter of this sheet was sampled at a density of 1 sample per 2 square miles and sample density on the rest of the sheet was 1 per 10 square miles. Unfortunately a large number of the samples from the latter area were lost in a fire at Metriclab's laboratory.

Regional Copper:

The eastern 2/3rd of this map sheet is occupied by a regional increase in copper. This is an extension northward of the regional copper trend outlined on the sheet (NTS 23E) to the south. These regional highs are restricted to the granulite unit and undoubtedly this formation must have a high background in copper and other metals. Similar regional build-ups can be seen for Ni-Co-Mn and to a lesser degree for Pb-Zn-Fe.

Residual Copper:

Residual copper anomalies (35-124ppm) occur in the areas underlain by granulites. Most of these are located in the south section of the map sheet east and southeast of Lac Homer. Many of the residual copper anomalies are high also in one or more of the following elements: Pb-Zn-Ni-Co-Fe-Mn-Mo. A geological assessment should be made of this area.

In the area of low density sampling to the north similar multi-metal anomalies can be found. The lake sediments over the rest of the sheet should be sampled at a density of 1 per 2 square miles.

Several singly anomalous copper values occur also over the granites in the southwest quarter of the map.

Regional Lead:

A regional increase in lead to greater than 12ppm occurs over granulites in the southwest quarter of the area. Whether this increase is formational or due to the presence of mineral deposits or both cannot be determined without further follow-up work. Similar regional metal increases in Cu-Zn-Ni-Co-Fe-Mn can be noted for this area.

Residual Lead:

Lead anomalies (7-20ppm), frequently associated with high residual values in Cu-Zn-Ni-Co-Fe-Mn and in places with U are spread over the southwest quarter of the area east of Lac Vinet and Lac Holmer.

Regional Zinc:

The south half of the area is marked by northwest trending regional zinc patterns. The increase is not confined to one rock type and it is obviously the result of various factors such as lithology, structure and mineralization.

Residual Zinc:

In the southwest quarter of the map singly anomalous residual zinc values (70-123ppm) occur more commonly in areas underlain by granitic rocks. While east of Lac Holmer,where granulites occur,most of the zinc anomalies (70-229ppm) are more intense and multi-element (eg. Cu-Pb-Ni-Co-Fe-Mn-Mo). A geolgoical evaluation should be made of the granulite rocks of this area. Anomalous residual zinc values are scattered also along the granulite belt northeast of the latter area.

Regional Nickel:

A regional increase to over 40ppm nickel is confined to the granulites in the eastern 2/3rds of the area. This is a continuation of the regional nickel anomaly on NTS sheet 23E to the south . Similar patterns also occur for Cu-Co-Mn.

Residual Nickel:

Residual anomalies (30-112ppm) in nickel are relatively common in the south half of the sheet. Frequently these are associated with anomalous base metal values, Co and Mn. Geological evaluation and prospecting should be carried out over the best anomalies south of latitude 54°30'.

Regional Cobalt:

A marked increase in regional cobalt (>35ppm) trends northward and is confined to the granulites in the south half of the map sheet. The central part of this zone corresponds to similar regional highs in Cu-Pb-Ni-Mn.

Residual Cobalt:

Very high residual cobalt values (86-164ppm) occur over the granulites east of Lac Holmer. Many of these have corresponding anomalies in one or more of the following (Cu-Pb-Ni-Fe-Mn-Mo) and warrant additional work.

Regional Iron:

The highest regional iron values (>4%) are centered over the granulites and this is a continuation of the regional iron trends from the map sheet to the south.

Residual Iron:

Residual iron values greater than 7% occur mainly over the granulites. Invariably these high values are associated with a variety of other metal anomalies such as Cu-Pb-Zn-Ni-Co-Mn.

Regional Manganese:

Maximum regional manganese values (>500 ppm) are centered over the granulites in the east portion of this map sheet. This is a continuation from the south of the regional anomalous manganese pattern. Coincident or partly coincident regional build-ups can be found with other metals such as Cu-Zn-Ni-Co-Fe.

Residual Manganese:

The maximum residual manganese values (>1000ppm) occur over the granulites and invariably they are associated with anomalies in other metals such as the base metals, nickel and cobalt. Some enhancement of these metals has probably occured due to the presence of manganese.

Regional Molybdenum:

The northeast trending regional molybdenum anomaly in the southwest quarter of the map sheet is an extension of one on the adjoining map sheet (NTS 23E) to the south. Granulites cut by northeast and north trending faults are common over the central part of the anomaly. Another east of north trending regional molybdenum high occurs in the southwest quarter of the map sheet. The anomaly is restricted to granulites cut by a series of northeast trending faults.

Residual Molybdenum:

West of Lac Niaux a series of very anomalous residual molybdenum values (30 to 72ppm) occur. These anomalies lie along northeast trending faults in granulites. Geological assessment and more detailed lake sediment sampling should be carried out in this region.

Another group of molybdenum values occur in the south-west quarter of the map sheet northeast of Lac Holmer. Residual values here range from 10 to 103ppm and the geological setting is similar to the previous anomaly. Most of the molybdenum highs are also anomalous in one or more of the base metals, nickel,cobalt and manganese. These anomalies should be investigated further.

Regional Uranium:

Regional increases in uranium greater than 3ppm are restricted to the granulites in the southwest and northeast quarters of the map sheet.

Residual Uranium:

The majority of the residual uranium anomalies on this sheet are concentrated in the southwest, east of Lac Holmer. Many of the stations are singly anomalous in uranium, however 10 miles northeast of Lac Holmer anomalous lead values accompany the high residual uranium. Additional geological work and prospecting is required to evaluate these high values.

Several weak uranium anomalies are scattered about the northeast corner of the map sheet. To better define these anomalies more detailed lake sediment (eg. 1 per 2 square miles) sampling would have to be carried out in this area.

Area "B" NTS 33H

Regional Copper:

The regional values for copper are low on this sheet, increases to >24ppm are restricted to areas underlain by greenstones. Generally the central portions of the regional highs are restricted to selected portions of the greenstone belts. This is evident from the anomalies at the east and south limits of the map sheet. Coincident regional increases for Pb-Zn-Ni-Co-Fe-Mn occur also in these areas.

Residual Copper:

Significant residual anomalies (>35ppm) in copper occur in the northeast quarter of the map over or in the vicinity of greenstones. Associated anomalies in nickel and/or other base matals are common, in one place north of La Grande Rivière high uranium is associated with anomalous copper values.

In the southeast quarter of the sheet singly anomalous copper values occur along a small greenstone belt north of Riv. Sakami. Other copper anomalies occur south of this river and at one location (lat. 53°01' - long. 72°46') the residual copper anomaly is high also in Pb-Zn-Ni and U. Geological assessment should be made of the anomalous copper areas.

Regional Lead:

The regional distribution for lead is similar to copper and they, in part, probably have the same sources within the greenstone belts.

Residual Lead:

A group of residual lead anomalies (7-47ppm) occur within a belt of volcanic rocks 13 miles south of La Grande Rivière. A multi-element Cu-Pb-Zn-Ni-Co-Fe-Mn-U anomaly is present in the same geological setting 5 miles farther south.

Pb-U anomalies occur at several places north of La Grande Rivière and on the north side of Riv. Sakami. Granitic rocks underlie these anomalies.

Regional Zinc:

Generally regional anomalies for zinc match those for Cu and Pb. They are restricted to areas in the east quarter of the map sheet where greenstone belts are indicated.

Residual Zinc:

Most of the highest residual zinc values (>100ppm) occur in and around the greenstone belts in the central part of the east quarter of this map sheet. These zinc anomalies may be singly high or they may occur with above normal quantities of one or more of the following elements Cu-Pb-Ni-Co-Fe-Mn-Mo. Follow-up work should be carried out in the vicinity of these multi-metal anomalies.

A Zn-Ni-Co association is evident in the anomalies south of Riv. Sakami. Gabbroic intrusions in volcanic rocks occur here and the area merits further work.

Regional Nickel:

There is a regional build-up (>25ppm) of nickel at the east central edge of the map. This is a continuation westward of a larger regional nickel anomaly on the adjoining map sheet (NTS 23E) to the east. Regional anomalies in Cu-Pb-Zn and Co occur here also. Volcanic rocks in granite underlie this anomaly.

Another regional nickel anomaly is located at the south edge of the map sheet. It is open to the south and coincides with regional increases in Cu-Pb-Zn and Co. A belt of volcanic rocks containing gabbroic intrusions underlie the anomaly.

Residual Nickel:

Residual nickel anomalies are present within both of the above regional highs. In places they are associated with anomalies in one or more of the following elements: Cu-Pb-Zn-Co. In the southeast corner of the map sheet two of the nickel highs are also abnormally high in uranium. Geological evaluation and prospecting is warranted in the vicinity of the residual anomalies.

Regional Cobalt:

As with Cu-Pb-Zn-Ni there are regional increases in cobalt at the east central part of the map sheet in the vicinity of Lac Duhesme and in the southeast south of the Riv. Sakami. A regional cobalt anomaly also occurs in the northeast quarter of the map sheet north of La Grande Rivière. Volcanic rocks occur in all three areas and the source of the cobalt is probably related to these greenstone belts.

Residual Cobalt:

Residual cobalt anomalies (46-68ppm) north of La Grande Rivière occur associated with high Pb-Zn and in places Fe-Mn-Mo.

A residual cobalt value of 104ppm occurs east of Lac La Savonnière and another of 158ppm is present west of this lake. Both anomalies occur in or close to volcanic rocks. The former contains anomalous quantities of Pb-Zn-Ni-Fe-Mn and the latter is high also in Cu-Pb-Zn-Ni-Fe-Mn-U. Both of these anomalies should be investigated.

Another high residual cobalt value (122ppm) occurs in granitic terrain southeast of Lac Sauvolles, it is accompanied by anomalous values in Pb-Ni-Fe-Mo.

In the southeast corner of the map anomalous residual values varying from 46 to 142ppm occur. The most southerly ones occur in an area of greenstones intruded by gabbroic rocks and these samples are anomalous also in zinc and nickel. The others occur in granitic terrain and generally they are high also in nickel.

Regional Iron:

Regional increases in iron (>2%) occur in granitic-volcanic terrain in the northeast, east central and south portions of the map sheet. Zn-Co-Mn and in part Pb-Ni also increase regionally in these areas.

Residual Iron:

A concentration of several residual iron anomalies are present over volcanic rocks on the north side of La Grande Rivière. These may be related to iron formation in the volcanics. Similar iron anomalies occur south of Riv. Sakami and many of the base metal, nickel and cobalt anomalies throughout the map sheet are also high in iron.

Regional Manganese:

Manganese is not exceptionally high in this region, weak regional anomalies (160-200ppm) occur in the same areas as the previously described ones for iron.

