1970 Report on the

# GAVIN LAKE Cu-Mo PROPERTY

Gavin and Wet Claims

# 2733

Cariboo Mining Division
93 A 5
52°30'N 121°45'W



AMAX Kamloops Office

November 1970 C.J. Hodgson, P.Eng. (B.C.)

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ILLUSTRATIONS

SUMMARY

The Gavin Lake property consists of 66 claims situated twenty-five miles east of McLeese Lake, B.C. about twelve miles southeast of Likely in the Cariboo Mining District. The property lies within the "Quesnel Trough", a Mesozoic Belt of volcanic and sedimentary strata in southern and central British Columbia with which numerous copper and molybdenum deposits are associated. The Cariboo Bell deposit lies five miles northeast of Gavin Lake and the Gibraltar deposit lies twenty miles to the west.

On the Gavin Lake property itself, minor amounts of chalcopyrite and molybdenite are associated with a swarm of quartz monzonite porphyry dykes. The claims were examined in 1969 by AMAX geologist D.K. Mustard (see 1969 Report "Gavin Lake Property) who supervised staking of the 48 Wet claims adjacent to the original 18 Gavin claims and recommended that a thorough examination of the property be carried out. Following Mustard's recommendation, AMAX optioned the property from Merna Tattersall and during the months April to October of 1970 carried out a detailed program of geological mapping, geochemical sampling, a magnetometer survey, pitting, trenching and sampling.

Geological mapping on a picket line grid indicated that most of the porphyry dykes occur in a quarter mile wide zone immediately north of Gavin Lake, where individual dykes attain widths of up to 600 feet. Chalcopyrite and molybdenite are associated with quartz and quartz-potash feldspar veins in the quartz porphyry in this area. Locally, trace amounts of chalcopyrite are disseminated within the porphyry. Geochemically

the soils, silts, and streams in this area stand out as highly anomalous in molybdenum content compared to the remainder of the property. Copper anomalies, on the other hand, show poor correlation with the quartz porphyry dykes and are scattered randomly throughout the property. The reason for this apparent lack of correlation may lie in the high background copper content of the sedimentary and volcanic country rock (100 - 200 ppm Cu) compared to the intrusive quartz porphyry (20 ppm Cu). Obviously, copper anomalies in soils overlying quartz porphyry should be up-graded relative to those overlying siltstones and volcanics.

A magnetometer survey carried out on the picket grid produced inconclusive results. It was hoped that the survey would assist in outlining areas of quartz porphyry which should, by its low magnetic response, contrast with the high relief banded magnetic pattern of interlayered volcanic and sedimentary strata. Such was not the case, however, possibly because of the complexity of intermingling of porphyry dykes with country rock.

# INTRODUCTION

## Location, Access, Topography

The Gavin Lake Cu-Mo Property lies 25 miles east of McLeese Lake, B.C. and 12 miles southwest of Likely, B.C. in the Cariboo Mining District (See Figure 1). Gavin Lake, roughly in the center of the property, is two miles long by one quarter mile wide. Approximate geographic co-ordinates of Gavin Lake are latitude N52°30', longitude W121°45'.

Access to the property is via gravel road either north from 150 Mile House on Highway #97 for a distance of 35 miles, or east from McLeese Lake for 25 miles.

Gavin Lake lies in the plateau region of central British Columbia. The lake itself has an elevation of 3165 feet and adjacent topography is moderately undulating, with a maximum relief of 700 feet. Streams on the property are sluggish and intermittent; most are dry by mid-July. Numerous springs and seeps occur on the hillsides north and south of Gavin Lake and, by contrast, many of these are active throughout the summer. Vegetation consists of dense cedar forest on north-facing slopes, and open woods of fir, pine, birch, and poplar on south-facing slopes.

## Property

The Gavin Lake Property consists of 18 Gavin claims and 48 Wet claims. The Gavin claims were recorded on June 2, 1969 (Gavin #1-14) and August 12, 1969 (Gavin #15-18) in the name of Merna Tattersall, General Delivery, Williams Lake. The Wet claims were staked by AMAX and registered on October 27, 1969; all but seven of them are located within one mile of the

Gavin claims and consequently fall under the terms of the option agreement.

The 66 claims were divided into two groups of 30 and 36 claims on May 29, 1970 (See Figure 3).

