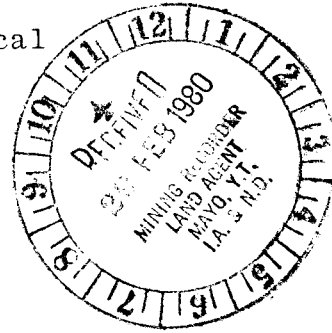
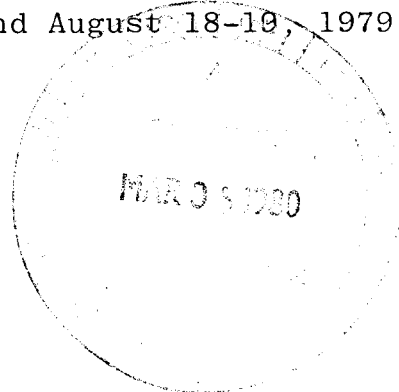


1979 Geological and Geochemical
Assessment Report



TITLE LYNX CREEK PROPERTY
CLAIMS HIT 1-96 Inclusive
COMMODITY W
LOCATED 60 miles north of Mayo, Y.T.
Latitude 64°03'N Longitude 135°20'W
Mayo Mining District 106 D 4
BY R. G. Kidlark
FOR AMAX of Canada Limited
WORK PERIOD July 4-14 and August 18-19, 1979



AMAX VANCOUVER OFFICE

090560

This report has been examined by the Geological Evaluation Unit and is recommended to the Commissioner to be considered as representative work in the amount of

\$ 9,600.00

J. A. Moir

Geologist or
Mining Engineer

Consulting Geologist work under
Section 50 of the Quartz Mining Act

B. R. BAXTER

Supervising Mining Engineer

Commissioner of Yukon Territory

TABLE OF CONTENTS

SUMMARY-----	1
CONCLUSIONS AND RECOMMENDATIONS-----	1
INTRODUCTION	
Location and Access-----	2
Claims-----	2
Physiography and Vegetation-----	2
History and Previous Work-----	2
Present Work-----	3
REGIONAL GEOLOGY-----	3
PROPERTY GEOLOGY-----	4
Description of Rock Units-----	4
STRUCTURAL GEOLOGY-----	6
STOCKWORK AND MINERALIZATION-----	6
ALTERATION-----	8
PROPERTY GEOCHEMICAL SURVEY-----	8
Introduction-----	8
Environment-----	8
Discussion of Results-----	9
REFERENCES-----	10

APPENDICES

- APPENDIX I - Statement of Costs & Contractor's Invoices
- II - Geochemical Analyses and Procedures for
 Collection & Processing of Geochemical Samples
- III - Statement of Qualifications

ILLUSTRATIONS

- Figure 1 - Location Map-----1:250,000--After Page 2
- 2 - Claim Map-----1:50,000--After Page 2
- 3 - Geological Map-----1:10,000--In Pocket
- 4 - Geochemical Map-----1:10,000--In Pocket

SUMMARY

The Hit 1-96 claims are situated 60 miles north of the town of Mayo, Y.T., and were staked as a contiguous block in April of 1979 in order to assess an area of known scheelite mineralization.

During the 1979 field season geological mapping and geochemical sampling were conducted on the claims.

Scheelite occurs in a quartz vein stockwork within a granodiorite stock which outcrops across the central portion of the property. The exposed stockwork is restricted to a small area at the northwestern end of the stock.

CONCLUSIONS AND RECOMMENDATIONS

Assay samples collected from the scheelite bearing quartz vein stockwork in the trenches returned an average grade of 0.03% WO_3 . The low grade and probable small size of the stockwork make the occurrence of little economic interest.

Development of the mineralized stockwork where the stock narrows rapidly to a dyke-like extension suggests a possible exploration setting for other stocks in the area.

A geochemical anomaly at the southeastern corner of the property resembles that over the scheelite bearing stockwork and thus merits more detailed geological and geochemical work.

INTRODUCTION

Location and Access

The Lynx Creek property is located at 64°03'N and 135°20'W on the Nash Creek Map Sheet (NTS 106 D 4) adjacent to the junction of Lynx and Skate Creeks.

Access is by helicopter from the town of Mayo, which lies approximately 60 miles to the north.

Claims

The property which consists of the HIT 1-96 claims was staked for AMAX of Canada Limited in April 1979.

Physiography and Vegetation

The Hit claims cover the summit of a broad northwest-trending ridge within the Stewart Plateau physiographic unit.

The topography is characterized by gentle slopes except at the northwest edge of the property where steep slopes occur. Elevations range from 4385 feet to 3200 feet.

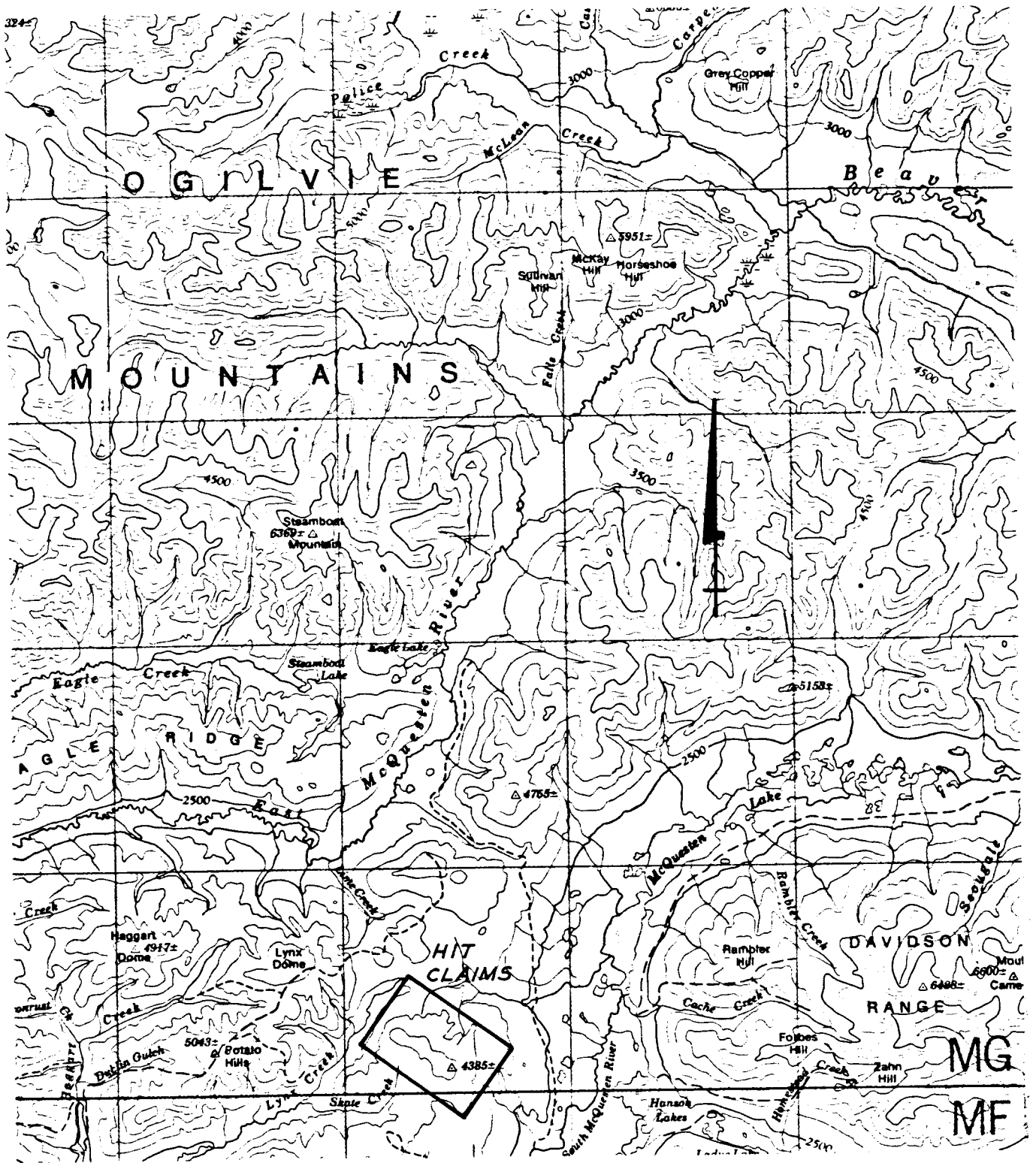
Sparse rock exposures are mainly felsenmeer along the ridge top and small outcrops along steeper sections of stream valleys.

The vegetation consists mainly of alder, spruce and fir with local thickets of willow along some stream valleys.

History and Previous Work

L.H. Green and J.A. Roddick mapped the region for the G.S.C. in 1961 (Map 1282A).