Residual Manganese:

Residual manganese anomalies may occur alone or accompanied by one or more other metals. The highest residual manganese value (8228ppm) near Lac Duhesme is also anomalous in lead. High cobalt is associated with a residual manganese value of 5096ppm west of Lac La Savonnière, east of this station another manganese anomaly (3287ppm) is high also in Cu-Pb-Zn-Ni-Co-Fe-U. On the north side of Lac La Savonnière two manganese residual values of 2421ppm and 2187ppm are accompanied by high Fe and high values in Zn-Mo respectively. Sixteen miles northwest of Lac La Savonnière a sample with a residual manganese value of 2618ppm is high also in Cu-Zn-Co and 10 miles northeast of this station 5606ppm residual manganese is found with residual anomalies in Co-Fe-Mo.

Although many of the residual anomalies contain anomalous amounts of manganese there does not appear to be any set pattern to the association of manganese and other metals. Probably there has been some enrichment of metals due to manganese, however despite this, multi-element anomalies should be taken at face value and not discarded because they happen to contain above normal amounts of manganese.

Regional Molybdenum:

In the north part of the sheet there is a regional increase (>6ppm) in molybdenum. Granitic rocks occur in the area.

In the south half of the area, north of Riv. Sakami there is a northeast trending regional molybdenum anomaly (>7ppm) underlain by granitic rocks.

The cause of these anomalies is probably molybdenum mineralization in granitic rocks or pegmatites.

Residual Molybdenum:

Several residual molybdenum anomalies ranging from 11 to 164ppm occur near the north limits of the map in the vicinity of Lac des Voeux. Some of these are high also in Zn and Mn and the highest value is anomalous in Mn and U. Molybdenite in pegmatites, quartz veins or granites are probably the source of the anomalies.

Several molybdenum anomalies are scattered through the central part of the area underlain by granites.

A concentration of molybdenum anomalies (11-68ppm) occur north of Lac Galinee. These too are underlain by granitic rocks and the source of the molybdenum mineralization is probably the granites and/or pegmatite dykes.

Regional Uranium:

A northwesterly trending uranium anomaly north of La Grande Rivière is an extension of one which appears on the adjoining map sheet (NTS 23E) to the east. Granites cut by a northeast fault underlies the central part (>4ppm) of the anomaly.

To the south, east-west trending weak (2ppm) regional anomalies occur along the north side of Riv. Sakami. This trend corresponds with the direction of faulting in the granitic rocks of this area.

South of Riv. Sakami a regional uranium high occurs over granitic rocks, the anomaly is open to the south.

Residual Uranium:

Seven anomalous residual uranium values (15 to 346ppm) occur on the north side of La Grande Rivière. Most of these anomalies are grouped around a major northeast fault which cuts the granite and volcanic rocks in this area. Follow-up geological examination and prospecting should be carried out here.

Another group of anomalous residual uranium values (8-102ppm) are strung out in an east-west direction on the north side of Riv. Sakami. These are underlain by granites and several of them occur over an east trending fault west of Lac Galinee. Geological examination and prospecting should be carried out in this area.

The uranium anomalies south of Riv. Sakami also are underlain by granites. Most of the samples are anomalous solely in uranium, however one of them is associated with anomalous quantities of Cu-Pb-Zn-Ni. Follow-up work in the form of geological evaluation and prospecting should be carried out to evaluate the significance of these anomalies. Additional lake sediment sampling should be carried out on the adjoining map sheet to the south.

<u>Area "B" NTS-33I</u>

Initially the northeast quarter of this sheet was sampled at a density of 1 sample per 10 square miles and the southeast quarter was sampled at a density of 1 sample per 2 square miles. Unfortunately the samples from the northeast sector were burnt by Metriclab and therefore only the results from those in southeast are available.

Regional Metal Trends:

Regionally there is a coincidental build-up of Pb-Zn-Ni-Co-Fe-Mn in the northeast corner of the sampled area near Lac Vincelotte. This sector of the map is underlain by granitic rocks, mixed gneisses and schists. This regional increase in metal is interpreted to be caused by the presence of mafic intrusions and/or gneisses.

The regional distribution of copper appears lobate to the southwest and southeast. The former trend corresponds to a major fault and the latter is the trend of the underlying greenstones, gneisses and schists.

A regional molybdenum high over granitic rocks occurs at the north extremity of the sampled area and it is open to the north. Molyodenum mineralization in these rocks is the probable cause of this anomaly.

Regionally there is an increase in uranium in the northwest corner of the sampled area, the anomaly is open to the west and north. It may be related to a major northeast fault zone which cuts the granites and granulites in this area.

Residual Metal Values:

There is only one residual copper value greater than 35ppm in the area; it is located about 12 miles southwest of the south end of Lac Vincelotte, Pb-Zn-Mn is also high in this sample.

Geologically the area is suppose to be underlain by granite which is cut by a northeast fualt.

Two nickel anomalies occur in the greenstone belt to the southeast and several of them are spread about gneiss-granite terrain in the vicinity of Lac Vincelotte. More geological work is required to assess the significance of these anomalies.

Residual molybdenum values varying from 12 to 153ppm occur near the southwest end of Lac Vincelotte and northwest of it. Molybdenite in granites, pegmatites and/or quartz veins probably is the source of the anomalies.

The highest residual uranium anomalies (6-67ppm) are grouped in the northwest part of the sampled area, here granites and granulites are faulted in a northeasterly direction. Additional lake sediment sampling to the west and north is required to close off the anomaly. Follow-up work should include also geological evaluation and prospecting of the area.

SUMMARY

This report covers the geochemical results for Cu, Pb, Zn, Ni, Co, Fe, Mn, Mo, U, As and Organic Matter in lake sediments from 2 areas in the James Bay region, Quebec. Area "A" covers all or parts of NTS Sheets 32O, 33B and 33G; Area "B" covers parts of NTS Sheets 23 E, 23L, 33H and 33I. A total of 21000 square miles was sampled and some 8450 organic-rich, lake center sediment samples were taken.

All geochemical data was computerized and sample locations were digitized. Statistical parameters such as means, standard deviations etc. were calculated and histogrames drawn. A complete data file by L. Martin accompanies this study. In addition maps at a scale of 1:250000 showing Regional Metal Trends and Residual Values were machine plotted for all metals. Measured value maps also were produced at a scale of 1:125000.

Because of the unreliability of the analytical results for As and Organic Matter these two parameters have not been discussed in the descriptions and interpretations of the anomalies.

Regional Metal Trends - Area "A"

Generally there is not a good correlation between the regional metal trends in this area and known lithology. This indicates that the metal sources are controlled by a variety of rock units as well as other features such as fautls and fracture zones.

For example a large regional copper trend occupies the west central part of Area "A"; although parts of this anomaly overlies volcano-sedimentary rocks near Eastmain River and north-west of Lac Village, the central portions of is are actually underlain by mixed gneisses-schists and granites. Coincident with the core of the regional copper anomaly are high regional values in Zn-Ni-Co-Fe-Mn and in part U and Mo. The presence of regional Cu-Ni-Co anomalies in the west central part of Area "A" suggests that unmapped mafic and/or ultra mafic intrusions may be present within the gneisses and granites.

The lobate character of many of the metal anomalies also indicates that major fault and fracture zones have some control over the distribution of metals in the bedrock.

One of the dominant metal trends in the east half of Area "A" includes north-south trending coincident anomalies in Pb-Zn-Co-Mn, most of this area is underlain by mxied gneisses-schists and granites.

Several major regional uranium anomalies occur in Area "A". The two largest of these are located in the central and southern parts of the region. The former trends easterly and the latter northeasterly. Mixed gneisses-schists and granites are the dominant rock types in the central anomaly and granitic rocks underlie the south one. Both areas are cut by northwest and northeast trending faults and mafic dykes.

Partial coincidence with regional molybdenum anomalies suggest that some of the uranium could be derived from uraniferous pegmatites. However there are corresponding regional anomalies in such metals as Cu-Ni-Co, especially in the central area, and this would indicate that other types of uranium deposits are present in Area "A". Follow-up geological examinations and prospecting must be carried out to evaluate the economic significance of the above regional metal trends.

Residual Metal Values

While the regional metal trends outline general areas of possible economic interest the residual metal values define specific target areas for follow-up. The dominent ones in Area "A" are:

1. Base metal and nickel anomalies associated with volcanic rocks north and northwest of Lac Corvette.

2. Cu-Ni-Co and in places associated uranium and/or molybdenum anomalies in the west central part of the area south of Opinaca River. Mixed gneisses-schist and granites supposedly underlie most of these anomalies.

3. Base metal and nickel anomalies occur associated with the greenstones north and northwest of Lac Village and in the vicinity of Eastmain River.

4. High Pb values are concentrated in the southeast corner of the area just north of Rupert River. Granites cut by NW and NE striking mafic dykes occur here.

5. In the east central sector of the area south and southeast of Packard Lake there are Zn-Ni-Co anomalies underlain by mixed gneisses and schists cut by northwest faults.

6. Another group of Zn-Ni-Co anomalies occur in the same geological setting in the southeast part of the region north of Eastmain River.

7. Molybdenum anomalies occur in granitic terrain south of Lichteneger Lake.

8. Many molybdenum anomalies frequently associated with high values in base metals, nickel or uranium occur in the south part of the region. Granites, cut by mafic dykes occur here.

9. A group of residual uranium anomalies south of Riv. Corvette are underlain by granitic rocks. However some of the anomalies also contain high values in base metals and nickel.

10. A series of uranium anomalies occur south of Riv. Sakami in the northwest part of the region. Mixed gneisses-schists are in contact with granites here.

11. Many uranium anomalies occur in the west central and east central parts of the region. In the west, south of Opinaca River many of the uranium anomalies occur in gneissic and granitic terrain and frequently they are associated with anomalies in other metals such as: Cu-Pb-Zn-Ni-Co-Mo. In the east the anomalies are underlain by mixed gneisses and schists cut by northwest trending faults.

12. The largest concentration of uranium anomalies in this area occur over granitic rocks in the south part of the region. Many of the anomalies are singly high in uranium however

others are associated with one or more anomalous base metal values, nickel, cobalt and molybdenum.

Regional Metal Trends - Area "B"

The most marked geochemical feature of this region are the large coincident northerly trending regional anomalies in Cu-Pb-Zn-Ni-Co-Fe-Mn-Mo which occupy the east half of the area. These are underlain by granulites which Eade (1966) describes as being pyroxene-bearing granodiorite and granodioritic gneisses containing accessory magnetite and apatite.

Less intense regional increases in Cu-Pb-Zn-Ni-Co-Fe-Mn occur in the vicinity and west of Lac Dalmas and in the southwest part of the region. All of these areas are underlain by volcano-sedimentary rocks and granites. The regional metal anomalies are probably related to the volcanic rocks.

Several northerly trending regional uranium anomalies occur in the east half of the area underlain by granulites.

In the central and west parts of the region the regional uranium trend is westerly. The largest anomaly occurs along La Grande Rivière and it is underlain by granite cut by northeast trending faults.