Previous Work

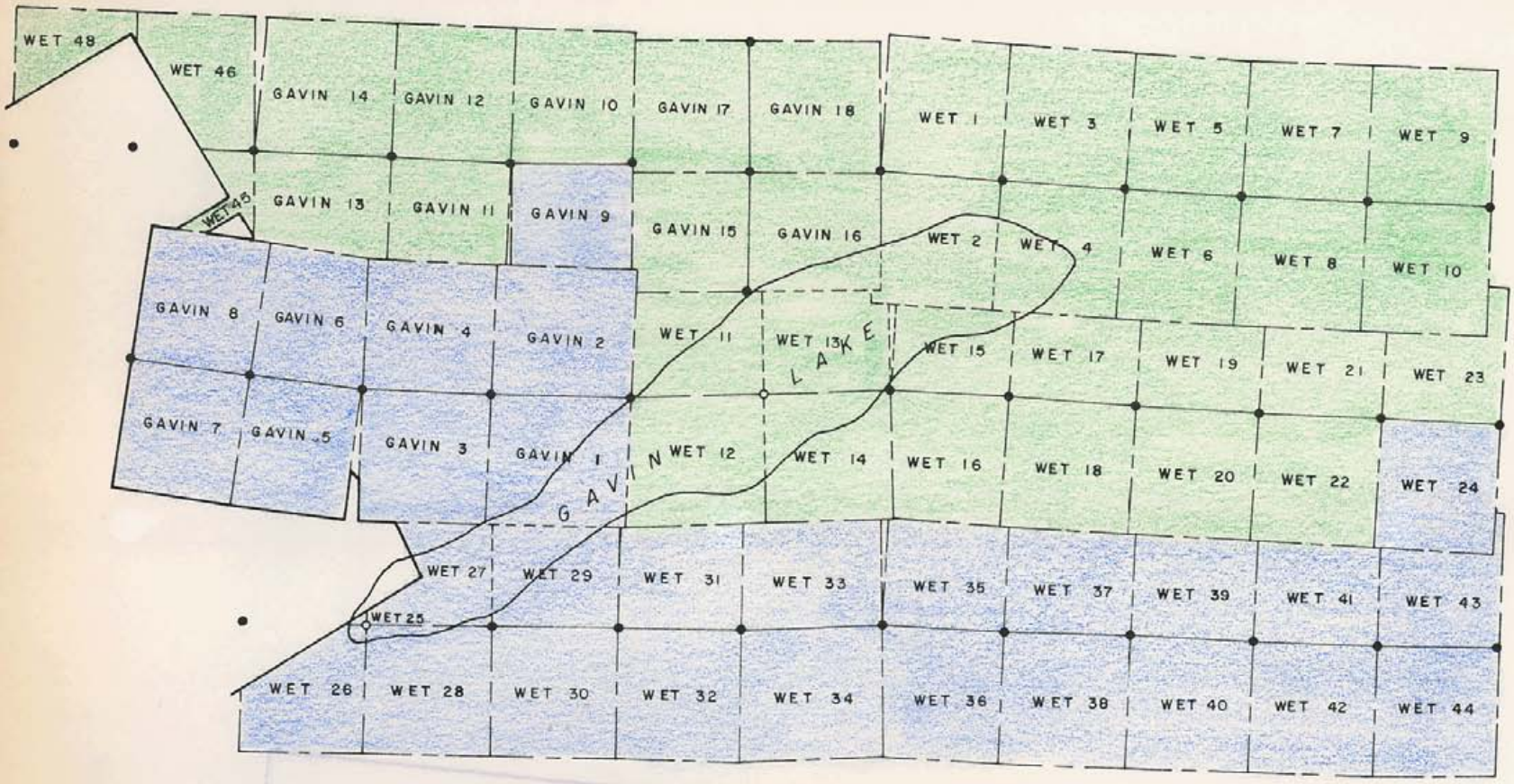
The property was first staked in 1965, and in 1966 several trenches were excavated and approximately 700 feet of X-ray drilling in six holes was done by Mr. Lloyd Tattersall. In 1968 the claims were examined by AMAX geologist H.W. Sellmer (1968 Report "Tattersall Copper Prospect") who recommended that a more thorough examination of the property be made in the following year. During 1969 geological mapping and geochemical soil sampling was carried out on the Gavin claims by D.K. Mustard (1969 Report "Gavin Lake Property") who supervised staking of the contiguous Wet claims and recommended that AMAX option the property.