The area was first staked, mapped and prospected as the Bob claims in October of 1962 by the Titan Project (Noranda, Canex, Homestake, Kerr Addison). United Keno Hill restaked the property as the G and N claims in 1964 and carried out a

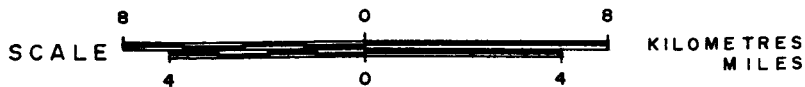


AMAX OF CANADA LIMITED

LYNX CREEK PROPERTY

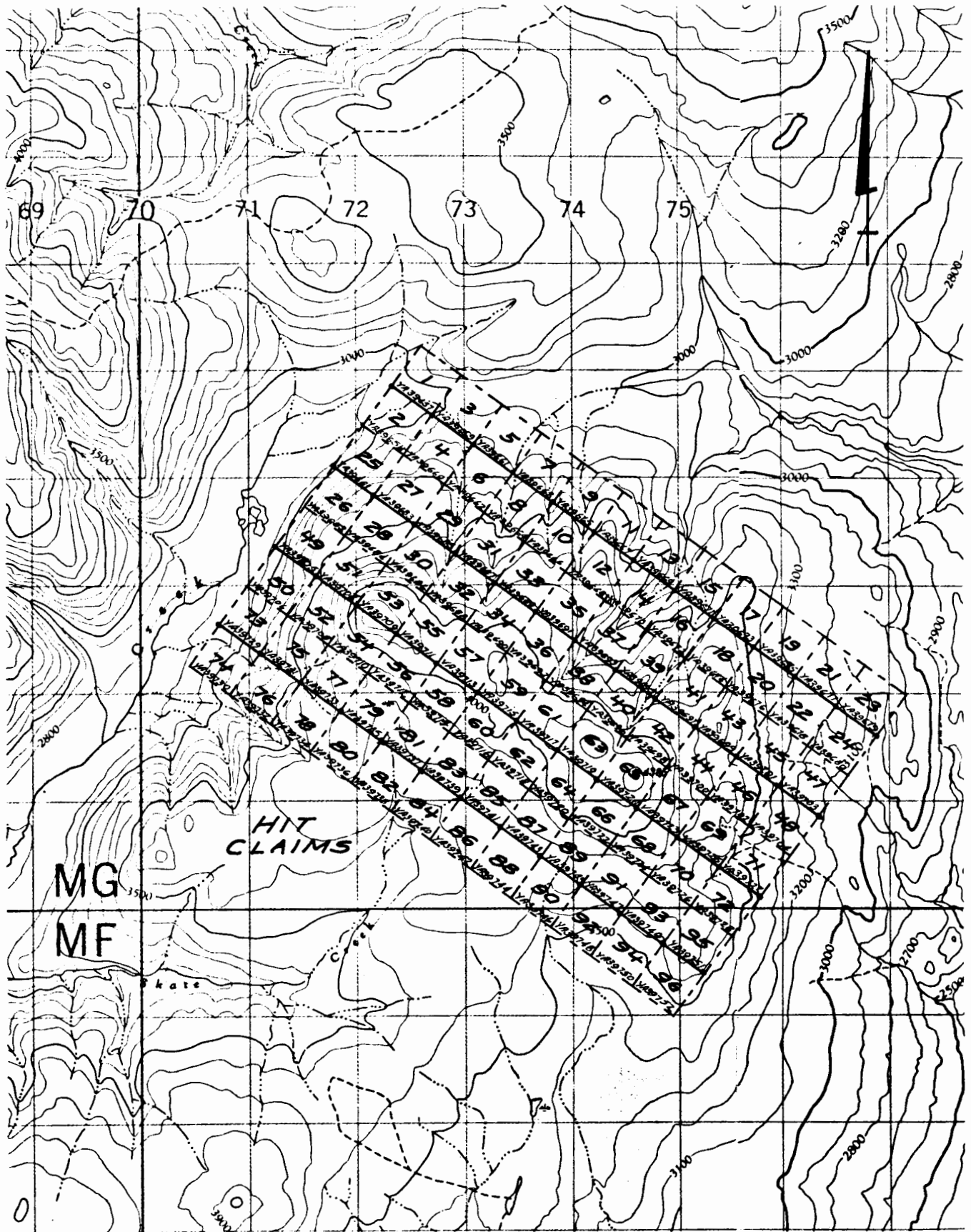
MAYO M.D. — YUKON TERRITORY

LOCATION MAP



1 : 250,000

N. T. S. Ref. 106 D 3 and 4
Fig. 1



LYNX CREEK PROPERTY
 MAYO M.D. - YUKON TERRITORY
 1 : 50,000

geochemical sampling and geological mapping program and then restaked the area as the Erin Claims in March of 1969.

In July of 1971, Archer, Cathro & Associates staked the area as the Gwaihir claims and put in four bulldozer trenches.

Present Work

During the period from July 4 to July 14, 1979 R.G. Kidlark, A.C. Hitchins and V.F. Grundy carried out geological mapping and geochemical sampling on the property.

From August 18 to August 19, 1979 E.A. Fuller, A.C. Smallwood and V.F. Grundy lamped, mapped and sampled the existing trenches on the property.

REGIONAL GEOLOGY

A thick Proterozoic sequence of impure quartzite, grit, slate, argillite and minor limestone, which underlies much of the southern half of the Nash Creek map area, is overlain by a band of the Jurassic Lower Schist Unit from the southeast corner of the Nash Creek map area westward to the Dawson map area. The Lower Jurassic Schist Unit consists of thin beds of quartzite interbedded with shale that locally grade to phyllites and schists. It is in turn overlain conformably by the Cretaceous Keno Hill Quartzite Unit of predominantly massive quartzite with interbedded phyllite.

Diorite and gabbro sills intrude rocks of the Lower Schist and Keno Hill Quartzite Units.

The youngest rocks in the region are Cretaceous granite to granodiorite intrusions.

Structurally the area is characterized by a strong development of foliation, isoclinal folding and overthrusting. A major thrust fault in the southwestern portion of the region has thrust Proterozoic sediments over Cretaceous and Jurassic sediments.

PROPERTY GEOLOGY

Most of the property is underlain by northwest-striking quartzites and schists of the Lower Schist Unit (Figure 3), which has been divided into two distinct lithologic sub units; namely, interbedded quartzite and quartz mica schist (Unit 1a) and quartz-graphite schist (Unit 1b) separated by a gradational contact.

At the northwestern end of the property the Lower Schist division appears to be in contact with a small band of Keno Hill quartzite Unit 2.

An irregular body of gabbro (Unit 3a) intrudes the sediments in the south central portion of the property and two bands of altered gabbro (Unit 3b) occur along the northwestern side of the property.

The youngest rocks are Cretaceous equigranular medium to coarse grained granite to granodiorite stocks and related quartz-mica-porphyry dykes. The stock outcrops in the form of an ellipse approximately 6,400 feet long which narrows towards the northwest where a quartz-vein stockwork is developed in it. At the contact with Unit 1a the stock exhibits a leucocratic aplitic texture while the schist becomes enriched in biotite.

Description of Rock Units

Only those rocks exposed on the Lynx Creek property are described below.

Jurassic

Lower Schist; Unit 1a, 1b - Exposures of Unit 1 include highly variable amounts of interbedded quartzite, quartz-mica-schist and quartz-graphite schist. Bands, less than two feet-wide, of calc-silicate occur throughout the unit. The rocks are commonly fine to medium grained and well foliated. Colour ranges from brown to grey or black depending upon the amount of graphite present. Where the content of graphite exceeds mica the unit has been subdivided into the 1b Unit. The mica consists almost entirely of muscovite although biotite is present in minor amounts.

Pyrite content ranges from trace to locally 1%.

Cretaceous

Unit 2 Keno Hill Quartzite - Exposures of this unit, are limited to two small outcrops and a talus slope, and consist of dark grey massive to banded quartzites commonly with veinlets of white quartz.

Unit 3a, 3b - A massive to slightly foliated, medium to coarse grained and black to green gabbro and its altered equivalents comprise the unit. Most of the amphibole in the gabbro is altered to chlorite whereas completely altered equivalents consist of a well foliated greenstone in which the foliation is parallel to that of the enclosing sedimentary rocks. Rocks of this unit are calcareous in places, contain traces of chalcopyrite and pyrite and are slightly magnetic.

Unit 4a, 4b - A relatively equigranular, medium to coarse grained granodiorite which is locally porphyritic and is composed of feldspar, quartz, biotite and minor green to black hornblende is the dominant rock-type in this unit.

Coarse grained equigranular biotite-granite float may represent another igneous phase.

A quartz-vein stockwork is developed at the northwest end of the stock.

STRUCTURAL GEOLOGY

The attitude of the main foliation consistently strikes in a northwesterly direction and dips 20° to 40° south. Local fluctuations are caused by small scale folding of the schists.

A prominent structural feature which is illustrated by lineaments on air photos is a steep to vertically dipping orthogonal joint set. North-south is the preferred direction and may also be a direction of faulting.

STOCKWORK AND MINERALIZATION

Scheelite is intimately associated with the granodiorite stock and a quartz vein stockwork which is well developed in a 600 x 100 m area, at the northwest end of the stock. A maximum intensity of 25 veins per m was observed in the trenches but the average density is less than 3 per metre. Vein width vary from less than 1.3 cm to greater than 3.8 cm.

Mapping of the trenches indicates four modes of occurrence for scheelite in the stock:

- a) disseminated between fractures
- b) in milky quartz veins
- c) in quartz-amphibole veins
- d) on hairline dry fractures.

Most of the tungsten mineralization occurs in the milky quartz veins and quartz-amphibole veins; less than 10% occurs as disseminations within the stock.

Grain size of scheelite varies from less than 0.2 cm to greater than 2.5 cm. The finer grains are disseminated within the stock while the coarser are associated with the quartz-amphibole veins.

A few milky quartz veins containing traces of scheelite have been noted in the sediments and altered gabbro near the contact with the stock.

Not all of the quartz veins within the stockwork contain scheelite. Late stage barren quartz veins cut all mineralized veins.

Traces of disseminated pyrite, chalcopyrite, covellite and wolframite within the stock, traces of molybdenite within a quartz vein in float from trench 4 and a galena and sphalerite in a quartz vein in trench 1 were also noted.

Manganese staining is locally intense in the trenched area.

Trace amounts of disseminated pyrite and chalcopyrite have been reported in gabbro and altered gabbro units.