Residual Metal Values

The most significant residual anomalies in Area "B" are as follows:

1. In the north central part of Area "B" northeast of Lac Holmer and continuing southeast to Lac Catalogne there are numerous base metal - Ni-Co-Mo anomalies underlain by granulites. This area should be evaluated, the predominance of Ni-Co anomalies in the area suggests that the anomalies may be derived from mafic

and/or ultra-mafic rocks.

2. Near the western boundary of the area about 10 miles northeast of Lac Sauvolles there are a group of residual lead anomalies centered over a band of volcanic rocks. The area should be prospected for base metals.

3. In the southeast part of the region, some 12 miles east of Roundeyed lake there is a group of high residual zinc anomalies. Some of these are high also in Pb-Ni-Co-Mn-Mo. Many northeast faults intersect granulites in this anomalous area and it warrants geological evaluation.

4. In the south central portion of the map sheet northeast and northwest of Lac Dalmas Ni-Co anomalies, in places associated with base metal highs, occur over or near volcanic rocks. These should be prospected for base metal- nickel deposits.

5. Some Ni-Zn anomalies also occur over the greenstone belt south of Riv. Sakami. Gabbroic rocks occur in the volcanics and the area should be prospected for nickel sulphide deposits.

6. In the southeast corner of the map area in the vicinity of Nichicun Lake and southeast of it Ni-Co anomalies are present. Some of them occur in granulites and others are supposedly underlain by granite and gneisses. All rocks are cut by northeast striking faults. A geological assessment should be made of this area.

7. In the central part of the area west of Lac Niaux a series of Mo anomalies fall along northeast fault zones in granulites. Follow-up prospecting and geological work is required to evaluate the economic significance of these anomalies.

8. In a similar geological setting at the east edge of the area, east of Lac Rambau another concentration of molybdenum anomalies occur.

9. Molybdenum anomalies are plentiful in the south part of the area and many residual values in excess of 20ppm occur in granitic terrain around Lac Taffanel and south of Riv. Sakami.

The intensity and extent of molybdenum anomalies suggests that molybdenum mineralization must be widespread in the south part of Area "B".

10. In the granitic terrane of the northwest sector of the region, northeast of Lac Vincelotte and north and east of Lac Des Voeux more molybdenum anomalies are present.

11. Uranium anomalies occur in granulites northeast of Lac Holmer, some of them are singly high in uranium, others are associated with high Pb and in one place anomalous Cu-Pb-Zn-Ni-Co-Mn accompanies the uranium anomaly.

12. Several low intensity uranium anomalies occur in an area underlain by granite northeast of Lac Dalmas. The highest residual value (316ppm) is associated with an anoamly in molybdenum.

13. Three residual uranium anomalies (26-50ppm) occur east of Eagle River where northeast faults cut granulites. Additional lake sediment sampling and prospecting is required here.

14. A group of residual uranium anomalies are concentrated near the west boundary of the area on the north side of La Grande Rivière. Granite, cut by a major northeast fault, underlies the anomalies. The area should be prospected.

15. In the southwest part of Area "B" there are uranium anomalies north and south of Riv. Sakami. The anomalies appear to be restricted to granites.

16. In the northwest corner of the area residual uranium anomalies also are associated with granitic rocks.

Submitted by

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Appendix 1
Analytical Techniques Used
by Metriclab

TECHNIQUES D'ANALYSE GEOCHIMIQUE POUR LES SEDIMENTS DE LAC ET LES SOLS

Réception des échantillons

Sur réception des échantillons, le nombre de caisses et les inscriptions sur les caisses sont immédiatement relevés. Un document attestant la date de réception, le nombre de caisses et le présumé nombre d'échantillons est expédié au client.

Séchage primaire

Si les échantillons n'ont pas reçu un séchage primaire sur le terrain, nous disposons les sacs sur des cabarets de bois et aluminium et nous procédons à un séchage de huit heures dans une étuve où l'air chaud se déplace par gravité à $100^{\circ}C$. Si l'analyse du mercure est prévu, le séchage primaire sera fait dans un séchoir à pression positive à une température de $110^{\circ}F \pm 2$.

Séchage final

Les échantillons sont déposés, par ordre numérique, sur des cabarets de bois et aluminium. Les échantillons manquant dans la suite numérique sont immédiatement remplacés par un sac vide portant le numéro manquant et suivi de "N.S." (pas d'échantillon). Pendant cette opération l'inventaire complet se prend.

Séchage final (suite)

Les cabarets d'échantillons sont disposés dans un séchoir à air chaud à pression positive, à une température de 145°F pendant 4 jours. Si l'analyse du mercure est prévu, la température ne dépassera pas 120°F pendant 6 jours.

Broyage

Metriclab utilise un broyeur excentrique de marque "BLEULER" dont le récipient (Chatter box) est de ferro-chrome. Après le séchage final et par odre numérique, le contenu de chaque sac est transféré quantitativement dans le récipient du broyeur (capacité 100g), les agrégats sont écrasés par pression avec le couvert du récipient et le broyage se fait pour un temps uniforme de 10 secondes mesurées au chronomètre incorporé au circuit du broyeur. Un temps de 10 secondes est suffisant pour complètement broyer les agrégats mais insuffisant pour pulvériser les gros sédiments de même que la partie minérale de l'échantillon.

L'échantillon broyé est déposé sur une feuille de papier "onion skin" et transféré au tamisage. Le sac original du client portant son numéro suit l'échantillon au tamisage.

Le récipient du broyeur est nettoyé à l'air comprimé, assemblé et l'échantillon suivant sera broyé.

Tamisage

Comme le broyage, le tamisage se fait individuellement sur un tamis 80 mailles en acier inoxydable. Comme la soudure du treilli est de Ag-Pb-Sn, la surface de soudure exposé à l'échantillon est recouverte de résine époxy et vérifiée souvent pour évaluer l'usure de la couche d'époxy. Le récipient est d'acier inoxidable.

Tamisage (suite)

L'échantillon fraîchement broyé et déposé sur une feuille de papier oignon est transféré dans le tamis 80 mailles monté sur un appareil de tamisage TYLER avec minuterie incorporée et l'échantillon est tamisé par cycles de 2 minutes.

La partie + 80 mailles est retournée dans le sac original du client et conservée. La partie - 80 mailles est retournée sur le papier oignon pour être homogénisée, (roulée) 20 fois, puis déposée dans un sac (enveloppe) neuf et portant le numéro de l'échantillon.

La feuille de papier oignon est rejetée tandis que le tamis et récipient sont nettoyés à l'air comprimé avant de passer à l'échantillon suivant. En aucun temps un pinceau ou brosse ne sont utilisés pour forcer les particules au-travers du tamis.

PROGRAMME DE CONTROLE INCORPORE A LA ROUTINE D'ANALYSES GEOCHIMIQUES

1. Le 10[e], 20[e], 30[e] échantillon sont automatiquement pesés, attaqués et dilués en double à chacun des cabarets et placés en position 11,23 et 35.

2. Le double est suivi d'un sédiment de contrôle dont les valeurs sont connues. Dans chacun des cabarets, 3 contrôles sont ainsi introduits en positions 12, 24, 36 dont les teneurs sont basses, moyennes et élevées pour la majorité des éléments.

3. Sur les feuilles de travail, les espaces 13, 26 et 39 sont réservés à la vérification de la standardisation de l'appareil.

4. Les résultats des doubles et des contrôles doivent se répéter à ±10% des valeurs connues sinon les déterminations sont immédiatement arrêtées et la situation est analysée sur le moment par le personnel responsable. Selon le cas, corrections seront faites ou reprise complète du lot.

5. Pour chaque cabaret et chaque journée d'opération un graphique continu pour chacun des éléments des échantillons contrôlés est tenu pour déceler une variation lente mais progressive.

Conclusion

Selon cette technique, tout le personnel participant aux analyses géochimiques profite d'un contrôle continu des opérations et assure ainsi la qualité du travail.

Conclusion (suite)

A l'examen des résultats, toutes valeurs douteuses sont décelées et des reprises se font par la suite.

Résultats

Les résultats dans les certificats d'analyses géochimiques sont explicités de façon à être traités facilement par des calculatrices, ainsi tous les échantillons par ordre numérique comportent des résultats normalisés. Les échantillons manquant dans une série reçoivent la mention N.S. (no sample) pour chacun des éléments. Ceux dont le poids est insuffisant reçoivent I.S. (insufficient sample) pour tous les éléments qui n'ont pu être déterminés. Toutes valeurs inférieures à la limite de détection sont rapportées comme étant la moitié de la limite de détection. Ex: 0.05 ppmU, 0.01% Fe etc.. Les décimales inclusent dans les résultats normalisent les décimales de la ½ limite de détection et n'ont aucune valeur au point de vue précision. Ex: 0.60 ppmU = 0.6 ppmU±100%; 12.10% Fe = 12% Fe±10% etc..

ATTAQUE ET MISE EN SOLUTION POUR LES DETERMINATIONS Cu, Pb, Zn, Ni, Co, Fe, Mn ,Mo et As PAR SPECTROPHOTOMETRIE D'ABSORPTION ATOMIQUE

Pesée

A l'aide d'une balance électrique "SARTORIUS" peser 1g±.01 d'échantillon utilisant une spatule et une capsule en aluminium. Transférer quantitativement dans une éprouvette sèche de 25 X 150.mm.Les sacs marqués N.S. sont jumelés à un tube vide et inscrit N.S. sur la feuille. Procéder de même pour les échantillons I.S..

Attaque

A- A chacun des tubes, ajouter 3ml d'acide nitrique conc. à l'aide d'un "OXFORD PIPETTOR". Laisser réagir, à froid pendant un minimum de 30 minutes avec agitation après l'addition de l'acide.

B- Déposer au bain-marie à 90°C et surveiller l'évolution des gaz jusqu'à stabilisation de l'efferverscence. Si l'évolution est trop rapide, stabiliser par agitation au "MINI SHAKE". Quand la réaction est contrôlée, laisser réagir pendant ½ heure supplémentaire.

C- Retirer les cabarets un par un et à chacun des tubes, ajouter 1ml d'acide chlohydrique conc. à l'aide d'un "OXFORD PIPETTOR". Agiter sur "MINI SHAKE". Retourner au bain-marie à 90°C pour un temps supplémentaire de 1½ heure avec agitation au "MINI SHAKE" à chaque ½ heure d'attaque.

Dilution

A chacun des tubes ajouter 16.8ml d'une solution de chlorure d'aluminium 1250 ppm à l'aide d'un "OXFORD PIPETTOR", agiter au "MINI SHAKE" et laisser sédimenter pendant un minimum de 8 heures.

ATTAQUE ET MISE EN SOLUTION POUR LES DETERMINATIONS Cu, PB, Zn, Ag, Ni, Co, Fe, Mn, Mo et As PAR SPECTROPHOMETRIE D'ABSORPTION ATOMIQUE

Procéder comme pour le Cu, Pb, Zn, Ni, Co, Fe, Mn et Mo sauf ce qui suit.