1970 Program

The 1970 Program commenced in late March with line cutting by Amex Exploration Services, Limited of Kamloops. At this time 23 miles of picket lines were put in to provide control for a magnetometer survey over the lake prior to spring break-up. A baseline 16,900 feet long was laid down on the north side of Gavin Lake on a bearing of 120° azimuth, parallel to the claim boundary. The origin is near the northwest corner of the property. Picket lines at 030° azimuth were run off the baseline at 16E and 128E and were connected by a tie line 6000 feet south of the baseline and aligned parallel to it. The resulting rectangle enclosing Gavin Lake was then filled in by


LOCATION MAP

N.T.S. Ref 93 A 5
FIG. 1




*GREEN GROUP Gavin 10-18 incl., Wet 1-23, 45, 46, 48; BLUE GROUP Gavin 1-9 incl., Wet 24-44 incl.*

AMAX EXPLORATION INC.

# GAVIN LAKE COPPER – MOLYBDENUM PROPERTY

CARIBOO MINING DIVISION — BRITISH COLUMBIA

# CLAIM SKETCH MAP

SCALE 1" = 2,000'

H. P.

N.T.S. Ref. 93 A 5

FIG. 3

additional picket lines spaced 400 feet apart. This initial line cutting by Amex and the magnetometer work over the lake were completed in early April.

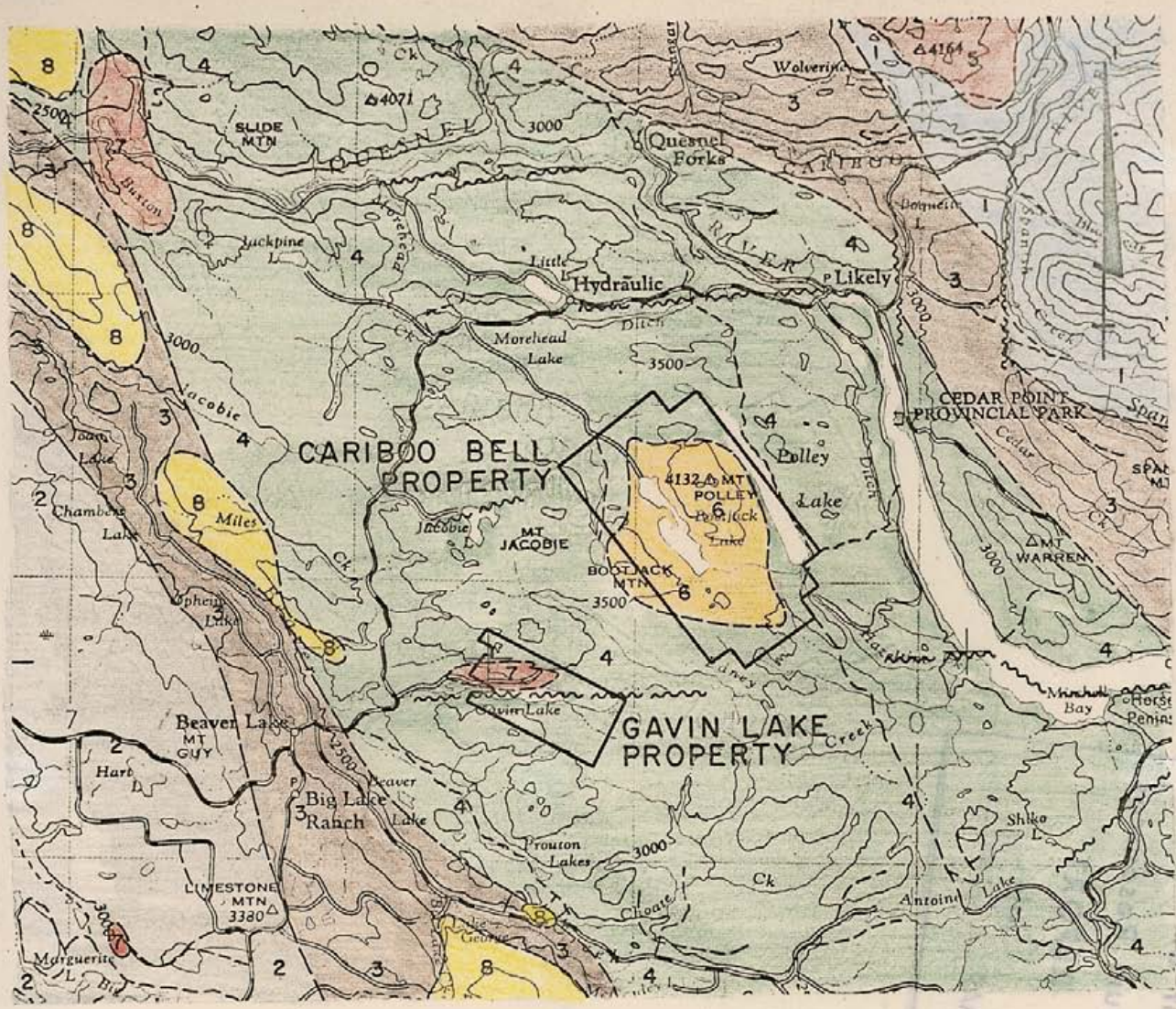
Regular field work was started on the property in early May. The picket grid was extended and completed (an additional 28 miles of lines spaced at 400 and 800 feet), and by mid-June geological, geochemical and magnetometer surveys had been carried out using the grid as control. Approximately 23 pits were blasted and sampled in late June. In October, 19 trenches totalling 3305 linear feet were excavated.