Assay results from rock chips collected at 50 metre intervals along trenches are as follows:

Sample Number	Sample Interval	% WO ₃
<u>Trench 1</u>	- 0 point at north end	
79AXA69	0-50	<0.02%
79AXA70	50-100	<0.02
79AXA71	100-150	<0.02

Trench 2 - 0 point at north end

79AXA64	0-50	0.06
79AXA65	50-100	<0.02
79AXA66	100-150	<0.02
79AXA67	150-200	<0.02
79AXA68	200-250	<0.02

Trench 3 - 0 point at north end

79AXA60	0-50	0.04
79AXA61	50-100	<0.02
79AXA62	100-150	<0.02
79AXA63	150-200	<0.02

Trench 4 - 0 point at northeast end

79AXA72	0-50	<0.02
79AXA73	50-100	0.04
79AXA74	100-150	0.14
79AXA75	150-200	0.04
79AXA76	200-250	0.02

ALTERATION

Feldspars of the granodiorite are partly altered to clays and biotite and hornblende grains are chloritized in the stockwork zone. Argillic alteration is widespread whereas the chloritization is restricted to quartz vein margins.

Amphiboles within the quartz, amphibole veins are partially altered to chlorite.

PROPERTY GEOCHEMICAL SURVEYIntroduction

Soil samples were collected from the top of the B horizon at 122 m intervals using a grub hoe along a number of traverse lines run perpendicular to the geological strike.

Silt samples were collected from streams which drain the property and rock chips were taken from selected outcrops and at 50 m intervals along trenches.

A total of 256 samples - 207 soils, 8 silts and 41 rock chips - were collected and analyzed by Rossbacher Laboratory for Mo, Cu, Ni, Co, Mn, Fe, Ag, Zn, Pb, W, F and Sn.

Environment

The topography is characterized by gentle slopes and the vegetation consists mainly of alder, spruce and fir. Gleysols and humic gleysols are the major soil types on the poorly drained flat areas of the property while wooded brown soils are characteristic of the remainder of the property.

Discussion of Results

Sample sites and corresponding values for Mo and W are plotted on a 1:10,000 scale map (Figure 4); all geochemical data are presented in Appendix III.

Soils collected from the area underlain by sedimentary units are similar in metal content to those collected from the granodiorite stock.

A four station anomaly with tungsten values ranging from 20 to 70 ppm in soils occur at the southeast corner of the property. Tungsten values in soils collected over the mineralized stockwork ranged from 15 to 70 ppm.

A few low-order, sporadic tungsten soil anomalies exist along the eastern end of the property.



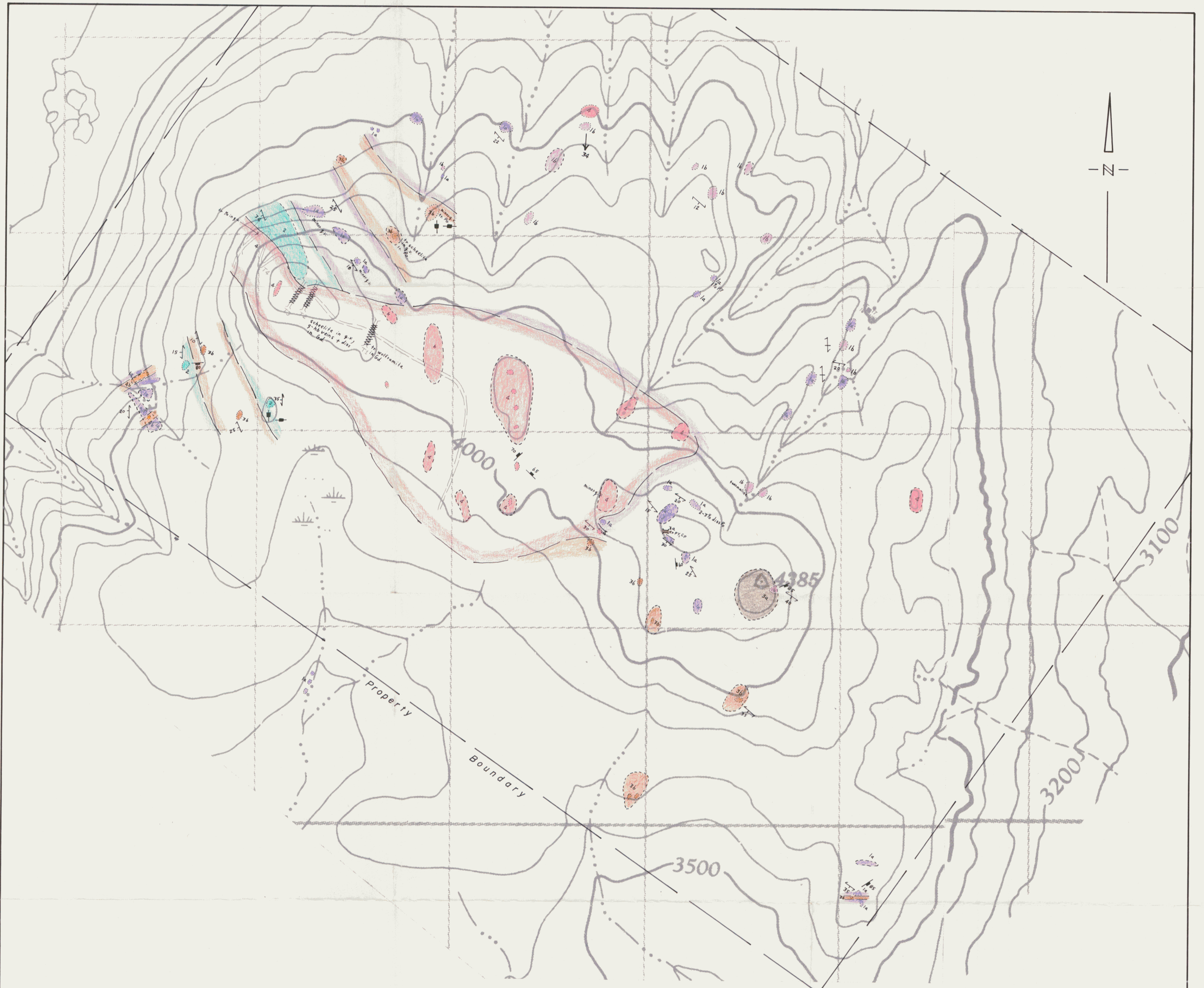
R.G. Kidlark

Jan 30, 1980

REFERENCES

GREEN, L.H., 1972: Geology of Nash Creek, Larsen Creek, and
Dawson Map-Area, Yukon Territory. G.S.C. Mem. 364

MINERAL INDUSTRY REPORT, 1969 and 1970, Vol. I, p. 16



LEGEND

CRETACEOUS

- 4a Granite and granodiorite
- 4b Quartz - mica - porphyry dykes
- 3a Gabbro
- 3b Altered gabbro
- 2 Keno Hill quartzite

JURASSIC LOWER SCHIST UNIT

- 1a Interbedded quartzite and quartz - mica - schist
- 1b Quartz - graphite - schist

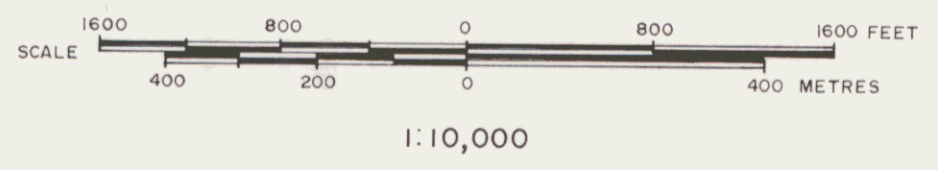
SYMBOLS

- Outcrop
- Float
- Geological contact, assumed
- ↘ Schistosity, foliation: inclined, vertical
- ↗ Jointing attitude: inclined, vertical
- ↘ Minor fold axis; showing plunge
- ⊘ Quartz vein stockwork
- ⊎ Trench
- Road

- Stream
- Claim post (located)
- Topographic contour (contour interval 100 feet)
- Po Pyrrhotite
- py Pyrite
- Cp Chalcopyrite
- qv Quartz vein
- hb Hornblende
- Gd Granodiorite