Dilution

A chacun des tubes ajouter 16.8ml d'une solution d'acide chlorhydrique 1:3 contenant 1250 ppm de chlorure d'aluminium à l'aide d'un "OXFORD PIPETTOR". Agiter au "MIN SHAKE" et laisser sédimenter pendant un minimum de 8 heures.

ATTAQUE ET MISE EN SOLUTION POUR LA DETERMINATION DE L'URANIMUM PAR FLUORESCENCE ULTRA-VIOLET, ET L'EVALUATION DE LA MATIERE ORGANIQUE

Pesée

A l'aide d'une balance à torsion peser 0.100g±.001 de sédiment, utilisant une spatule et capsule d'aluminium. Transférer quantitativement dans un éprouvette de 15 X 150 mm. Suivre la même séquence que pour les éléments métalliques; le 10e, 20e, 30e échantillon est doublé. En positions 12, 24, 36 introduire les sédiments de contrôle dont les valeurs en uranium sont connues. Le dernier tube ne contient pas d'échantillon afin de servir de témoin des réactifs. Jumeler un tube vide pour chaque échantillon N.S. ou I.S..

Attaque

A chacun des tubes ajouter 2ml d'acide nitrique conc.. Agiter sur "MINI SHAKE". Déposer au bain-marie à 90°C pendant 2 heures avec agitation au "MINI SHAKE" à chaque ½ heure.

Dilution

Après la période d'attaque, ajouter à chacun des tubes 8.4 ml d'eau déionisée à l'aide d'un "OXFORD PIPETTOR". Agiter au "MINI SHAKE" et laisser sédimenter pour un minimum de 12 heures.

SOLUTIONS STANDARDS ET REACTIFS

Cu 1000: 1000 mcg/ml

Dissoudre 1000 g. de fil de cuivre, M-B Reagent, dans 100 ml d'acide nitrique 1:1, chauffer légèrement, transférer quantitativement dans un jaugé de 1000 ml. Compléter au volume avec de l'eau déionisée. Agiter et conserver dans un contenant de plastique marqué Cu 1000.

Pb 1000: 1000 mcg/ml

Dissoudre 1.599 g de nitrate de plomb (Reagent) dans 100 ml d'acide nitrique 1:1 transférer quantitativement dans un jaugé de 1 litre, compléter au volume avec l'eau déionisée. Agiter et transférer dans un contenant de plastique marqué Pb 1000.

Zn 1000: 1000 mcg/ml

Dissoudre 1000 g de ruban de Zn (Reagent) dans 100 ml d'acide nitrique 1:1, transférer quantitativement dans un jaugé de 1 litre et compléter au volume avec de l'eau déionisée. Agiter et conserver dans un contenant de plastique marqué Zn 1000.

Ni 1000: 1000 mcg/ml

Dissoudre 4,049 g de $NiCl_2 \cdot 6H_2O$ dans 100 ml de HCl 1:1 transférer quantitativement dans un jaugé de 1 litre et compléter au volume avec de l'eau déionisée. Agiter et conserver dans un contenant de plastique marqué Ni 1000.

SOLUTIONS STANDARDS ET REACTIFS (suite)

Co 1000: 1000 mcg/ml

Dissoudre 4.037 g de $CoCl_2 \cdot 6H_2O$ dans 100 ml de HCl 1:1 transférer quantitativement dans 1 jaugé de 1 litre, compléter au volume avec de l'eau déionisée. Agiter et conserver dans un contenant de plastique marqué Co 1000.

Ag 1000 : 1000 mcg/ml

Dissoudre 1.575 g d'$AgNo_3$ dans 100 ml de HCl 1:1, transférer dans un jaugé de 1 litre, compléter au volume avec du HCl 1:4. Agiter et conserver dans un contenant de plastique marqué Ag 1000.

Mn 1000 : 1000 mcg/ml

Dissoudre 1000 g de Manganese électrolytique dans 100 ml de HNO_3 1:1.,transférer quantitativement dans 1 jaugé de 1 litre, compléter au volume avec du HNO_3 1:4. Agiter et conserver dans le jaugé marqué Mn 1000.

Fe 10000 mcg/ml

Peser exactement 10.00 g de fil de fer, reagent et attaquer par 100 ml HCl 1:1. Aprês attaque complête, ajouter 150 ml HNO_3 . Transférer quantitativement dans un jaugé de 1 litre. Compléter au volume avec H_2O D.I.Agiter. Conserver dans le jaugé de 1000 ml marqué Fe 10000.

SOLUTIONS STANDARDS ET REACTIFS (suite)

Mo 1000 : 1000 mcg/ml

Peser 1,500 g de MoO_3 reagent et dissoudre dans 100 ml de HCl 1:1. Transférer quantitativement dans un jaugé de 1 litre et compléter au volume avec H_2O D.I. Agiter. Conserver dans un contenant de plastique marqué Mo 1000.

As 1000 : 1000 mcg/ml

Peser 1.734 g de $NaAsO_2$ reagent, dissoudre dans 100 ml H_2O D. I. dans laquelle 2 pastilles de NaOH ont été ajoutées. Transférer quantitativement dans un jaugé de 1 litre. Compléter au volume avec H_2O D.I. Agiter. Conserver dans le jaugé de 1 litre marqué As 1000.

$AlCl_3$ 12,500

Peser 335 g $AlCl_3 \cdot 6H_2O$, dissoudre dans 2 litres avec H_2O D.I. Agiter et conserver dans un récipient de plastique marqué $AlCl_3$ 12,500

$AlCl_3$ 1250

Diluer 100 ml de $AlCl_3$ 12,500 ad 1 litre avec H_2O D.I.

HNO_3 1:1

Diluer 1 volume d'HNO_3 conc. avec 1 volume d'H_2O D.I.

HCl 1:4

Diluer 1 volume d'HCl conc. avec 3 volumes d'H_2O D.I.

Cu, Pb, Zn, Ni, Co, 100: 100 mcg/ml (refaire fraîchement)

Dans un jaugé de 250 ml, diluer 25 ml de chacune des solutions Cu 1000, Zn 1000, Ni 1000, Co 1000 et compléter à 250 ml avec de l'H_2O D.I. Agiter.

Solutions de travail Cu, Pb, Zn, Ni, Co (refaire chaque semaine)

Dans des jaugés de 500 ml, préparer:

Cu, Pb, Zn, Ni, Co ppm	Cu, Pb, Zn, Ni, Co 100	$AlCl_3$ 12500	H_2O DI	HNO_3	HCl	H_2O DI
4	1 ml	40 ml	250 ml	70 ml	20 ml	ad 500
12	3 "	40 "	250 "	70 "	20 "	ad 500
20	5 "	40 "	250 "	70 "	20 "	ad 500
100	25 "	40 "	250 "	65 "	20 "	ad 500
200	50 "	40 "	250 "	60 "	20 "	ad 500

Conserver dans des contenants de plastique marqués Cu, Pb, Zn, Ni, Co 4 à 200 ppm

Solutions de travail Cu, Pb, Zn, Ni, Co, Ag
(Refaire chaque semaine)

Procéder comme pour les solutions de travail Cu, Pb, Zn, Ni, Co en remplaçant H_2O D.I. par du HCl 1:4.
Conserver dans des contenants de plastique marqués Cu, Pb, Zn, Ni, Co, Ag 4 à 200 ppm.

Mn 100 : 100 mcg/ml (Refaire fraîchement)

Dans un jaugé de 250 ml diluer 25 ml de Mn 1000 compléter au volume avec H_2O D.I.. Agiter.

Mo 100 : 100 mcg/ml (Refaire fraîchement)

Dans un jaugé de 100 ml, diluer 10 ml de Mo 1000, compléter au volume avec H_2O D.I.. Agiter.

Solution de travail Mn, Mo (Refaire chaque semaine)

Dans des jaugés de 500 ml, ajouter 200 ml de $AlCl_3$ 1250 puis additionner les volumes suivants:

Mcg/ml Mo	PPM Mn	Mo 100	Mn 100	Mn 1000
0	0	0.0 ml	0.0 ml	
0.2	10	1.0 ml	2.5 ml	
0.4	20	2.0 ml	5.0 ml	
0.6	40	3.0 ml	10.0 ml	
1.0	60	5.0 ml	15.0 ml	
1.5	80	7.5 ml	20.0 ml	
2.0	100	10.0 ml	25.0 ml	
3.0	120	15.0 ml		3.0 ml
4.0	160	20.0 ml		4.0 ml
5.0	200	25.0 ml		5.0 ml
	400			10.0 ml
	600			15.0 ml

- Ajouter 75 ml HNO_3 à chacun. Agiter.
- Ajouter 25 ml HCl à chacun. Agiter
- Compléter au volume avec $AlCl_3$ 1250. Agiter.
- Conserver les solutions dans des contenants de plastique marqués Mo mcg/ml Mn ppm.

Solution de travail Mn, Mo, Ag (Refaire chaque semaine)

Procéder comme pour les solutions de travail Mn, Mo, mais remplacer l'acide nitrique par 50 ml de $AlCl_3$ 12500 et le $AlCl_3$ 1250 par du HCl 1:4.

Conserver dans des contenants de plastique marqués Mo mcg/ml Mn ppm Ag.

Fe 1000 : 1000 mcg/ml (Refaire chaque semaine)

Diluer 25 ml de Fe 10000 ad 250 ml dans un jaugé avec H_2O D.I.. Agiter.

Solution de travail: Fer (Refaire chaque semaine)

Dans des jaugés de 500 ml, préparer:

% Fe	Fe1000	Fe10000	$AlCl_3$12500	HCl	HNO_3	H_2O
0.02	5 ml		50 ml	25 ml	75 ml	ad 500
0.10	25 ml		50 ml	25 ml	75 ml	ad 500
0.50	125 ml		50 ml	25 ml	75 ml	ad 500
1.00		25 ml	50 ml	25 ml	75 ml	ad 500
2.00		50 ml	50 ml	25 ml	75 ml	ad 500
3.00		75 ml	50 ml	25 ml	75 ml	ad 500
4.00		100 ml	50 ml	25 ml	75 ml	ad 500
5.00		125 ml	50 ml	25 ml	75 ml	ad 500
10.00		250 ml	50 ml	25 ml	75 ml	ad 500

Transférer des contenants de plastique marqués 0.02, 0.10, 0.50, 1.00, 2.00, 3.00, 4.00, 5.00 et 10.00.

Solution de travail Fe, Ag (Refaire chaque semaine)

Procéder comme pour les solutions de travail Fe en remplaçant HCl, HNO_3 et H_2O par HCl 1:4 et compléter au volume. HCl 1:4

Conserver dans des contenants de plastique marqués FeAg au lieu de Fe.