## GEOLOGY

### Regional Geology

Gavin Lake lies near the western edge of the so-called "Quesnel Trough" (Campbell and Tipper, 1970, Bull. C.I.M.M.), a belt of Mesozoic volcanic and sedimentary strata which is flanked on the east and west by variably metamorphosed Palaeozoic strata of the Cariboo and Cache Creek groups, respectively. The Mesozoic sequence, which unconformably overlies the Cache Creek strata about six miles west of Gavin Lake, consists of a complexly interbedded sequence of volcanic flows and breccias, and argillite, siltstone and conglomerate of volcanic origin. In the Gavin Lake area the strata strike consistently northwesterly and dip at moderate angles to the northeast.

Numerous stocks and several large batholiths intrude the Mesozoic sequence of the Quesnel Trough, and most have associated copper and/or molybdenum mineralization. The Cariboo Bell deposit (50 million tons, 0.4% Cu) lies five miles northeast




## L E G E N D

**TERTIARY**

8 — *Plateau basalt flows.*

**JURASSIC AND/OR CRETACEOU AND (?) EARLIER**

7 — *Granodiorite, quartz monzonite.*

6 — *Cariboo Bell diorite, syenodiorite and monzonite.*

5 — *Gneissose biotite granite (may be PALEOZOIC)*

**JURASSIC AND/OR UPPER TRIASSIC**

4 — *Predominantly volcanic flows and breccias.*

3 — *Argillite, siltstone and conglomerate.*

**PERMIAN AND EALIER**

2 — *CACHE CREEK GROUP – Limestone, chert, argillite and greenstone.*

**LOWER CAMBRIAN AND LATER**

1 — *CARIBOO GROUP – (Undifferentiated), phyllite, serecitic quartzite, limestone.*

**S Y M B O L S**

*Geological contact.*

*Fault.*

*Property boundry.*

AMAX EXPLORATION INC.

# GAVIN LAKE COPPER – MOLYBDENUM PROPERTY

CARIBOO MINING DIVISION — BRITISH COLUMBIA

# REGIONAL GEOLOGY MAP

SCALE 4 2 0 4 8 MILES

N.T.S. Ref. 93 A 5

FIG. 2

of Gavin Lake, and the Gibraltar deposit (200 million tons, 0.4% Cu), slated for production, lies 20 miles to the west. Although outside the Quesnel Trough, the latter deposit occurs in a stock of identical age (200 m.y.) to Cu-Mo bearing intrusions within the Trough.

## Property Geology

### General Statement

Most of the geological mapping was carried out in May by R.J. Bailes and D.C. Smith. Outcrops were located with respect to the picket line grid by pace and compass. In June and July the writer (C.J. Hodgson) checked most of the surface geology and added new geological information from outcrops exposed by pitting. Trenches excavated in October were mapped by D. Simon and R. Anderson and this additional information was also incorporated on the geological map.