AMAX POTASH LIMITED
LYNX CREEK PROPERTY
 MAYO MINING DIVISION — YUKON

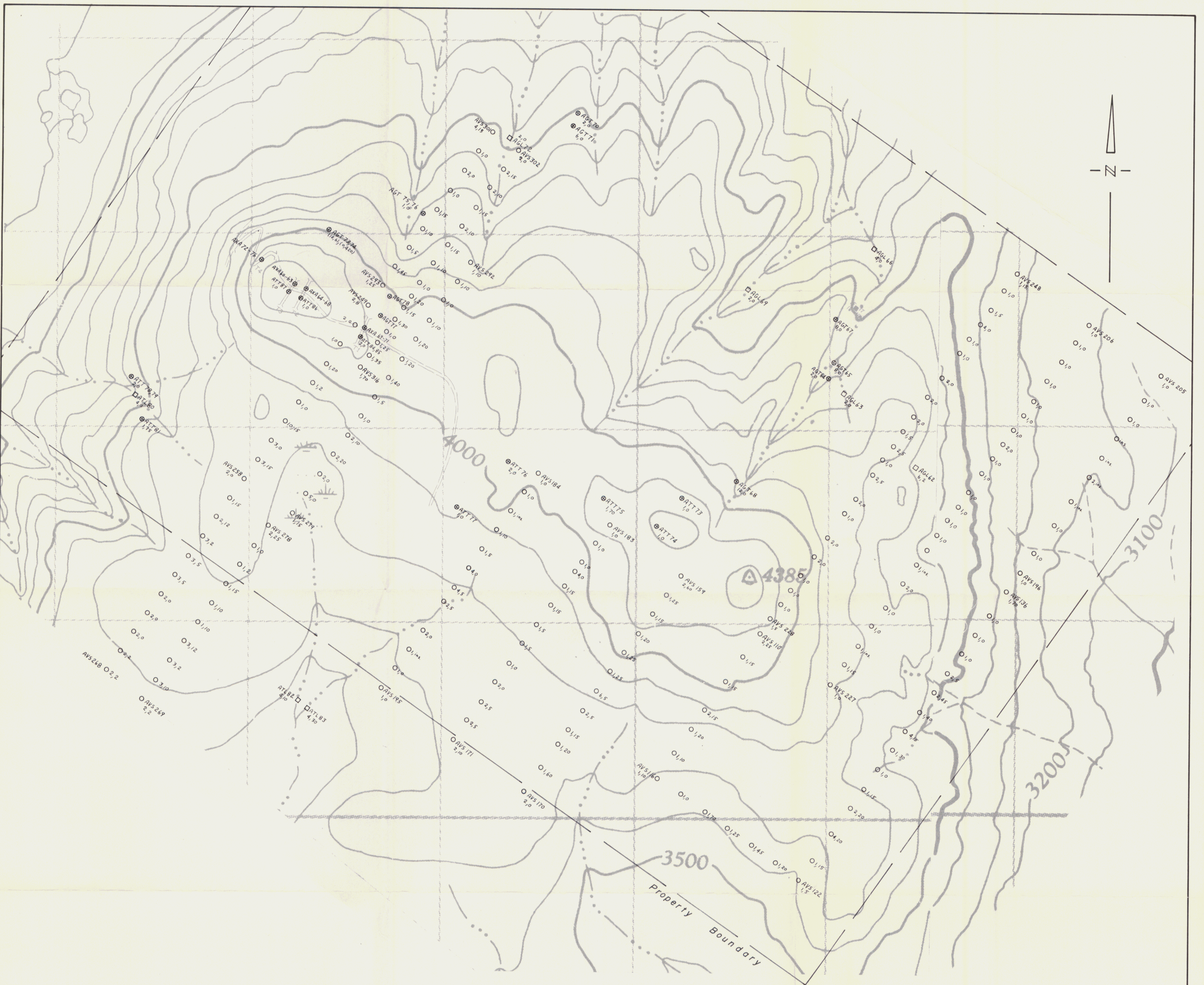
GEOLOGICAL MAP



To accompany 1979 Assessment Report by R.G.Kidlark

R. Killam Jan 30, 1980 Vancouver - 1979

Fig. 3



- LEGEND**
- 79AUS170 0.0 Soil } Sample site, sample number
 - 79ATL82 0.10 Silt } p.p.m. Mo, W
 - 79ATT76 2.0 Rock chip
 - Trench
 - Road
 - Claim post (located)
 - 3000 Topographic contour (contour interval 100 feet)
 - Stream

AMAX POTASH LIMITED
 LYNX CREEK PROPERTY
 MAYO MINING DIVISION — YUKON
GEOCHEMICAL MAP

SCALE 1600 800 0 800 1600 FEET
 400 200 0 400 METRES
 1:10,000

Fig. 4

APPENDIX II

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY, B.C.
CANADA
TELEPHONE 299-6910
AREA CODE 604
CERTIFICATE NO. 9152-1

INVOICE NO.
DATE ANALYSED 79/07/30
PROJECT 996 M170

No.	Sample	pH	Mo	Cu	Na	Co	Mn	Fe	As	Zn	Ca	W	F	No.
01	79AVS 110		2	24	28	16	280	2.4	0.2	60	6	25	600	01
02	111		1	16	18	12	160	1.8	0.4	36	10	15	520	02
03	112		1	16	24	16	200	2.4	0.2	64	10	15	520	03
04	113		2	32	32	20	400	2.4	0.2	74	8	15	740	04
05	114		1	16	32	20	280	2.4	0.2	76	8	20	650	05
06	115		1	36	32	20	320	2.4	0.2	64	8	10	520	06
07	116		1	24	16	8	120	1.2	0.4	32	8	10	540	07
08	117		1	40	20	12	80	1.2	0.6	28	8	0	490	08
09	118		1	4	16	12	200	2.2	0.2	38	8	70	480	09
10	119		1	24	32	16	240	2.4	0.2	50	8	25	530	10
11	120		1	12	20	12	200	2.0	0.2	44	6	45	580	11
12	121		1	36	32	20	360	2.4	0.2	62	8	20	600	12
13	122		1	12	28	20	420	2.6	0.2	52	10	5	540	13
14	123		1	20	30	20	240	2.6	0.2	72	12	15	520	14
15	124		4	26	32	16	240	2.4	0.2	66	10	20	600	15
16	125		2	40	30	20	320	2.6	0.2	70	8	30	720	16
17	126		1	16	28	16	200	2.6	0.2	46	10	15	520	17
18	127		1	32	32	16	200	2.6	0.2	86	8	0	680	18
19	128		1	28	28	20	340	2.2	0.4	68	8	30	620	19
20	STD E		4	84	48	16	320	2.8	0.2	168	16	0	5850	20
21	129		4	36	40	20	320	3.0	0.6	130	12	15	630	21
22	130		1	32	28	12	600	2.4	0.2	62	8	40	390	22
23	131		2	12	16	8	180	2.8	0.2	58	12	45	420	23
24	132		2	20	16	20	720	2.4	0.4	90	16	5	420	24
25	133		1	32	16	10	400	1.4	0.2	52	10	0	420	25
26	134		1	24	20	8	240	1.0	0.2	74	4	0	280	26
27	135		1	26	16	8	320	1.0	0.2	126	6	0	320	27
28	136		1	14	12	4	120	2.0	0.2	60	14	20	420	28
29	139		2	12	16	8	160	2.4	0.2	52	10	60	460	29
30	160		1	32	28	16	280	3.0	0.2	80	10	25	450	30
31	161		1	28	16	12	200	3.2	0.2	84	10	28	390	31
32	162		1	24	8	4	100	1.6	0.2	40	6	20	410	32
33	163		1	22	16	8	200	2.4	0.2	60	8	25	460	33
34	164		1	16	12	4	120	2.2	0.2	48	8	25	420	34
35	165		6	46	44	56	6800	3.6	0.6	138	22	5	620	35
36	166		2	30	28	12	240	2.4	0.6	84	14	15	500	36
37	167		1	20	20	8	160	2.2	0.4	54	6	25	440	37
38	168		1	20	20	8	200	2.8	0.2	68	10	20	480	38
39	169		1	16	12	4	80	1.6	0.2	34	10	60	400	39
40	STD E		4	80	40	12	320	3.4	0.2	164	14	0	3150/40	40

Certified by

P. Rossbach

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY B.C.
CANADA
TELEPHONE 299-6910
AREA CODE 604
CERTIFICATE NO. 9152-2

INVOICE NO.
DATE ANALYSED 79/07/30
PROJECT 996 M170

No.	Sample	pH	Mo	Cu	Na	Co	Mn	Fe	As	Zn	Ca	W	F	No.
01	79AVS 170		2	20	24	12	180	2.0	0.2	64	10	0		01
02	171		2	20	24	8	200	2.2	0.2	68	16	10		02
03	172		2	38	28	16	320	2.4	0.2	88	12	5		03
04	173		2	24	24	12	160	2.0	0.2	64	14	5		04
05	174		2	32	28	16	320	2.6	0.2	104	18	0		05
06	175		1	24	16	8	120	1.8	0.2	42	12	0		06
07	176		1	24	28	16	240	2.4	0.2	72	12	5		07
08	177		1	20	20	12	140	2.0	0.2	56	18	5		08
09	178		1	20	24	16	160	2.0	0.2	70	20	15		09
10	179		1	12	20	12	160	1.8	0.2	44	10	15		10
11	180		4	20	24	16	360	2.4	0.2	98	20	0		11
12	181		1	20	20	12	180	2.2	0.2	72	14	0		12
13	182		1	24	20	8	240	2.0	0.2	64	20	0		13
14	183		1	24	24	12	220	2.6	0.2	78	12	0		14
15	184		1	8	8	4	60	1.0	0.2	20	18	0		15
16	185		1	44	36	20	280	2.8	0.2	70	8	0		16
17	186		1	28	16	4	160	1.6	0.2	38	8	INS		17
18	187		1	40	28	12	240	2.4	0.2	78	10	10		18
19	188		1	22	24	16	360	2.2	0.2	70	8	5		19
20	STD A		6	24	12	12	440	2.6	0.2	38	20	0		20
21	189		4	36	40	28	800	3.2	0.2	150	28	0		21
22	190		4	20	32	24	2120	6.4	0.2	96	16	5		22
23	191		2	24	24	16	400	2.4	0.2	118	38	5		23
24	192		2	24	16	8	140	2.2	0.2	104	58	0		24
25	193		1	32	8	8	160	1.6	0.2	50	22	INS		25
26	194		1	8	12	4	100	1.4	0.2	40	32	0		26
27	195		1	24	20	12	240	2.4	0.2	74	20	0		27
28	196		1	22	20	8	280	1.8	0.2	74	12	0		28
29	197		1	24	24	12	360	2.6	0.2	94	16	0		29
30	198		1	28	28	16	360	2.4	0.2	102	12	0		30
31	199		1	24	28	12	400	2.0	0.2	72	6	INS		31
32	200		2	28	30	16	720	2.6	0.2	90	12	INS		32
33	201		-	-	-	-	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	33
34	202		-	-	-	-	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	NOT FINISHED	34
35	203		1	20	24	12	400	2.2	0.2	68	10	0		35
36	204		1	18	30	16	640	2.6	0.2	80	12	0		36
37	205		1	24	28	12	1480	2.2	0.2	100	10	0		37
38	206		1	24	32	16	860	2.8	0.2	102	14	0		38
39	207		1	16	24	4	480	1.6	0.2	66	8	0		39
40	STD H		6	24	12	4	480	2.8	0.2	38	20	0		40

Certified by

P. Rossbach

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY, B.C.
CANADA
TELEPHONE 299-6910
AREA CODE 604
CERTIFICATE NO. 9152-3

INVOICE NO.