Solutions de travail Ag (Refaire chaque semaine)

PPM	mcg/ml	Ag 1	Ag 10	Ag 100	HCl 1:3	$AlCl_3$ 12500	HNO_3	HCl 1:3
0.0	0.00	0 ml			300 ml	40 ml	75 ml	ad 500 ml
0.2	0.01	5 ml			300 ml	40 ml	75 ml	ad 500 ml
0.4	0.02	10 ml			300 ml	40 ml	75 ml	ad 500 ml
0.6	0.03	15 ml			300 ml	40 ml	75 ml	ad 500 ml
1.0	0.05	25 ml			300 ml	40 ml	75 ml	ad 500 ml
2.0	0.10		5.0 ml		300 ml	40 ml	75 ml	ad 500 ml
4.0	0.20		10.0 ml		300 ml	40 ml	75 ml	ad 500 ml
10.0	0.50		25.0 ml		300 ml	40 ml	75 ml	ad 500 ml
15.0	0.75		37.5 ml		300 ml	40 ml	75 ml	ad 500 ml
20.0	1.00			5 ml	300 ml	40 ml	75 ml	ad 500 ml

Préparer les solutions précédentes dans des jaugés de 500 ml et conserver dans contenants de plastique marqués: Ag 0, Ag 0.2, Ag 0.4, Ag 0.6, Ag 1.0, Ag 2.0, Ag 4.0, Ag 10.0, Ag 15.0, Ag 20.0 ppm.

Technique pour les déterminations de Cu, Pb, Zn, Ni, Co et Ag à l'aide de l'appareil Perkin-Elmer 460

- En suivant le mode opératoire recommandé par le manufacturier et selon les paramètres pré-déterminés pour chacun des éléments Cu, Pb, Zn, Ni, Co. et Ag dans les monographes particuliers, standardiser pour les concentrations S_1, S_2 et S_3 à l'aide des solutions de travail appropriées Cu, Pb, Zn, Ni Co. ou Cu, Pb, Zn, Ni, Co et Ag selon le cas.

- Aspirer de l'eau D.I. entre chaque échantillon et attendre l'apparition du Zéro.

- Vérifier les lectures standards intermédiaires entre 0, S_1, S_2 et S_3.

- Diluer toute solution qui donne un résultat "OVER CAL".

- Si une dilution est nécessaire, diluer 1 + 9 avec $AlCl_3$ 1250 ou HCl 1:4 selon le cas.

- Vérifier que les échantillons doubles donnent des résultats ayant moins de 10% de variation. Si la variation excède 10% demander l'aide du personnel responsable.

- Vérifier que les échantillons contrôlés ne donnent pas des résultats excédant les déviations stipulées pour chacun des contrôles et chacun des éléments.

- Dès que les déviations permises sont dépassées demander l'aide du personnel responsable.

- Pendant les opérations, inscrire à l'endroit prévu les résultats des solutions standards se rapprochant des valeurs moyennes des échantillons ou l'équivalent de l'échantillon le plus élevé.

Technique d'opération pour les déterminations de Fe, Mn et Mo à l'aide de l'appareil Pge-Unicam SP-1900.

- En suivant le mode opératoire recommandé par le manufacturier et selon les paramètres pré-déterminés pour chacun des éléments Fe, Mn et Mo dans les monographes particuliers, standardiser l'appareil pour déterminer les concentrations accessibles en utilisant les solutions standards appropriées.

- Aspirer de l'eau D.I. entre chaque échantillon et attendre l'apparition du zéro.

- Vérifier la standardisation sur toute la gamme des concentrations accessibles en modifiant légèrement l'expansion et la correction de la courbure à l'aide du jeu de solutions standards disponibles.

- Pour l'ensemble du travail, procéder selon les mêmes directives qu'avec le Perken-Elmer 460.

Détermination par spectrophotométrie d'absorption atomique des Cu, Pb, Zn, Ci, Co et Ag

CUIVRE

Appareil	:	Perkin Elmer 460
Cathode	:	Cuivre P.E.
Courant	:	15 ma.
Longueur d'onde	:	324.8 nm
Fente	:	0.7 nm
Correction de fond	:	non
Intégration	:	0.5 seconde
Brûleur	:	Air-acetylene 10 cm parallèle
Débit	:	Acetylene: 25 à 8 psi Air: 55 à 30 psi
Standardisation	:	S_1: 20 ppm S_2: 100 ppm S_3: 200 ppm

PLOMB

Appareil	:	Perkin-Elmer 460
Cathode	:	Plomb P.E.
Courant	:	10 ma.
Longueur d'onde	:	283.3 nm
Fente	:	0.7 nm
Correction de fond	:	oui automatique et continu
Intégration	:	1 seconde
Brûleur	:	air-acetylene 10 cm parallèle
Débit	:	Acetylene: 25 à 8 psi Air: 55 à 33 psi
Standardisation	:	S_1: 20 ppm S_2: 100 ppm S_3: 200 ppm

ZINC

Appareil	:	Perkin-Elmer 460
Cathode	:	Zinc P.E.
Courant	:	15 ma.
Longueur d'onde	:	213.9 nm
Fente	:	0.7 nm
Correction de fond	:	non
Intégration	:	1 seconde
Brûleur	:	air-acetylene 10 cm parallèle
Débit	:	acetylene: 25 à 8 psi Air: 55 à 30 psi
Standardisation	:	S_1: 20 ppm S_2: 100 ppm S_3: 200 ppm

NICKEL

Appareil	:	Perkin-Elmer 460
Cathode	:	Nickel P.E.
Courant	:	25 ma.
Longueur d'onde	:	232.0 nm
Fente	:	0.7 nm
Correction de fond	:	oui - automatique et continu
Intégration	:	1 seconde
Brûleur	:	Air-acetylene, 10 cm, parallèle
Débit	:	Air:55 à 30 psi Acetylene: 25 à 8 psi
Standardisation	:	S_1: 20 ppm S_2: 100 ppm S_3: 200 ppm

COBALT

Appareil	:	Perkin-Elmer 460
Cathode	:	Co P.E.
Courant	:	30 ma.
Longueur d'onde	:	240.7 nm
Fente	:	0.2 nm
Correction de fond	:	oui- automatique et continu
Intégration	:	1 seconde
Brûleur	:	air-acetylene, 10 cm, parallèle
Débit	:	Acetylene: 25 à 8 psi air: 55 à 30 psi
Standardisation	:	S_1: 20 ppm S_2: 100 ppm S_3:

ARGENT

Appareil	:	Perkin-Elmer 460
Cathode	:	Ag, Westinghouse avec adapteur 013
Courant	:	15 ma.
Longueur d'onde	:	328.1 nm
Fente	:	0.7 nm
Correction de fond	:	oui - automatique et continu
Intégration	:	1 seconde
Brûleur	:	Air-acetylene, 10 cm, parallèle
Débit	:	Acetylene: 25 à 8 psi air: 55 à 30 psi
Standardisation	:	S_1: 0.4 ppm S_2: 1.0 ppm S_3: 2.0 ppm

FER

Appareil	:	Pye-Unicam SP-1900
Cathode	:	Fer P.E. modifiée par Metriclab Inc.
Courant	:	15 ma.
Longueur d'onde	:	302.1 nm
Fente	:	0.30 nm
Sensivité	:	378
Expansion	:	455
Courbure	:	234
Concentration	:	oui en %
Intégration	:	1 seconde
Stabilisateur 10	:	oui
Brûleur	:	air-acetylene, 10 cm, à 90°, hauteur 5 cm
Débit	:	Air: 31/min Acetylene: 31/min
Aspiration	:	2ml par minute
Opération	:	Standardiser manuellement en variant l'expansion, la correction de courbe, et le zéro de façon à lire des concentrations de 0.01 à 10.00% sur l'écran lumineux à l'aide des solutions de travail du Fer ou Fer-Ag selon le cas.

Manganese

Appareil	:	Pye-Unicam SP-1900
Cathode	:	Mn Westinghouse
Courant	:	15 ma.
Longueur d'onde	:	279.5 nm
Fente	:	0.30 nm
Sensitivité	:	477
Expansion	:	364
Courbure	:	108
Concentration	:	oui en PPM
Stabilisateur 10	:	oui
Integration	:	1 seconde
Brûleur	:	air-acetylene, 10 cm, hauteur 0.5 cm, parallèle
Début	:	air: 3l/min acetylene: 3l/min
Aspiration	:	2 ml par minute
Opération	:	Standardiser manuellement de façon à lire de 0 à 600 ppm sur l'écran lumineux à l'aide des solutions de travail MN, Mo ou Mn Mo Ag selon le cas.

Molybdene

Appareil	:	Pye-Unicam SP-1900
Cathode	:	Mo Westinghouse
Courant	:	25 ma.
Longueur d'onde	:	313.3 nm
Fente	:	0.30 nm
Sensitivité	:	356
Expansion	:	225
Courbure	:	299
Concentration	:	oui en mcg/ml
Stabilisateur 10	:	oui
Intégration	:	1 seconde
Brûleur	:	N_2O - acetylene, 5 cm, parallèle
Hauteur	:	0.5 cm
Débit	:	N_2O: 3.2 l/min Acetylene: 3.5 l/min

Molybdene (suite)

Aspiration	:	2 ml par minute
Opération	:	Standardiser manuellement de façon à lire 0.00 à 5.00 mcg/ml sur l'écran lumineux à l'aide des solutions de travail Mn, Mo, ou Mn, Mo, Ag selon le cas.

Inscrire les résultats en mcg/ml sur les feuilles de travail. Les résultats en ppm sera:

mcg/ml X 20 = ppm Mo

DETERMINATION DE L'ARSENIC A L'AIDE D'UN GENERATEUR D'ARSINE ET MESURE PAR SPECTROPHOTOMETRIE D'ABSORPTION ATOMIQUE

Appareil	:	Perkin-Elmer 460 couplé à un générateur d'hydrure Perkin-Elmer
Cathode	:	Arsenic, Westinghouse, adapteur 014
Courant	:	19 ma.
Longueur d'onde	:	193.7 nm
Fente	:	0.7 nm
Correction de fond	:	oui-automatique et continu
Brûleur	:	3 fentes, 10 cm, argon-hydrogene, parallèle
Débit	:	Azote: 60 à 50 psi Hydrogène: 20 à 8 psi
Standardisation	:	Lecture d'absorption maximum sur une période de 15 sec. de solns std d'arsenic représentées sur un graphique.
Temps de réaction	:	15 secondes

STANDARDISATION

Utiliser un solution de 100 mcg/ml pour aligner le brûleur et optimaliser l'appareil.

As 100 : 10 mcg/ml (Refaire au besoin)

Diluer 10 ml de As 1000 ad 100 ml dans jaugé de 100 ml et compléter au volume avec H_2O D.I.. Agiter.

As 10 : 10 mcg/ml (Refaire fraîchement)

Diluer 10 ml de As 100 ad 100 ml dans un jaugé de 100 ml et compléter au volume avec H_2O D.I.. Agiter.

As 1 : 1 mcg/ml (Refaire fraîchement)

Diluer 25 ml de As10 ad 250 ml dans un jaugé, compléter au volume avec H_2O D.I.. Agiter.