In general, outcrop is sparse, particularly on that portion of the property south of the Gavin Lake - Mitchell Bay road where a thick mantle of glacial debris occurs. North of the road the glacial veneer is generally less than five feet thick. Even so, few well-exposed outcrops occur here; many occur under up-turned trees and are only a few square feet in size. Geological boundaries are at best approximate, but in areas of better exposure some hint is given of the stratigraphic complexity of the sequence and the structural complexity of the porphyry dykes. The latter occur as a swarm north of and parallel to Gavin Lake, and extend westward onto the contiguous FS claims. Similar porphyry dykes occur up to five miles from Gavin Lake, particularly to the southeast and northwest, and to

a lesser extent to the east and west. The dykes show little mineralogical variation and appear to be the result of a single intrusive pulse.

The porphyry dykes around Gavin Lake intrude a sequence of siltstone, argillite and conglomerate of volcanic origin interlayered with basic volcanic flows. The latter are as a rule of insufficient width to permit the mapping of individual flows through the map area. On the northeast side of the property this sequence is overlain by coarse polymictic volcanic breccia and conglomerate.

Lithological Descriptions

Quartz monzonite porphyry on the property is a fine grained, leucocratic, pink-weathered rock with conspicuous (2-8 mm) euhedral quartz phenocrysts on the weathered surface. Plagioclase phenocrysts, although smaller and less obvious, are actually more abundant than quartz phenocrysts. The average composition is as follows:

| | | | |
|---|---|---|---|
| Phenocrysts - | Quartz | 15% | 2-8 mm |
| | Plagioclase | 25% | 1-3 mm |
| Groundmass - | Potash feldspar | 35% | < 1 mm |
| | Plagioclase | 15% | < 1 mm |
| | Quartz | 5% | < 1 mm |
| | Biotite | 5% | $\leq$ 1 mm |

Plagioclase is gradational in grain size from phenocrysts to groundmass but is always subhedral. Potash feldspar, on the contrary, is very fine grained and entirely interstitial, enclosing all other minerals. Biotite occurs as subhedral plates and is of primary origin. Quartz is unusual on account of its paucity in the groundmass compared to its abundance as phenocrysts.

With decrease in quartz phenocrysts, quartz monzonite

porphyry grades into what was referred to in the field as quartz monzonite. Actually the latter rock type, with minor 1 - 2 percent) quartz phenocrysts in a quartz-poor matrix may be closer to monzonite in composition. Generally this phase seems to be simply a local variant of the quartz monzonite porphyry, and is particularly common in peripheral dykes outside the property. In only one outcrop was a possible age relationship observed between the two types; in an outcrop on line 92E, quartz monzonite porphyry appears to cut a dyke of quartz monzonite. However, since all gradations in composition occur between quartz monzonite porphyry and quartz monzonite, there is little doubt of their genetic connection.

The porphyry dykes are locally chilled to a fine grained, non-porphyritic felsite. This rock type commonly contains disseminated pyrite, and weathers a rusty orange. Several leucocratic rusty outcrops north of the main dyke area were mapped as felsite in the field; trenching indicates that some, at least, may be simply bleached and hornfelsed siltstone.

On the east side of the property, between picket lines 88E and 92E, two outcrops of breccia occur. The breccia appears to cut across a porphyry dyke, fragments of which are seen in the breccia. Most of the fragments are badly altered and unidentifiable. They measure up to several inches in diameter. The matrix, although scant, is quite siliceous and quartz lines drusy cavities within the breccia. No sulphides were seen associated with this breccia.

The intruded strata consists of complex sequence of argillite, siltstone and conglomerate, all of volcanic

derivation, interbedded with basaltic to andesitic volcanic flows. Argillite is dark grey and very brittle with a sub-conchoidal fracture. It invariably contains disseminated pyrite and weathers rusty orange. Siltstone is more variably coloured than argillite, more obviously banded and less brittle. Fossils occur rarely in both argillite and siltstone. Conglomerate occurs mainly in a unit on the east side of the property. It consists of volcanic fragments up to two inches diameter in a matrix of volcanic crystal debris, and is intimately interlensed with coarse, polymictic volcanic breccia containing angular volcanic fragments up to 12 inches diameter. This unit trends southeasterly across the eastern corner of the claims and overlies the dominantly siltstone sequence to the west.

Basalt is dark green, fine to medium grained, and contains visible pyroxene, biotite (locally) and minor disseminated pyrite. Most flows are only a few feet thick and cannot be followed for any distance along strike. However, in the western portion of the claims a 1500 foot wide unit of predominantly volcanic flows can be traced across the property. Trenches within this unit near Gavin Lake expose a medium grained trachybasalt referred to in the field as potassic basalt. This unit, although only about 100 feet wide was found in several other locations along strike and forms a reasonably reliable marker unit. The rock consists of about 25% potash feldspar intergrown with 75% pyroxene and appears to be a differentiate of a basaltic flow.