DATE ANALYSED 79/07/30

PROJECT

No.	Sample	pH	Mo	Cu	Ni	Co	Mn	Fe	As	Zn	Pb	W	F	No.
01	79 ANS 208		1	20	24	12	400	2.0	0.4	70	10	0	570	01
02	209		1	22	28	20	1800	2.6	0.4	90	14	0	550	02
03	210		1	28	32	16	520	2.6	0.4	94	12	0	560	03
04	211		1	24	28	16	760	2.6	0.8	100	16	0	520	04
05	212		1	20	28	10	200	1.0	0.4	54	6	0	480	05
06	213		2	12	16	4	80	0.8	0.2	64	4	0	280	06
07	214		1	20	24	12	400	1.8	0.4	82	6	0	560	07
08	215	w 079	1	16	16	12	260	0.8	0.4	36	4	0	315	08
09	216		1	4	8	2	20	0.2	0.2	52	2	0	360	09
10	217		1	12	16	8	560	1.2	0.2	76	10	0	480	10
11	218		1	24	32	12	320	2.6	0.4	102	14	0	570	11
12	219	w 039	1	16	20	4	80	0.6	0.4	34	4	0	370	12
13	220						M 1 S S 1 N G							13
14	221	p 0 2 2	1	16	16	8	200	1.2	0.2	46	4		590	14
15	222		2	32	36	12	320	2.4	0.4	98	6	0	680	15
16	223		1	32	32	10	200	2.4	0.2	78	6	0	640	16
17	224		1	24	32	4	120	1.0	0.6	42	6	0	600	17
18	225	p 0 0 0 0 3	1	8	16	8	80	0.8	0.4	40	4		640	18
19	226		1	12	20	4	140	2.2	0.2	98	6	15	570	19
20	STD A		30	140	16	4	140	0.8	1.2	152	100	50	860	20
21	227		1	12	20	16	280	2.6	0.2	66	10	0	620	21
22	228		1	20	28	16	200	2.4	0.2	68	12	5	610	22
23	229		1	20	28	16	240	2.4	0.2	60	8	0	530	23
24	230		1	42	28	16	280	2.8	0.2	64	8	0	520	24
25	231		1	20	20	8	120	1.0	0.4	32	6	0	640	25
26	232		2	140	24	20	200	2.0	1.8	50	12	0	500	26
27	233		2	28	20	12	120	1.6	0.2	40	12	0	490	27
28	234		1	20	30	16	200	2.6	0.2	70	14	0	640	28
29	235		2	16	24	12	240	2.0	0.2	64	26	0	590	29
30	236		2	40	40	20	300	2.8	0.6	150	40	5	620	30
31	237		1	16	20	16	200	2.0	0.4	74	26	0	530	31
32	238		2	12	20	12	120	1.6	0.4	48	10	5	490	32
33	239		1	18	24	12	160	2.4	0.2	64	8	5	500	33
34	240		2	16	24	16	160	2.0	0.2	56	6	0	560	34
35	241		2	40	52	24	440	3.8	0.4	164	24	0	660	35
36	242		2	22	28	16	200	2.2	0.2	62	14	0	510	36
37	243		1	20	28	16	200	2.2	0.2	66	10	0	530	37
38	244		1	20	30	16	380	2.0	0.2	74	8	0	590	38

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY B.C.
CANADA
TELEPHONE 299-6910
AREA CODE 604
CERTIFICATE NO. 9152-4

INVOICE NO.

DATE ANALYSED 79/07/30

PROJECT 996 MAYO

No.	Sample	pH	Mo	Cu	Ni	Co	Mn	Fe	As	Zn	Pb	W	F	No.
01	79 HVS 24		1	28	32	20	320	2.4	0.2	98	14	5	640	01
02	247		1	20	24	16	360	2.2	0.2	74	10	0	590	02
03	248		1	20	24	12	300	2.4	0.2	70	12	15	720	03
04	249		2	20	24	16	200	2.0	0.2	70	20	0	570	04
05	250		2	32	36	16	240	3.0	0.2	134	34	20	750	05
06	251		2	24	32	12	240	3.2	0.2	74	8	10	660	06
07	252		1	12	8	4	80	1.0	0.4	32	14	0	640	07
08	253		1	16	20	12	200	2.6	0.2	74	12	5	590	08
09	254		1	12	16	8	160	2.2	0.2	68	8	40	570	09
10	255		1	12	16	12	200	2.0	0.2	50	6	30	540	10
11	256		1	16	22	12	240	2.6	0.2	64	10	20	540	11
12	257		1	16	24	16	200	2.8	0.2	74	8	10	580	12
13	258		1	26	32	16	280	2.8	0.2	94	10	0	700	13
14	259		1	26	28	16	240	2.6	0.2	78	8	10	560	14
15	260		1	20	20	12	180	2.2	0.2	60	6	10	500	15
16	261		1	18	24	16	240	2.6	0.2	82	10	25	640	16
17	262		1	20	28	16	300	2.6	0.2	84	8	45	660	17
18	263		1	64	28	24	440	3.6	0.2	106	20	5	570	18
19	264		1	20	24	12	240	2.4	0.2	90	34	10	580	19
20	STD C		16	172	48	12	200	1.2	0.4	116	80	20	460	20
21	265		1	12	20	12	200	3.0	0.2	54	14	15	500	21
22	266		1	20	28	12	280	2.6	0.2	94	22	0	540	22
23	267		2	24	30	20	520	2.6	0.2	88	10	0	550	23
24	268		1	56	32	20	320	3.0	0.2	106	50	0	580	24
25	269		4	76	44	28	1000	3.8	0.4	162	40	15	580	25
26	270		2	20	24	12	200	2.4	0.2	78	10	0	450	26
27	271		2	12	12	8	140	1.4	0.2	40	8	15	400	27
28	272		2	30	36	16	360	2.6	0.2	120	12	10	570	28
29	273		1	36	32	16	240	2.6	0.2	96	12	15	590	29
30	274		2	24	28	12	280	2.2	0.2	98	10	10	640	30
31	275		1	16	24	12	180	2.4	0.2	64	14	15	500	31
32	276		1	20	20	12	200	2.2	0.2	64	16	10	580	32
33	277	w 039	1	24	16	8	120	1.6	0.2	38	8	0	460	33
34	278		1	12	20	8	120	1.6	0.2	58	20	20	320	34
35	279		1	16	24	12	160	2.2	0.2	68	18	15	370	35
36	280		1	12	20	12	120	1.6	0.2	42	14	30	450	36
37	281		1	14	12	8	120	1.2	0.2	42	16	0	560	37
38	282		1	12	24	12	160	2.0	0.2	72	26	25	440	38

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
801 - 535 THURLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY B.C.
CANADA
TELEPHONE 299 6910
AREA CODE 604
CERTIFICATE NO. 9296

INVOICE NO.
DATE ANALYSED 79/09/18
PROJECT 969.

No.	Sample	pH	Mo	Cu	Ni	Co	Mn	Fe	Ag	Zn	Pb	W	F	No.
01	79 AVS 149		2	14	16	8	120	1.5	.4	30	26	8	380	01
02	250		2	14	10	4	200	.9	.2	42	14	0	430	02
03	251		1	12	20	10	160	1.6	.2	45	14	0	380	03
04	252		1	20	16	8	140	1.4	-.4	38	20	20	360	04
05	253		1	12	20	12	140	2.0	.2	58	20	2	370	05
06	254		1	12	20	10	140	1.8	.2	62	26	0	340	06
07	255		10	14	24	20	760	2.5	.2	100	30	15	450	07
08	256		3	10	20	12	220	1.5	.2	46	10	0	210	08
09	257		3	20	24	12	140	1.9	.2	58	16	15	350	09
10	258		2	14	20	8	120	1.7	.2	42	10	0	350	10
11	259		1	20	22	10	200	2.1	.2	56	10	15	350	11
12	260		2	28	28	12	220	1.8	.2	66	28	12	420	12
13	261		3	20	22	12	180	2.0	.2	62	20	2	370	13
14	262		3	32	32	16	240	2.0	.2	90	16	5	420	14
15	263		3	32	28	12	260	2.3	.2	86	12	5	420	15
16	264		2	12	20	14	160	2.7	.2	48	14	0	210	16
17	265		2	24	24	12	160	2.9	.2	62	10	0	350	17
18	266		2	18	22	12	140	2.1	.2	54	16	0	330	18
19	267		2	20	22	12	160	1.7	.2	56	16	2	320	19
20	STD E		5	40	40	14	280	2.8	.2	156	16	0	680	20
21	268		2	28	28	18	200	2.6	.2	70	12	2	400	21
22	269		2	24	32	16	180	2.5	.2	64	12	2	470	22
23	270		3	20	20	10	160	2.0	.2	54	10	10	350	23
24	271		3	30	28	14	240	2.2	.2	80	12	2	410	24
25	272		3	28	28	14	280	2.0	.2	74	14	12	420	25
26	273		1	18	20	12	160	1.9	.2	52	10	10	380	26
27	274		1	12	16	10	120	1.9	.2	50	10	10	390	27
28	275		1	20	24	10	160	1.9	.2	66	20	15	470	28
29	276		1	12	20	8	140	1.9	.2	52	14	2	355	29
30	277		1	16	14	8	80	1.5	.2	28	16	0	380	30
31	278		2	16	18	10	160	1.9	.2	62	24	25	460	31
32	279		1	16	20	10	160	1.6	.2	52	18	15	420	32
33	280		5	42	24	10	160	1.2	.2	100	12	0	450	33
34	STD E		6	84	42	14	280	2.7	.2	156	16	0	690	34
35														35
36														36
37														37
38														38
39														39
40														40

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY, B.C.
CANADA
TELEPHONE 299 6910
AREA CODE 604
CERTIFICATE NO. 9409-1