MODE OPERATOIRE

1. Introduire 50 ml de HCl 25% V/V dans le réacteur. Fixer au générateur, faire circuler et barbotter librement le courant d'azote dans la solution et de la solution au brûleur. Introduire une pastille de borohydrure de sodium et en même temps déclancher le chronomètre intégré et préréglé à 15 secondes. Enregistrer l'absorption maximum indiqué à l'écran lumineux.

2. Répéter l'opération 1 quatre ou cinq fois pour vérifier la stabilité des circuits et faire la moyenne. Cette moyenne sera la valeur du "BLANK".

3. Successivement et à trois reprises chacune déterminer l'absorption maximum pour 1, 2, 3, 4 et 5 ml de As V/V. Enregistrer les résultats et faire les moyennes pour chacune des additions. Ceci donnera les valeurs pour 10, 20, 30, 40, 50 ppm d'arsenic.

4. Rincer à plusieurs reprises les vases à réactions entre chaque détermination.

5. L'arsenic est déterminé à partir du surplus de solutions qui a servi aux déterminations de Cu, Pb, Zn, Ni, Co , Fe, Mn, Mo et Ag.

6. Suivre l'ordre des feuilles d'attaque et enregistrer tous les résultats sur ces mêmes feuilles; y compris les résultats de standardisation.

7. A l'aide d'une pipette automatique OXFORD prélever et additionner 2 ml de solution inconnue à 50 ml de HCl 25% V/V dans un vase à réaction et déterminer l'absorption maximum de la même façon que pour les "BLANK" et les "std". Enregistrer les résultats.

MODE OPERATOIRE (suite)

8. Si l'absorption maximum est inférieure au "BLANK" passer à l'échantillon suivant.

9. Si l'absorption maximum est voisine du "BLANK" faire 2 mesures les enregistrer et utiliser la moyenne.

10. Si l'absorption maximum est supérieur au "BLANK" faire un minimum de 3 lectures, les enregistrer et utiliser la moyenne.

11. Pour toute valeur supérieure à 30 ppm utiliser une dilution 1 + 9 HCl 25% u/u.

12. Conserver le même système de contrôle que pour la détermination des autres éléments. Les tubes 11, 23 et 35 sont des doubles des tubes 10, 22 et 34. Les tubes 12, 24 et 36 sont des sédiments de contrôles dont les valeurs sont variées et connues. Aux positions 13, 25 et 37 passer et enregistrer 1 "BLANK" et 1 "std" voisin des valeurs obtenues lors des 10 déterminations précédentes.

COURBE STANDARD

- Procéder à l'élaboration d'une courbe standard ppm As vs absorption corrigé.

ppm As = ml As 1 X 10

Abs corr = abs moy. ppm As - abs moy. "BLANK"

- A partir de cette courbe standard ppm As vs abs. corr. calculer les résultats en ppm As en reportant sur la courbe: abs moy. échant - abs. moy. BLANK = abs. corr.

- Pour tout échantillon donnant des valeurs inférieures à 1 ppm As; rapporter 0.5 ppm As.

DETERMINATION DE L'URANIUM PAR FLUORESCENCE DANS L'ULTRA-VIOLET

SOLUTIONS STANDARDS

U 1000 : 1000 mcg/ml

Peser 1.18 g. de U_3O_8 N.B.S. séché 1hre à 105°C et dissoudre dans 20 ml d'acide nitrique 1:1. Transférer quantitativement dans un jaugé d'un litre et compléter au volume avec de l'eau déionisée. Agiter. Conserver dans le jaugé de 1 litre.

U 100 : 100 mcg/ml (Préparer à chaque semaine)

Diluer 10 ml de U 1000 ad 100 ml dans un jaugé de 100 ml à l'aide d'eau déionisée. Ajouter 5 ml d'acide nitrique conc avant de compléter au volume. Agiter. Conserver dans le jaugé de 100 ml.

U 10 : 10 mcg/ml (Préparer à chaque semaine)

Diluer 10 ml de U 100 ad 100 ml dans un jaugé de 100 ml et procéder comme en U 100.

U 1 : 1 mcg/ml (Préparer à chaque semaine)

Diluer 10 ml de U 10 ad 100 ml comme en U 100.

U 0.1 : 0.1 mcg/ml (Préparer à chaque jour)

Diluer 10 ml de U 1 ad 100 ml comme en U 100.

U 0.2 : 0.2 mcg/ml (Préparer pour le lot + 10 ppm)

Diluer 20 ml de U 1 ad 100 ml comme en U 100.

U 0.5 : 0.5 mcg/ml (Préparer pour le lot de + 20 ppm)

Diluer 5 ml de U 10 ad 100 ml comme en U 100.

ROUTINE GENERALE POUR L'ANALYSE DE L'URANIUM

Les teneurs en Uranium sont déterminées par élémination de groupes d'échantillons. Ainsi, dans un premier temps lors de la première attaque; tous les échantillons ayant une teneur inférieure à 10 ppm seront déterminés en standardisant l'équipement de 0 à 10 ppm. Tous les échantillons ayant plus de 10 ppm sont consignés sur une liste. Quand la liste atteind un nombre suffisant d'échantillons, ce lot d'échantillons est ré-attaqué et redéterminé vs une standardisation de 10 à 100 ppm. Les échantillons à plus de 100 ppm sont refaits une troisième fois.

Chaque lot d'échantillons comportent 3 échantillons en double, 3 contrôles à concentration variée dont les valeurs sont connues.

Comme un lot de fusion est formé de 50 creusets, pour chaque lot de 34 échantillons il y a 2 fusions témoins, 3 standards d'uranium, 3 échantillons attaqués en double, 3 contrôles et 5 fusions en duplicata d'échantillons, au hazard.

Toutes ces précautions donnent les critères permettant d'évaluer la qualité des déterminations.

LAVAGE DES CREUSETS

1. Les creusets sont disposés dans un bécher de 3 litres.
2. Ajouter du HCl 1:4 et bouillir 5 min.
3. Rincer 3 fois avec de l'eau déionisée.
4. Bouillir 5 min. avec H_2O D.I.
5. Rinser 1 fois et ajouter HNO_3 10% pour couvrir. Bouillir 5 min.
6. Rincer 3 fois avec H_2O D.I.
7. Sécher.

MODE OPERATOIRE

1. Déposer les 50 creusets de platine en 10 rangées de 5 creusets sur la plaque de titane de façon à ce que le point indicateur soit en haut à gauche. Ainsi les creusets seront dans l'ordre de 1 à 50 en prenant soin de retourner du côté du point indicateur après chaque rangée de 5.

2. Dans chacun des creusets déposer une pastille de Fluorure de Sodium et lithium.

3. A l'aide d'une pipette Ependorf 100 lambda déposer 0.1 ml des solutions suivantes dans l'ordre 1, 2, 3 etc jusqu'à 46 en commençant par 2 fois le témoin en positions 1 et 2; 3 fois le standard U 0.1 en 3.4 et 5. Pour les creusets de 6 à 45 déposer 0.1 ml des échantillons du cabaret. Pour les creusets 46 à 50 déposer 0.1 ml d'échantillons au choix en prenant soin d'inscrire sur la feuille les numéros d'échantillons choisis.
   IMPORTANT: Changer l'embout jaune de la pipette Ependorf après chaque addition.

4. Déposer la plaque et ses creusets sur la plaque chauffante et sécher ½ hre ou 1 hre à l'étuve à 105°C. Déterminer le % de matière organique pendant le séchage.

5. Transférer la plaque et ses creusets dans la fournaise Lindberg à 1150°C et faire une fusion d'exactement 8 minutes.

6. Retirer de la fournaise et laisser refroidir 15 minutes.

7. Standardiser le fluoromètre Jarrell-Ash selon les instructions du manufacturier en prenant soin de calibrer de façon à ce que les 2 pastilles témoins donnent une lecture inférieure à 10 déviations et que les 3 standards d'uranium donnent environ 80 déviations.

MODE OPERATOIRE (suite)

8. Une fois la standardisation stabilisée, lire les déviations des 50 fusions et les inscrire sur la feuille d'attaque.

9. Faire la moyenne des déviations témoins.

10. Faire la moyenne des déviations des standards d'Uranium.

11. Les fusions qui dépassent la standardisation de 0 - 10 ppm sont inscrits sur la liste des "OVER".

12. Calculs.

$$(f) = \text{facteur} = \frac{10 \text{ ppm}}{\text{moyenne des std} - \text{moyenne des témoins}}$$

$$\text{ppm} = (\text{Lecture échant} - \text{moyenne des témoins}) \times f$$

13. Pour les échantillons qui ont une déviation inférieure à la moyenne des déviations témoins rapporter: 0.05 ppm.

14. Chaque lot de résultats doivent être examiné par le personnel responsable avant de passer au lot suivant.

ECHANTILLONS "OVER"

- Procéder de la même façon que les lots réguliers mais en utilisant les creusets 3.4 et 5 pour les standards U 0.2 en 3, U 0.5 en 4 et U 1 en 5 qui donneront respectivement des standardisations de 20, 50 et 100 ppm.

- Pour les échantillons ayant plus de 100 ppm utiliser des dilutions de 1 + 9 avec H_2O D.I. et refaire la fusion des échantillons dilués en procédant comme pour les échantillons "OVER".

EVALUATION DE LA MATIERE ORGANIQUE DANS LES SEDIMENTS DE LAC

PRINCIPE

L'attaque d'un sédiment de lac par de l'acide nitrique donnera une coloration jaune plus ou moins proportionnelle à la teneur en matière organique. L'intensité de cette coloration peut être évaluée au colorimètre ou au spectrophotomètre à 600 nm.

VARIATIONS

Pour un échantillon ne contenant pas trop de matières ligneuses et complètement sédimenté, la variation sera ± 6% au niveau de 50% par rapport à une perte au feu à 500°C.

MODE OPERATOIRE

COURBE STANDARD

1. Utiliser une série d'échantillons contrôlés dont les valeurs en M.O. varient de 10 à 90% obtenu par perte au feu à 500°C.

2. Attaquer ces échantillons selon le procédé pour la détermination de l'uranium soit 100 mg ad 10 ml par 2 ml HNO_3 à 90°C.

3. Laisser sédimenter un minimum de 12 hrs.

4. A l'aide du Spectronic 100, une pipette automatique OXFORD et des cuvettes de 1cm déterminer les absorption à 600 nm en ajustant le zéro avec de l'eau D.I..

5. Elaborer une courbe standard abs vs % M. O.

6. Construire un tableau des absorptions M.O. à 5% d'intervale à l'aide de la courbe standard.

EVALUATION DES ECHANTILLONS

1. Déterminer l'absorption de chacun des échantillons, en utilisant le surplus de solution qui a servi à la détermination de l'uranium. Inscrire les résultats en % M.O. à partir du tableau standard. Maintenir le même système de contrôle que pour l'uranium.