Plagioclase porphyry sills or flows consisting of 20% plagioclase phenocrysts up to 8 mm in a dark grey fine grained

matrix occur rarely on the property. They are probably part of the stratigraphic sequence and form marker units of sorts. They are definitely pre-quartz porphyry in age.

Structure

The most important structural aspects of the property are the disposition of the porphyry dykes, a subject which has been mentioned earlier, and the occurrence of several east-west faults parallel to the dykes which may be closely related genetically to the intrusive event. The faults coincide with gullies and with Gavin Lake itself and form prominent air photo lineaments. Although trenching across some of the gullies revealed fairly intense fracturing, geological evidence indicates that displacement was relatively minor.

The magnetometer survey map revealed an east-west magnetic lineament which more-or-less coincides with the central axis of the porphyry dykes. Although there is little geological evidence for a fault here, this lineament may represent a pre-porphyry structure which controlled emplacement of the intrusion. Several northwest-trending faults were also deduced from the magnetic survey map; for these too there is little geological evidence.

Veining, Sulphide Mineralization, Alteration

Quartz veins occur wherever porphyry dykes are present, but are most abundant in an area northwest of Gavin Lake outlined by a dotted line on the geological map. Here, quartz veins 1/4 to 2 inches wide, commonly with selvages of potash feldspar, have a density of 3-5 per square foot. They occur in two main directions; 160°/75W and 45°/90N. Minor amounts of

molybdenite, chalcopyrite and pyrite occur within these quartz and quartz-potash feldspar veins, characteristically as vein selvages. Most mineralized veins contain either molybdenite and pyrite or chalcopyrite and pyrite; there is little mixing of the two.

Chalcopyrite-bearing veins occur throughout the property, but molybdenite-bearing veins are restricted to the area mentioned above. No relative age of the two vein types (Cu-bearing and Mo-bearing) was established. It was noted that molybdenite had a preference for hairline quartz veins in chilled contact phases of the porphyry. Minor disseminated pyrite and chalcopyrite occurs locally within the porphyry. The best assays from various pits put down on the property were 0.02% $MoS_2$ and 0.05% Cu.

In several places on the property, quartz veins occur up to 15 feet wide, trending the predominant 160°/75W vein direction. These contain galena and trace amounts of silver and gold. A selected grab sample from a vein on 56E taken by L. Tattersall in 1966 assayed as follows:

| | | | |
|---|---|---|---|
| Au | 0.54 oz/ton | Cu | 0.33% |
| Ag | 2.95 oz/ton | Pb | 0.30% |
| Ni | 0.024% | | |

Hydrothermal alteration of the porphyry is negligible. Primary biotite is unchloritized, and only rarely is clouding of feldspars observed, usually near established faults. Potash feldspar selvages in quartz veins may be regarded as alteration, since the irregularity of vein walls suggests replacement by potash feldspar. In the intruded sedimentary strata and volcanic flows only weak contact hornfelsing is observed. Although all

rock types contain minor amounts of pyrite there is no evidence of a "pyrite halo" about the main area of veining.

## GEOCHEMISTRY

### General Statement

Detailed subsoil and stream sediment sampling was conducted on the Gavin Lake Copper-Molybdenum Property during May and June 1970 by P. Vanstone and junior assistants. A total of 1298 soil, silt and water samples were collected on a grid with a line separation of 4000 feet. At each 200 foot centre soil sample material was collected from the B and C horizon, at an average depth of 9-12 inches. Silt and water samples were also collected from the drainage channel at the point of their intersection with a grid line. Seventy rock chips were taken from the rock types outcropping on the property. The -80 mesh fraction of the soils and silts was analysed for copper and molybdenum (See Appendix II for methods of analysis). pH determinations were made on every fifth soil and on all silt and water samples. The analytical results for copper and molybdenum on all samples are shown in Figure 5.

Copper and molybdenum values for soils and silts were processed statistically. For each element frequency histograms were constructed and anomalous ranges, established from inspection of the resultant graphs, were placed at 3, 5 and 7 times the mode. These are tabulated below.