INVOICE NO.
DATE ANALYSED Nov. 79
PROJECT 996

No.	Sample	pH	Mo	Cu	Sn									No.
01	79 AVS 110				0									01
02	111				2									02
03	112				0									03
04	113				0									04
05	114				0									05
06	115				2									06
07	116				0									07
08	117				0									08
09	118				2									09
10	119				0									10
11	120				0									11
12	121				0									12
13	122				0									13
14	123				0									14
15	124				0									15
16	125				2									16
17	126				2									17
18	127				0									18
19	128				0									19
20	STD B				12									20
21	129				0									21
22	130				0									22
23	131				0									23
24	132				0									24
25	133				0									25
26	134				0									26
27	135				0									27
28	136				0									28
29	139				0									29
30	160				0									30
31	161				2									31
32	162				0									32
33	163				0									33
34	164				0									34
35	165				0									35
36	166				0									36
37	167				0									37
38	168				0									38
39	169				0									39
40	STD B				12									40

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Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY, B.C.
CANADA
TELEPHONE 299-6910
AREA CODE 604
CERTIFICATE NO. 9409-2

INVOICE NO.
DATE ANALYSED NOV. 79
PROJECT 996

No.	Sample	pH	Mo	Cu	Σ	No.
01	79 AVS 170				0	01
02	171				2	02
03	172				0	03
04	173				0	04
05	174				0	05
06	175				L	06
07	176				0	07
08	177				0	08
09	178				0	09
10	179				0	10
11	180				0	11
12	181				0	12
13	182				0	13
14	183				0	14
15	184				2	15
16	185				0	16
17	186				INSUFFICIENT	17
18	187				0	18
19	188				0	19
20	SPCC				10	20
21	189				0	21
22	190				0	22
23	191				0	23
24	192				0	24
25	193				INSUFFICIENT	25
26	194				0	26
27	195				0	27
28	196				0	28
29	197				0	29
30	198				0	30
31	199				INSUFFICIENT	31
32	200				INSUFFICIENT	32
33	201				INSUFFICIENT	33
34	202				INSUFFICIENT	34
35	203				0	35
36	204				0	36
37	205				0	37
38	206				0	38
39	207				0	39

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLOW ST.
VANCOUVER, B.C.

2225 S SPRINGER AVE.
BURNABY, B.C.
CANADA
TELEPHONE: 299-6910
AREA CODE: 604
CERTIFICATE NO. 9409-3
INVOICE NO.
DATE ANALYSED NOV. 79
PROJECT 996

No.	Sample	pH	Mo	Cu	Σ	No.
01	79 AVS 208				0	01
02	209				0	02
03	210				0	03
04	211				0	04
05	212				0	05
06	213				INSUFFICIENT	06
07	214				0	07
08	215				INSUFFICIENT	08
09	216				0	09
10	217				2	10
11	218				0	11
12	219				INSUFFICIENT	12
13	221				INSUFFICIENT	13
14	222				0	14
15	223				2	15
16	224				0	16
17	225				0	17
18	226				0	18
19	227				5	19
20	228				2	20
21	228				0	21
22	229				0	22
23	230				2	23
24	231				0	24
25	232				0	25
26	233				0	26
27	234				0	27
28	235				2	28
29	236				0	29
30	237				0	30
31	238				5	31
32	239				2	32
33	240				0	33
34	241				0	34
35	242				0	35
36	243				0	36
37	244				0	37
38	245				0	38
39	246				0	39

Rossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

CERTIFICATE OF ANALYSIS

TO: AMAX MINERALS EXPLORATION
601 - 535 THURLOW ST.
VANCOUVER, B.C.

2225 SPRINGBUSH CREEK
BURNABY, B.C.
CANADA
TELEPHONE: 299-6910
AREA CODE: 604
CERTIFICATE NO. 9302

INVOICE NO.

DATE ANALYSED 79/09/20

PROJECT 996

No.	Sample	pH	Mo	Cu	Ni	Co	Mn	Fe	As	Zn	Pb	F	No.
01	79AxA60		3	10	18	16	100	0.8	.2	8	2	230	01
02	61		2	10	18	16	120	0.8	.2	6	2	375	02
03	62		1	2	14	12	140	1.0	.2	14	2	510	03
04	63		2	8	12	16	160	1.1	.2	38	6	490	04
05	64		3	4	16	12	160	0.9	.2	30	2	470	05
06	65		1	6	14	12	140	1.0	.2	36	4	500	06
07	66		1	2	12	12	140	1.0	.2	34	4	480	07
08	67		1	2	12	12	120	1.0	.2	24	6	490	08
09	68		1	2	10	10	80	0.7	.2	6	4	370	09
10	69		4	4	12	12	200	0.9	.2	46	24	500	10
11	70		2	4	12	10	120	0.9	.2	22	2	530	11
12	71		3	2	12	12	160	0.7	.2	40	10	355	12
13	72		10	4	12	14	200	0.9	.2	48	16	520	13
14	73		3	12	14	16	160	1.0	.2	26	8	490	14
15	74		3	16	20	20	220	1.2	.2	30	8	590	15
16	75		7	14	22	20	200	1.0	.2	26	4	460	16
17	76		4	12	20	20	140	1.0	.2	18	2	420	17
18	STD. D		2	136	4	2	80	0.9	4.1	510	96	-	18
19													19
20													20
21													21
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A. A. [Signature]

Procedures for Collection and Processing
of Geochemical Samples

Analytical Methods for Ag, Mo, Cu, Pb, Zn,
Fe, Mn, Ni, Co and W in sediments and soils;
Mo, Cu, Zn, Ni and SO_4^{--} in waters.

Amax Exploration, Inc.
Vancouver Office.

September 1970

SAMPLE COLLECTION

Soils

B horizon material is sampled and thus organic rich topsoil and leached upper subsoil are avoided. Occasionally organic rich samples have to be taken in swampy depressions.

Samples are taken by hand from a small excavation made with a cast iron mattock. Approximately 200 gms of finer grained material is taken and placed in a numbered, high wet-strength, Kraft paper bag. The bags are closed by folding and do not have metal tabs.

Observations as to the nature of the sample and the environment of the sample site are made in the field.

Drainage Sediments

Active sediments are taken by hand from tributary drainages which are generally of five square miles catchment or less. Composite samples are taken of the finest material available from as near as possible to the centre of the drainage channel thus avoiding collapsed banks. More than one sample is taken if marked mineralogical or textural segregation of the sediments is evident.

Some 200 gm of finer material is collected unless the sediment is unusually coarse in which case the weight is increased to 1 kg. Samples are placed in the same type of Kraft paper bag as are employed in soil sampling. Water samples are taken at all appropriate sites. Approximately 100 ml are sampled and placed in a clean, screw sealed, polythene bottle. Observations are made at each site regarding the environment and nature of the sample.

Kossbacher Laboratory

GEOCHEMICAL ANALYSTS & ASSAYERS

BURNABY, B. C.
CANADA
TELEPHONE: 299 6910
AREA CODE: 604

April 30, 1974

SUMMARY OF SOME ANALYTICAL TECHNIQUES CURRENTLY IN USE AT ROSSBACHER LABORATORY

A ANALYTICAL TECHNIQUES FOR GEOCHEMICAL SAMPLES

SAMPLE PREPARATION

Packages of samples are opened as soon as they arrive at the laboratory and the bags placed in numerical sequence in an electrically heated sample drier (maximum temperature 70°C).

After drying soil and sediment samples they are lightly pounded with a wooden block to break up aggregates of fine particles and are then passed through a 35 mesh stainless steel sieve. The coarse material is discarded and the minus 35 mesh fraction replaced in the original bag providing that this is undamaged and not excessively dirty.

Rock samples are exposed to the air until the outside surfaces are dry; only if abnormally wet are rocks placed in the sample drier. Rock samples are processed in such manner that a fully representative 1/2 g. sample can be obtained for analysis. The entire amount of each sample is passed through a jaw crusher and thus reduced to fragments of 2 mm. size or less. A minimum of 1 kg. is then passed through a pulverizer with plates set such that 95% of the product will pass through a 100 mesh

Rock Chips

Composite rock chip samples generally consist of some ten small fragments broken from unweathered outcrop with a steel hammer. Each fragment weighs some 50 gms. Samples are placed in strong polythene bags and sealed with non-contaminating wire tabs. Samples are restricted to a single rock type and obvious mineralization is avoided.

Soil, sediment and rock samples are packed securely in cardboard boxes or canvas sacks and dispatched by road or air.

screen. Where samples are appreciably heavier than 2 kg the material is split after jaw crushing by means of a Jones splitter. After pulverizing the sample is mixed by rolling on paper and is then placed in a Kraft paper bag.

SAMPLE DIGESTION

Digestion tubes (100 x 16 mm) are marked at the 5 ml level with a diamond pencil. Tubes are cleaned with hot water and concentrated HCl. 0.5 g samples are weighed accurately, using a Fisher Dial-O-Gram balance, and placed in the appropriate tubes.

To each of the samples thus prepared are added 2 ml of an acid mixture comprising 15% nitric and 15% perchloric acids. Racks of tubes are then placed on an electrical hot plate, brought to a gentle boil ($\frac{1}{2}$ hour) and digested for $4\frac{1}{2}$ hours. Samples unusually rich in organic material are first burned in a porcelain crucible heated by a bunsen burner before the acid mixture is added. Digestion is performed in a stainless steel fume hood.

After digestion tubes are removed from the hot plate and the volume is brought up to 5 ml with deionized water. The tubes are shaken to mix the solution and then centrifuged for one minute. The resulting clear upper layer is used for Cu, Mo, Pb, Zn, Ag, Fe, Mn, Ni and Co determination by a Perkin-Elmer 200B atomic absorption spectrophotometer. Analytical procedures are given on the following pages.

ANALYTICAL PROCEDURES

Silver

1. Scope - This procedure covers a range of silver in the sample from less than .5 to 1000 ppm
2. Summary of Method - The sample is treated with nitric and perchloric acid mixture to oxidize organics and sulphides. The silver then is present as perchlorate in aqueous solution. The concentration is determined by atomic absorption spectrophotometer
3. Interferences - Silver below 1 gamma/ml is not very stable in solution. Maintaining the solution in 20% perchloric prevents silver being absorbed on the glass container. Determination must be completed on the same day as the digestion.