Appendix - II

Results of standards

NB, NM, NH

C1X, C2X, C3X

C10X, C20X, C30X

Étude des Nouveaux Standards 1975 introduits dans le lot d'échantillons # 50,000 à 53357 Analysés par Métriclab

STD	Elements	Nb	$\bar{X}$	S	$\bar{X} - S$	$\bar{X} + S$	Erreur relative $\frac{S}{\bar{X}} \times 100$
Bas							
NB	Cu	26	17.62	1.30	16.32	18.92	7.38
	Pb	24	10.92	0.83	10.09	11.75	7.60
	Zn	26	35.00	3.36	31.64	38.36	9.60
	Ni	25	29.96	1.57	28.39	31.53	5.24
	Co	24	11.52	0.91	10.61	12.43	7.90
	% Fe	29	1.35	0.07	1.28	1.42	5.19
	Mn	27	184.30	23.20	161.10	207.50	12.59
	As	25	0.52	0.10	0.42	0.62	19.23
	U	29	0.72	0.52	0.20	1.24	72.22
	Mo	27	2.19	0.55	1.64	2.74	25.11
	% Mat. Org.	24	22.17	10.55	11.62	32.72	47.59
Moyen							
NM	Cu	28	46.54	2.63	43.91	49.17	5.65
	Pb	26	18.35	0.75	17.60	19.10	4.09
	Zn	27	74.89	5.26	69.63	80.15	7.02
	Ni	28	122.32	4.67	117.65	126.99	3.82
	Co	29	30.34	1.93	28.41	32.27	6.36
	% Fe	29	3.99	0.22	3.77	4.21	5.51
	Mn	28	655.89	56.42	599.47	712.31	8.60
	As	26	0.50	0.00	0.50	0.50	0.00
	U	30	0.81	0.32	0.49	1.13	39.51
	Mo	28	6.31	0.47	5.84	6.78	7.45
	% Mat. Org.	27	36.74	8.05	28.69	44.79	21.91
Haut							
NH	Cu	26	72.42	4.78	67.64	77.20	6.60
	Pb	24	20.67	1.43	19.24	22.10	6.92
	Zn	24	94.88	5.32	89.56	100.20	5.61
	Ni	24	31.63	1.84	29.79	33.47	5.82
	Co	24	27.67	1.83	25.84	29.50	6.61
	% Fe	26	4.36	0.25	4.11	4.61	5.73
	Mn	26	470.58	33.57	437.01	504.15	7.13
	As	25	0.56	0.17	0.39	0.73	30.36
	U	26	12.97	1.88	11.09	14.85	14.49
	Mo	24	7.26	0.65	6.61	7.91	8.95
	% Mat. Org.	24	54.13	9.52	44.61	63.65	17.59

Precision calculated at 95% level (2S) : $2 \times \frac{S}{\bar{X}} \times 100$

Fe & Mat. Org. in % – all others in ppm

M.P. Mars 197[illegible]

No. d'éch.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	% Mat. org.
STD NB											
Bondar-Clegg	15	11	34	29	8	0.75	140	1	1.8	2	11.4
Geolab	15	10	35	30	7	1.02	148	4.3	0.45	1.5	10.2
Barringer	16	3	34	29	8	0.9	110	< 1	0.6	4	1.4
Polytechnique											
Metriclab											
50053	17	11	32	30	12	1.33	173	0.5	0.6	2.6	16
50147	17	10	39	31	11	1.41	164	0.5	1.1	1.8	38
50209	16	11	34	29	12	1.28	161	0.5	0.6	1.2	10
50398	16	11	29	26	11	1.27	159	1.0	0.4	2.2	2
50491	20	11	34	31	12	1.32	180	0.5	0.6	2.0	6
50562	19	11	33	28	11	1.24	166	0.5	0.6	1.6	7
50610	18	10	35	31	12	1.25	169	0.5	0.7	1.8	44
50745	21	12	36	31	13	1.41	174	0.5	0.5	2.6	19
50806	18	11	36	30	12	1.37	182	0.5	1.6	2.2	30
50948	18	11	36	32	13	1.32	178	0.5	1.0	2.4	22
51012	17	11	35	29	11	1.33	192	0.5	1.0	1.9	36
51139	15	10	30	27	10	1.17	145	0.5	0.8	2.0	15
51227	17	11	34	30	13	1.33	170	0.5	0.2	2.0	27
51389	17	11	34	32	12	1.25	160	0.5	0.1	2.6	28
51472	18	12	34	31	11	1.36	167	0.5	2.2	2.0	30
51514	18	13	36	31	13	1.43	187	0.5	1.3	4.0	26
51647	17	11	33	29	11	1.36	199	0.5	1.4	2.6	18
51798	18	11	35	32	10	1.36	190	0.5	0.1	3.0	11
51882	17	10	31	31	11	1.40	173	0.5	0.1	2.4	25
51911	18	10	47	31	12	1.49	255	0.5	0.05	2.6	34
52088	19	9	35	30	11	1.42	209	0.5	0.1	1.6	23
52158	19	11	35	28	11	1.36	195	0.5	0.7	1.8	24
52296	18	12	36	29	11	1.50	209	0.5	0.7	2.0	21
52341	17	11	39	29	11	1.40	192	0.5	0.6	1.8	20
52423	16				13					2.6	
52582						1.37			0.5	1.8	
52608			36	31	11	1.42	197	0.5			
52779			36		12	1.40			0.7		
52880									1.6		
52957					11	1.35	218			2.0	
53012									0.6		
53082	17				10	1.38	212				
53164									0.3		

M. P. Maasn

No. d' Ech.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	% total org.
STD. N/M											
Bondar-Clegg	43	18	68	111	21	3.00	540	1	2.5	5	9.3
Geolab	41	16	70	107	23	2.85	515	8.1	0.35	13	15.4
Barringer	46	9	76	130	23	3.20	440	4	1.0	6	4.3
Polytechnique											
Metriclab											
50015	41	18	70	112	31	3.84	778	0.5	1.4	5.2	27
50188	43	17	71	115	29	3.62	613	0.5	1.0	6.8	31
50281	46	18	73	126	32	4.06	602	0.5	1.1	6.0	46
50363	41	18	70	116	30	3.85	565	.5	0.6	6.2	22
50418	48	19	78	126	33	3.42	650	0.5	0.9	6.4	34
50594	50	18	77	123	32	3.91	611	0.5	0.9	7.0	38
50645	45	18	74	122	31	3.77	580	0.5	1.0	6.4	41
50718	49	19	76	128	34	4.28	616	0.5	0.8	6.0	30
50885	47	19	74	126	33	3.93	603	0.5	0.8	6.4	38
50991	44	17	71	119	29	3.82	647	0.5	0.6	5.6	31
51063	45	18	72	121	29	4.01	653	0.5	0.7	6.6	44
51121	48	19	74	124	30	4.31	589	0.5	0.5	6.6	41
51293	46	18	73	123	32	3.98	581	0.5	0.8	5.6	35
51362	51	18	80	127	31	4.20	700	0.5	0.6	6.6	50
51405	48	19	72	118	29	4.09	738	0.5	0.9	5.8	21
51554	48	18	74	124	31	4.34	638	0.5	0.5	7.0	31
51681	44	18	69	119	29	3.92	671	0.5	0.2	6.0	43
51757	48	18	78	128	29	4.15	695	0.5	0.1	6.6	42
51803	46	18	72	118	27	3.96	684	0.5	0.05	6.6	31
51946	50	20	76	128	32	4.06	660	0.5	0.9	6.4	33
52014	45	18	68	113	26	3.64	685	0.5	1.2	6.3	44
52193	46	20	95	126	30	4.08	710	0.5	0.7	6.8	38
52279	47	18	78	126	32	4.20	737	0.5	1.0	6.0	36
52319	48	19	76	121	33	4.10	681	0.5	0.9	6.0	40
52494	48			123	30	3.71	579	0.5	0.9	6.6	55
52518				122	29				0.9		
52649		19									42
52733	46	18	73	122	28	3.98	6.70			6.0	
52830									1.3		
52919	51		82		31	4.25			0.9		
53032			76	129	28	4.08	707	0.5	1.3	7.2	28
53128	44										
53191									0.8		
53278						4.[illegible]	7[illegible]			[illegible]	M.P. [illegible]

No. of ech.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	% Vol. .01g
STD. N H											
Bondar + Clegg	70	22	89	29	19	3.32	380	3	23.5	6	16.[illegible]
GeoLab	63	18	86	29	20	3.15	358	10.5	4.7	8	25.6
Barringer	71	14	97	31	19	3.30	330	8	15.0	8	10.3
PolyTechnique											
MeTricLab											
50079	73	21	96	32	30	4.30	507	0.5	11.0	6.8	52
50121	66	20	95	31	30	4.31	490	0.5	11.3	8.6	52
50239	56	18	77	26	23	3.5	410	0.5	11.0	[illegible].4	59
50337	69	20	97	31	30	4.6	433	0.5	12.7	6.6	58
50456	74	21	96	34	29	4.39	467	1.0	14.3	8.2	52
50541	71	21	94	32	28	4.25	445	1.0	13.7	7.6	45
50690	75	22	102	34	30	4.25	485	0.5	12.1	7.8	45
50781	72	20	97	31	29	4.37	475	0.5	12.7	7.4	64
50839	67	20	91	30	28	4.10	441	0.5	12.0	8.0	42
50929	75	22	100	34	30	4.58	489	0.5	15.4	8.0	56
51087	77	22	100	33	28	4.57	460	0.5	12.2	8.0	84
51177	73	22	100	33	27	4.58	465	1.0	12.5	6.8	61
51258	73	18	89	31	28	4.02	423	0.5	13.3	6.2	54
51330	74	20	88	30	28	4.13	409	0.5	12.0	6.4	53
51441	76	20	93	33	26	4.44	478	0.5	13.5	6.8	54
51583	70	20	94	30	27	4.53	456	0.5	13.4	7.4	55
51618	70	20	42	29	27	4.43	461	0.5	14.1	7.2	40
51726	76	21	95	33	27	4.62	537	0.5	11.2	8.0	58
51838	78	22	100	33	25	4.62	477	0.5	9.5	7.0	48
51987	77	23	100	33	29	4.49	500	0.5	12.9	7.4	61
52052	76	20	96	32	26	4.47	462	0.5	12.0	6.8	50
52122	76	23	99	31	27	4.56	528	0.5	13.6	6.8	50
52239	75	22	94	31	25	4.40	504	0.5	19.2	7.0	40
52377	67	18	92	32	27	4.00	472	0.5	12.0	7.0	66
52455						4.42					
52559	70						496				
52676								0.5			
52713	77					4.44	505		14.3		
52856									15.4		

M.P. [illegible]

Étude des Anciens Standards 1975 pris à Fontanges et Galina par M. [illegible]
Introduits dans le lot d'échantillons # 50,000 à 53357 analysés par Méta.

STD	éléments	Nb	$\bar{X}$	S	$\bar{X}-S$	$\bar{X}+S$	e R Relative $\frac{S}{\bar{X}} \times 100$
Bas	Cu	13	23.62	5.61			23.73
# 3	Pb	10	9.10	0.88			9.62
	Zn	12	54.83	6.95			12.68
C3X	Ni	12	16.25	1.22			7.48
	Co	13	14.85	1.21			8.18
	% Fe	16	2.70	0.17			6.38
	Mn	13	61.15	7.34			12.00
	As	13	0.5	0			0
	U	15	1.68	0.38			22.52
	Mo	12	6.12	0.99			16.22
	% Mat. Org.	12	35.58	6.63			18.62
Moyen	Cu	10	13.30	2.67			20.07
# 2	Pb	10	35.70	9.71			27.19
	Zn	11	37.00	6.91			18.69
C2X	Ni	10	16.90	1.85			10.96
	Co	10	11.40	1.71			15.02
	% Fe	11	1.52	0.22			14.63
	Mn	10	286.70	86.52			30.18
	As	11	0.55	0.15			27.41
	U	10	0.76	0.56			73.97
	Mo	10	2.44	0.83			33.86
	% Mat. Org.	12	24.58	8.94			36.37
Haut	Cu	12	27.50	5.82			21.18
# 1	Pb	11	51.40	10.39			20.19
	Zn	10	412.10	85.08			20.65
	Ni	10	31.30	4.57			14.61
C1X	Co	10	16.80	2.10			12.49
	% Fe	12	2.21	0.31			14.20
	Mn	10	413.10	81.65			19.77
	As	10	2.30	0.79			34.30
	U	13	0.38	0.45			118.85
	Mo	12	3.13	1.96			62.74
	% Mat. Org.	10	16.60	10.38			62.55

Precision calculated at 95% level ie 2S $(2 \times \frac{S}{\bar{X}} 100)$
Fe & Mat. Org. in %, all others in ppm

STANDARDS [illegible] - HAUT - # 1 DANS SERIE 59000

No d Ech.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	Mat. Org. %
24370	21	47	370				407			2.0	
25095									0.1		
25625	23								0.6		
26601									0.1		
27730	21	41	340	24	14	1.70	401	1.5	0.5	4.2	11
28297	33	64	448	29	16	2.38	477	2.0	1.6	3.1	8
28368	21	38	300	25	13	1.74	295	1.0	0.2	2.0	27
28423	28	51	370	31	17	2.20	428	2.0	0.5	1.6	27
28528	41	75	610	40	20	2.54	602	3.5	0.1	1.4	14
28694	28	48	430	33	17	2.20	Ex 3.66	2.5	0.1	2.0	24
28767	31	55	Ex 70	33	19	2.26	408	3.5	0.1	2.6	1
28855	28	47	378	32	17	2.11	362	2.0	0.1	3.0	10
28999	28	48	420	32	18	2.05	361	2.5	0.9	8.6	33
29064	27	52	455	34	17	2.16	390	2.5	0.05	4.4	11
31255						2.33					
31609						2.85				2.6	

STANDARD C/X

N.B.: Ex ⇒ EXCLUS DANS CALCULS DE

[illegible] S [illegible]

STANDARDS M [illegible] 15 - MOYEN - # 2 [illegible]

No d'Ech.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	Mat. Org. %
24950											16
25529											23
26205			40								
Ex. 26400	30	52	460	34	18	2.17	401	3.0	0.1	3.2	19
27790	16	43	42	18	12	1.72	388	0.5	Ex. 12.2	1.8	28
28227	17	54	47	20	13	1.74	430	0.5	0.6	2.6	18
28392	12	32	34	16	11	1.53	262	0.5	0.1	2.2	28
28492	10	26	28	14	9	1.30	180	0.5	1.0	1.8	36
28562	16	40	43	18	12	1.71	310	0.5	0.4	2.2	17
28631	9	18	23	15	8	0.99	139	0.5	1.9	2.0	18
28726	12	33	34	15	12	1.41	255	0.5	0.1	2.8	44
28890	13	39	39	18	13	1.62	305	1.0	0.4	1.6	18
28975	15	37	40	18	13	1.56	316	0.5	0.9	4.4	31
29089	13	35	37	17	11	1.47	282	0.5	1.3	3.0	18
30130								0.5			
31288						1.64					
31502									0.9		
Ex. 31790	21	13	96	32	23	4.81	539			9.6	

STANDARD C2X

N.B. Ex. ⇒ EXCLUS DANS CALCULS DE $\bar{X}$, S [illegible]

STANDARDS M. CANNUL[illegible] 75 - BAS - #3.

No d'Ech.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	Mat. Org. %
24280			54	17	15	2.70	67		2.0		
24615	18			16	16	2.64	60	0.5	1.5	5.8	44
24805	18										
25271			52			2.75					
26099						2.69			1.7	6.6	
26125						2.75					
26276								0.5	1.0		
26371	22	9	61	17	14	2.56	66	0.5	1.7	6.0	44
27760									1.2		28
28264	30	9	55	16	13	2.46	68	0.5	1.6	6.2	29
28331	23	10	41	14	13	2.53	51	0.5	1.7	3.8	30
28468	25	8	61	17	15	2.90	54	0.5	2.0	5.4	42
28595	27	8	47	14	14	2.71	49	0.5	1.7	6.4	38
28672	35	10	66	18	16	3.20	65	0.5	2.3	7.0	34
28793	24	10	55	17	15	2.60	52	0.5	1.4	6.0	36
28821	26	9	62	16	17	2.70	64	0.5	1.6	6.4	24
28932	25	10	53	16	15	2.60	67	0.5	2.4	5.8	38
29023	21	8	51	17	16	2.58	61	0.5	1.4	8.0	40
30170	13				14	2.78	71				
31199								0.5			
Ex 31806	95	22	181	54	70	6.12	1780			6.0	

STANDARD 3X

N.B. Ex ⇒ EXCLU[illegible] DA[illegible] CA[illegible]LS

Étude des anciens standards [illegible] près à Lac Village par [illegible]

Introduits dans le lot d'échantillons # 50,000 à 53357 analysés par Métri[illegible]

STD	éléments	Nb	$\bar{X}$	S	$\bar{X}-S$	$\bar{X}+S$	erreur relative $\frac{S}{\bar{X}}\times 100$
Bas							
	Cu	6	5.17	0.75			14.56
#10	Pb	6	14.67	1.21			8.26
	Zn	6	11.33	2.50			22.09
C 10X	Ni	6	8.50	0.55			6.44
	Co	6	5.67	0.52			9.11
	% Fe	6	0.68	0.05			7.14
	Mn	6	34.33	2.34			6.81
	As	6	0.5	0			0
	U	6	2.80	0.88			31.54
	Mo	6	2.63	0.74			28.32
	% Mat. Org.	6	49.67	8.78			17.67
Moyen							
	Cu	8	6.38	1.06			16.62
#20	Pb	8	9.38	0.52			5.52
	Zn	8	20.63	2.20			10.66
C 20X	Ni	8	9.75	0.46			4.75
	Co	8	6.88	0.35			5.14
	% Fe	8	0.56	0.04			7.52
	Mn	8	81.38	13.43			16.50
	As	8	0.5	0			0
	U	8	8.98	1.25			13.94
	Mo	8	1.95	0.59			30.40
	% Mat. Org.	8	21.00	8.45			40.25
Haut							
	Cu	7	6.29	1.11			17.69
#30	Pb	7	9.86	1.46			14.85
	Zn	7	15.71	2.06			13.10
C 30X	Ni	7	6.86	0.49			7.27
	Co	7	4.29	0.49			11.37
	% Fe	7	0.26	0.02			9.12
	Mn	7	56.43	9.05			16.04
	As	7	0.5	0			0
	U	7	23.04	3.86			16.77
	Mo	7	1.94	0.49			25.05
	% Mat. Org.	7	79.71	8.86			11.12

Precision calculated at 95% level (2S): $2\times\frac{S}{\bar{X}}\times 100$

Fe - Mat. Org. in % all others in ppm.

STANDARDS M. CANNOLI 1975 — BAS # 10

No d Ech.	Cu ppm	Pb ppm	Zn ppm	Ni ppm	Co ppm	Fe %	Mn ppm	As ppm	U ppm	Mo ppm	Mat. Org. %
29560	6	16	16	8	6	0.70	34	0.5	3.4	2.5	58
29693	—	—	—	—	—	—	—	—	—	2.5	50
29726	5	14	9	8	6	0.62	32	0.5	2.2	1.6	39
29989	6	14	10	9	5	0.70	34	0.5	2.3	3.9	54
32020	4	15	10	8	5	0.63	32	0.5	1.6	2.8	39
32179	5	13	11	9	6	0.68	36	0.5	3.5	4.6	85
32270	41	11	63	20	22	1.76	109	0.5	10.0	2.4	58
32342	5	16	12	9	6	0.75	38	0.5	3.8	—	—
32401	—	—	—	—	—	—	—	—	—	—	—

STANDARD C10X

No d Ech.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	Mat. Org. %
29798	7	10	21	10	7	0.55	85	0.5	9.9	2.2	27
29863	8	10	25	10	7	0.63	103	0.5	8.9	1.6	28
29954	7	9	21	10	7	0.59	85	0.5	9.5	1.8	24
30000	6	10	21	10	7	0.57	86	0.5	7.1	1.2	18
32056	5	9	18	10	7	0.50	75	0.5	9.3	2.4	29
32118	5	9	18	10	6	0.52	75	0.5	10.1	1.2	18
32236	7	9	21	9	7	0.56	86	0.5	10.0	2.8	3
32305	6	9	20	9	7	0.54	56	0.5	7.0	2.4	21

STANDARD C20X

No d Ech.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	Mat. Org. %
29798	7	10	21	10	7	0.55	85	0.5	9.9	2.2	27
29863	8	10	25	10	7	0.63	103	0.5	8.9	1.6	28
29954	7	9	21	10	7	0.59	85	0.5	9.5	1.8	24
30000	6	10	21	10	7	0.57	86	0.5	7.1	1.2	18
32056	5	9	18	10	7	0.50	75	0.5	9.3	2.4	29
32118	5	9	18	10	6	0.52	75	0.5	10.1	1.2	18
32236	7	9	21	9	7	0.56	86	0.5	10.0	2.8	3
32305	6	9	20	9	7	0.54	56	0.5	7.0	2.4	21

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No d'éch.	Cu	Pb	Zn	Ni	Co	Fe %	Mn	As	U	Mo	Mat. Org %
29771	8	9	15	6	4	0.24	56	0.5	19.1	1.8	87
29891	7	13	17	7	5	0.29	68	0.5	21.3	1.6	95
29918	7	9	17	7	4	0.29	70	0.5	20.4	1.6	80
32090	5	9	14	7	4	0.23	48	0.5	24.5	1.8	71
32141	6	9	13	7	5	0.26	49	0.5	30.8	2.0	76
32200	5	10	19	7	4	0.28	54	0.5	21.8	1.8	79
32375	6	10	15	6	4	0.26	50	0.5	23.4	3.0	70

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