Samples high in dissolved solids, especially calcium, cause high background absorbance. This background absorbance must be corrected using an adjacent Ag line.

Silver AA Settings P.E. 290

Lamp - Ag

Current 4 ma position 3

Slit 7 A

Wavelength 3281A Dial 287.4

Fuel - acetylene - flow - 14

Oxidant - air - flow - 14

Burner - techtron AB_51 in line

Maximum Conc. 3 to 4x

Calibration

1. Set 1 gamma/ml to read 40 equivalent to 20 gamma/gm
 Factor $\frac{1}{2}$ x meter reading
 Check standards
 4, 10, 20, 40 ppm Ag in sample
2. Set 15 gamma/ml to 100 equivalent to 100 ppm
 Check standards
 40, 100 ppm
 Factor directly in ppm Ag
3. Rotate burner to maximum angle
 Set 10.0 gamma/ml Ag to read 100
 Check standards
 100, 200, 400, 1000 ppm Ag
 Factor 10x scale reading
4. Samples higher than 1000 ppm should be re-analyzed by assay procedure
5. Background correction for sample reading between 1 to 5 ppm
 Calibrate AA in step 1
 Dial wavelength to 300 (peak)
 Read the samples again
 Subtract the background reading from the first reading

Standards

1. 1000 gamma/ml Ag - 0.720 gm Ag₂SO₄ dissolved in 20 mls Hx10₃
 and dilute to 500 mls
2. 100 gamma/ml Ag - 10 mls of above + 20 mls HClO₄, dilute to
 100 mls

3. Recovery spiked standard

5 gamma/ml Ag - 5 mls 100 gamma/ml dilute to 100 mls with
 "mixed" acid

Working AA Standards

Pipette .2, .5, 1, 2, 5, 10 mls of 100 gamma/ml and 2, 5 mls 1.000
 gamma/ml dilute to 100 mls with 20% HClO₄. This equivalent to
 4, 10, 20, 40, 100, 200, 400, and 1000 ppm Ag in the sample .50 gm
 diluted to 10 mls.

Recovery Standard

Pipette 2 mls of 5 gamma/ml Ag in mix acids into a sample and
 carry through the digestion. This should give a reading of 20
 ppm Ag + original sample content.

Follow the general geochemical procedure for sample preparation
 and digestion.

For low assay Ag, the same procedure is used. Ag is then calcu-
 lated in oz/ton.

$$1 \text{ ppm} = .0292 \text{ oz/ton}$$

conversion factor

$$\text{oz/ton} = .0292 \times \text{ppm Ag}$$

Zn Geochemical AA Setting

Lamp Zn

Current 8 #3 Slit 20A

Wave length 2133 Dial 84.9

Fuel - Acetylene Flow 14

Oxidant - Air Flow 14

Burner - P.E. short path 90°

Range

0 - 20 gamma/ml Factor 4x - 0 to 400 ppm

0 - 50 gamma/ml Factor 10x - 0 to 1000 ppm

For Waters - Burner AB- 51 in line 1 gamma/ml read 100 to give 0
to 1000 ppb

High Zn Burner Boling in line. Wavelength 3075. Dial 250 Slit 7A

Fuel 14 Air 14.5

0 to 1000 gamma/ml read 0 to 20 Factor 400 x

Pure Standard 10,000 gamma/ml

1 gm Zn dissolved, H₂O, HCl, HNO₃, HClO₄, fumed to HClO₄ -
make up to 100 mls H₂O

1000, 100 gamma/ml and 100 ml by dilution in 20 % HClO₄

0 to 200 gamma/ml Zn use combined Cu, Ni, Co, Pb, Zn standards

Pipette

1, 2, 3, 5, 8, 10 mls of 10,000 gamma/ml - dilute to 100 mls
with 20% HClO₄ to give

100, 200, 300, 500, 800, 1000 gamma/ml Zn for high standards

Co Geochemical AA Setting

Lamp - 5 multi element

Current 10 #4 Slit 2A

Wavelength 2407 Dial 133.1

Fuel - Acetylene Flow 14

Oxidant - Air Flow 14

Burner - AB 51 in line

Range

0 - 10 gamma/ml read 100 Factor 2 x reading to 200 ppm

0 - 20 gamma ml read 100 Factor 4 x reading to 400 ppm

Burner at maximum angle

0 - 100 gamma/ml read 100 Factor 20 x reading to 2000 ppm

0 - 200 gamma/ml read 100 Factor 40 x reading to 4000 ppm

Standards - 1000 gamma/ml

1.000 gm cobalt metal dissolved in HCl, HNO₃, and fumed into
HClO₄, dilute to 1 liter

Pipette

1, 2, 10, 20 mls into 100 ml vol flasks diluted to mark
with 20% HClO₄

This gives

10, 20, 100, 200 gamma/ml Co

Mixed - combination standards of Cu, Ni, Co, Pb, Zn

of

1, 2, 5, 10, 20, 30, 50, 80, 100, 150, 200 gamma/ml are used
for calibration

Mn Geochemical AA Setting

Lamp Multi element Ca, Ni, Co, Mn Cr

Current 10 #4 Slit 7A

Wave length 4030.8 Dial 425.2

Fuel - Acetylene Flow 14.0

Oxidant - Air Flow 14.0

Burner - P.E. short path (or AB 50)

Range

0 - 100 gamma/ml Factor 20x - 0 to 2000 ppm

0 - 200 gamma/ml Factor 40x - 0 to 4000 ppm

Burner 90°

0 - 1000 gamma/ml Factor 200x - 0 to 20,000 ppm

0 - 2000 gamma/ml Factor 400x - 0 to 40,000 ppm

EDTA Extraction - use AB 51 in line

0 - 20 gamma/ml Factor 4x - 0 to 400 ppm

Standards

Fisher 10,000 gamma/ml (ml)

10x Dilution 1000 gamma/ml

Pipette

.5, 1, 2, 3, 5, 8, 10, ml of 1000 gamma/ml

2, 3, 5, 8, 10, 15, 20 ml of 10,000 gamma/ml dilute to 100

mls with 20% HClO₄. This gives

5, 10, 20, 30, 50, 80, 100, 200, 300, 500, 800, 1000, 1500,

2000 gamma/ml.

Mo Geochemical AA Setting

Lamp ASL H/C Mo

Current 5 #5 Slit 7A

Wavelength 3133 Dial 260.2

Fuel - Acetylene Flow 12.0 to give 1" red feather

Oxidant - Nitrous oxide Flow 14.0

Burner - AB 50 in line

Caution read the operation using N₂O and acetylene flame at
end of general AA procedure

Range

0 - 10 gamma/ml Factor 2x - 0 to 200 ppm

Rotate burner to max. angle

0 - 50 gamma/ml Factor 10 x 0 to 1000 ppm

0 - 100 gamma/ml Factor 20 x 0 to 2000 ppm

Standards 1000 gamma/mlDissolve .750 gms MoO₃ (acid molybdic) with 20 mls H₂O, 6
lumps NaOH, when all dissolved, add 20 mls HCl, dilute to 500 mls
100 gamma/ml - 10 x dilution

Pipette

.2, .5, 1, 2, 3, 5, 8, 10 mls of 100 gamma/ml

2, 3, 5, 8, 10 mls of 1000 gamma/ml add 5 mls 10% AlCl₃
and dilute to 100 mls with 20% HClO₄

This gives

.2, .5, 1, 2, 3, 5, 8, 10, 20, 30, 50, 80, 100 gamma/ml Mo

Fe Geochemical AA Setting

Lamp - Fe

- Do not use multi element Fe

Current 10 #4 Slit 2A

Wavelength 3440.6 Dial 317.5

Fuel - Acetylene Flow 14.0

Oxidant - Air Flow 14.0

Burner - PE Short Path 90°

Range

0 - 5000 gamma/ml 0.1 x % - 0 to 10.0%

0 - 10,000 gamma/ml 0.2 x % - 0 to 20.0%

Higher Fe - 10 x dilution

Standards 10,000 gamma/mlWeigh 5.000 gms iron wires, into beaker, add H₂O, HCl, HNO₃,HClO₄, heat to HClO₄ fumes. Add HClO₄ to 100 mls + 100 mlsH₂O, warm, dilute to 500 mls

Pipette

1, 5, 10, 20, 30, 50, 80 mls 10,000 gamma/ml dilute to 100 mls with 20% HClO₄ to give

100, 500, 1000, 2000, 3000, 5000, 8000 gamma/ml to be equivalent to .2, 1.0, 2.0, 4.0, 6.0, 10.0%, 16.0% Fe in geochem sample

Ni Geochemical AA Setting

Lamp P.E. H/C. Ni or multi element Cu, Ni, Co, Mn, Cr

Current 10 #4, Slit 2A

Wave length 3415 Dial 312.5

Fuel - Acetylene Flow 14.0

Oxidant - Air Flow 14.0

Burner AB 51 in line

Range

0 - 20 gamma/ml Factor 4x - 0 - 400 ppm

0 - 100 gamma/ml Factor 20x - 0 - 2000 gamma

45° 0 - 200 gamma/ml Factor 40x - 0 - 4000 ppm

0 - 500 gamma/ml Factor 100x - 0 - 10,000 ppm

Ni in waters and very low ranges

Wave length 2320 Dial 113

Range 0 - 5 gamma/ml Factor 1x - 0 - 100 ppm

Standards 10,000 gamma/ml1.000 gm pure Ni metal dissolved in HCl, HNO₃, HClO₄ to perchloric fumes, dilute to 100 ml H₂O1000 gamma/ml and 100 gamma/ml Successive 10x dilutions in 20% HClO₄

1, 2, 5, 8, 10 mls of 100 gamma/ml

2, 5, 8, 10 mls 1000 gamma/ml

2, 5, 8, 10 mls 10,000 gamma/ml - dilute to 100 mls in 20%

HClO₄. This gives

1, 2, 5, 8, 10, 20, 50, 80, 100, 200, 500, 800, 1000 gamma/ml

Combined Standards - Cu, Ni, Co, Pb, Zn is used as a working standard

Cu Geochemical AA Setting

Lamp Single Cu or

5 multi element

Current 10 for multi element #4 Slit 7A

4 for single #3 Slit 7A

Wavelength 3247 Dial 280

Burner Techtron AB 51 (For Cu in natural waters)

P.E. Short Path (For geochem)

Fuel Acetylene Flow 14

Oxidant Air Flow 14

Range

0 - 5 gamma/ml Factor 1x to 100 ppm (for low Cu)

0 - 20 gamma/ml Factor 4x to 400 ppm

Burner 90°

0 - 200 gamma/ml Factor 40x to 4000 ppm

Wavelength 2492 Dial 147

Burner in line

Range

0 - 1000 gamma/ml Factor 200x to 20,000 ppm

0 - 2000 gamma/ml Factor 400x to 40,000 ppm

Higher range than 40,000 ppm requires 10x dilution

Standards

10,000 gamma/ml

1.000 gm metal powder, H₂O, HCl, HNO₃ until dissolved, addHClO₄, fume dilute to 100 mls1000 gamma/ml 10x dilution above in 20% HClO₄2000 gamma/ml 20 mls 10,000 gamma/ml - dilute to 100 mls in
20% HClO₄100 gamma/ml 10x dilution 1000 gamma/ml dilute to 100 mls in
20% HClO₄200 gamma/ml 10x dilution 2000 gamma/ml dilute to 100 mls in
20% HClO₄

Pipette

1, 2, 3, 5, 8, 10 mls 100 gamma/ml - dilute to 100 mls with
20% HClO₄ to give 1, 2, 3, 5, 8, 10 gamma/ml

Combined standards Cu, Ni, Co, Pb, Zn

1, 2, 5, 10, 20, 30, 50, 80, 100, 150, 200 gamma/ml

Pb Geochemical AA Setting

Lamp ASL H/c Pb

Current 5 ma Slit 7A

Wave length 2833 Dial 208

Fuel - acetylene Flow 14

Oxidant - air Flow 14

Burner AB 51 in line

Range

0 - 20 gamma/ml to read 0 to 80. Factor 5x 0 to 500 ppm

0 - 200 gamma/ml to read 0 to 80. Factor 50x 0 to 5000 ppm

Standards - 10,000 gamma/ml

1.000 pure metal, dissolved in HNO₃, fumed to HClO₄ make up to 100 mls in 20% HClO₄1000 gamma/ml and 100 gamma/ml Successive 10x dilutions in 20% HClO₄

Pipette

1, 2, 5, 8, 10 mls 100 gamma/ml

2, 5, 8, 10, 20 mls 1000 gamma/ml dilute to 100 mls in 20%

HClO₄ this gives

1, 2, 5, 8, 10, 20, 50, 80, 100, 200 gamma/ml

Combined Standards Cu, Ni, Co, Pb, Zn, are used as working standards

W in Soils and Silts

Reagents and apparatus

Test tubes - pyrex disposable

Test tubes - screw cap

Bunsen Burner

Flux - 5 parts Na₂CO₃

4 parts NaCl

1 part KNO₃ pulverized to -80 mesh7% SnCl₂ in 70% HCl20% KSCN in H₂O

Extractant - 1 part tri-n-butyl phosphate

9 parts carbon tetrachloride

Standards

1000 gamma/ml W

.18 gms Na₂WO₄ 2H₂O dissolved in H₂O, make up to 100 mls

100 gamma/ml, 10 gamma/ml by dilution

Standardization

Pipette .5, 1, 2, 3, 5, 8, 10 ml of 10 gamma/ml

and 1.5, 2 mls of 100 gamma/ml - dilute to 10 mls

continue from step #4

Artificial colors - Nabob pure Lemon Extract, dilute with 1:1 ethanol and water to match. Tightly seal these for permanent standards

Procedure

1. Weigh 1.0 gram sample, add 2 gm flux, mix

2. Sinter in rotary for 2 to 3 minutes (Flux dull red for one minute)
3. Cool, add 10 mls H₂O, heat in sand bath to boiling, cool, let sit overnight
4. Stir, crush, and mix. Let settle
5. Take 2 ml aliquot into screw cap test tube
6. Add 7 mls SnCl₂, heat in hot water bath for 5 minutes (80°C)
7. Cool to less than 15°C
8. Add 1 ml 20% KSCN, mix (if lemon yellow; compare color standard 10x)
9. Add $\frac{1}{2}$ ml extractant, cap, shake vigorously 1 minute
10. Compare color

Molybdenum in Water Samples

1. Transfer 50 mls to 125 separatory funnel
2. Add 5 ml .2% ferric chloride in conc HCl
3. Add 5 mls of mixed KSCN and SnCl₂
4. Add 1.2 mls isopropyl ether, shake for 1 minute, and allow phases to separate
5. Drain off water
6. Compare the color of extractant

Standardization

Pipette 0, .2, .5, 1, 2, 3, 4, 5, mls of 1 gamma/ml and 1, 1.5, 2, mls of 10 gamma/ml dilute to 50 mls with demineralized H₂O, and continue step #2.

This equivalent to

1, 4, 10, 20, 40, 60, 80, 100, 200, 300, 400 ppb Mo

Artificial color - Nabob orange extract dilute with 1:1 H₂O to methanol to match. Seal tightly

SnCl₂ - 15% in 15% HCl

300 gm SnCl₂ · 2H₂O + 300 mls HCl, until SnCl₂ dissolved dilute to 2 liters

KSCN - 5% in H₂O

Mixed SnCl₂ - KSCN

3 parts SnCl₂ to 2 parts KSCN

Water Samples Run for AA

1. Cu - 2 gamma/ml reads 30 scale therefore 1 unit = 25 ppb
2. Zn - 1 gamma/ml reads full scale therefore 1 unit = 10 ppb
3. Ni - 2.5 gamma/ml reads 50 scale therefore 1 unit = 50 ppb

Burner: long slot techtron burner in line

Sulphate in Natural Waters

1. Pipette 0.5 ml sulphate reagent mix into a colorimetric tube
2. Add 5 ml water sample and mix
3. Read at 343 *mμ* against a demineralized water blank
4. Read again at 400 *mμ* and subtract from sulphate reading
5. Calculate ppm sulphate from the graph

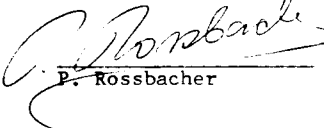
Reagent

Dissolve 54 grams red mercuric oxide (J.T. Baker 2620- Can Lab) in 185 ml 70% perchloric acid and 20 ml H₂O, shake for one hour. Add 46.3 grams ferric perchlorate [Fe(ClO₄)₃ · 6H₂O] (GFS 39) and 47 grams aluminum perchlorate [Al (ClO₄)₃ · 3H₂O] (GFS 2) Add 400 ml water to dissolve, let settle overnight, decant into bottle and make to 1 liter

pH MEASUREMENTS

Soil and drainage sediment samples are dampened with water in a glass beaker to a pasty consistency. Demineralized water is used for this purpose as it has a low buffer capacity and thus does not influence the pH of the sample. Measurement is made with a Fisher Acument pH meter. Electrodes are stored in buffer overnight. A 30 minute warm up time is allowed for the instrument each morning. A 10 ml aliquot is taken from water samples for pH measurement.

ROSSBACHER LABORATORY



P. Rossbacher

APPENDIX III

STATEMENT OF QUALIFICATIONS

NAME	R.G. Kidlark
ADDRESS	972 Birchbrook Place Coquitlam, B.C.
EDUCATION	BSc. Major in Geology University of Toronto 1974
EXPERIENCE	1972 Royal Ontario Museum - Party Chief 1974 Silvermaque Mining - Project Geologist 1974-1976 Brascan Resources - Staff Geologist 1977 Chevron Standard - Senior Assistant 1978 AMAX Minerals Exploration - Senior Assistant 1979 AMAX Minerals Exploration - Senior Assistant

STATEMENT OF QUALIFICATIONS

NAME: A.C. Hitchins

ADDRESS: 601-535 Thurlow Street,
Vancouver, B.C. V6E 3L6

EDUCATION: University of Toronto - B.A. Sc. 1970
University of Toronto - M.Sc. 1973

EXPERIENCE: Amax Potash Limited - Geologist - 1972 to present

STATEMENT OF QUALIFICATIONS

NAME E.A. Fuller

ADDRESS 301 - 6730 Willingdon Avenue
Burnaby, B.C. V5H 2V8

EDUCATION 1 year Geological Engineering
Queen's University - Kingston

4 years Honours Geology B.Sc.
University of Western Ontario - London

EXPERIENCE 1975 Can. Occidental Petroleum - Field assistant
1976 G.S.C. - Field assistant
1977 G.S.C. - Field assistant
1978 Essex Minerals - Geologist
1978 Donegal Developments - Temporary staking & office work
1979 G.S.C. - Temporary office work
1979 AMAX of Canada Limited - Geologist

STATEMENT OF QUALIFICATIONS

NAME A.C. Smallwood

ADDRESS 7580 Burris Street
Burnaby, B.C.

EDUCATION 3rd year standing at Simon Fraser University

EXPERIENCE 1977 Newmont Mining - Field Assistant
 1978 AMAX Minerals - Field Assistant
 1979 AMAX Minerals - Field Assistant

STATEMENT OF QUALIFICATIONS

NAME V.F. Grundy

ADDRESS 2969 Mathers Avenue
West Vancouver, B.C.
V7V 2J7

EDUCATION 3rd year Commerce - University of B.C.
Vancouver

EXPERIENCE AMAX of Canada Limited - field assistant - 1979