Molybdenum in Soils & Silts

| | | | |
|---|---|---|---|
| Background | 0 | - 4.5 | ppm |
| Positive | 4.6 | - 7.5 | ppm |
| Anomalous | 7.6 | - 10.5 | ppm |
| Highly Anomalous | | > 10.5 | ppm |

Molybdenum in Water

| | |
|---|---|
| Background | 0-2 ppb |
| Anomalous | > 2 ppb |

| Copper in Soils & Silts | | Copper in Water |
|---|---|---|
| Background | 0 - 75 ppm | Undectable in most samples |
| Positive | 76 -125 ppm | |
| Anomalous | 126 -175 ppm | |
| Highly Anomalous | 175 ppm | |

Description of Anomalies

Contrast of the molybdenum soil anomalies locally exceeds 20X the threshold of 4.5 ppm, although the normal range of anomalous values is 2 to 10X threshold. These anomalous samples form a broad belt north of Gavin Lake. Maximum homogeneity of the anomaly is apparent between grid lines 0-16E becoming more diffuse eastwards. Only an occasional isolated value exceeding threshold is encountered east of line 63E. The drainage regime between lines 0-16E is of particular interest; a long, homogeneous molybdenum dispersion train is evident, having high contrast (20X threshold) in both silt and water.

Soil copper anomalies demonstrate low to moderate contrast (4 x 5X threshold of 75 ppm). They are diffuse and irregular in shape, occur throughout the property and are not contained by the boundary of the soil molybdenum anomaly. Although the majority of values are only in the positive (76-125 ppm) range, a significant proportion fall between 150 and 400 ppm. Unlike molybdenum, copper is undectectible in water samples and the dispersion train in silt is short and inhomogeneous. pH values for silts and waters are within the range 7.0 to 8.0. Although the pH range for soils is 4.5 - 7.5 the majority of samples are within the limits 7.0 - 7.5.

The rock chips are from two categories

1) quartz monzonite porphyry
2) volcanic and sedimentary rock types

Background for the first group, where there is no visible copper or molybdenum mineralization, has been established at 5 ppm Mo and 20 ppm Cu. The volcanic rocks, however, have a high copper background, within the range 100 - 200 ppm.

Environments

Two distinct secondary environments can be identified within the area covered by the grid. The hill slope, north of Gavin Lake, is dissected by a number of small valleys and impeded drainage in several of these depressions has led to the formation of black or dark brown, humus-enriched gleysols.

On the steeper valley slopes, where more effective drainage prevails, wooded brown or grey soils have developed beneath a mature vegetation cover. The A horizon of a typical soil profile consists of a thick layer of partially decomposed vegetation (Ao horizon) above a dark brown humic-rich loam ($A_1$ horizon). A medium to dark-brown or medium-grey loamy clay represents the B soil horizon which grades into a parent boulder clay of variable thickness. As a result of coarser textured material in the soil horizon wooded brown podzolic soils have developed locally on hill tops.

The soil catena may be summarized as follows:

1) Wooded brown podzols on the hill tops
2) Wooded brown or grey soils on the hill slopes with local gleying and humus enrichment
3) Appreciable development of humic gleysols in depressions and on the margins of the lake.

The drainage regime is an oxidizing, weakly alkaline environment, although organic material in the channels may lower

the pH. It is probable that a significant variation in hydrology occurs during the late spring.

Conclusions

1) A large zone of anomalous molybdenum in soils bears a close spatial relationship to sub outcrop of mineralized quartz monzonite porphyry.

2) Higher background of copper in the volcanic rock types may account for the diffuse anomalous pattern shown by copper throughout the property.

3) Regional physiography indicates a glacial advance from the northwest or southeast. Boulder clay may reach 30-40 feet thick on the margins of the lake and in the eastern half of the property. High values of copper and molybdenum in these areas, where not directly the result of organic accumulations, are probably the result of glacial transport of mineralized boulders. On the steeper valley slopes copper and molybdenum in the shallow overburden cover is a direct reflection of the abundance of these metals in the underlying bedrock.

4) The large homogeneous molybdenum soil anomaly, reflected by high values of both silt and water samples, suggests active mobilization of molybdenum by weakly alkaline ground water. This would be initiated by interaction of the water table with weathered mineralized host rock. The process of leaching of molybdenum probably reaches a maximum during spring run-off. The pH of the ground water inhibits the dispersion of copper and as a result diffuse, isolated soil anomalies develop and negligible copper concentration is evident in the water. Close correlation occurs between high contrast copper and/or molybdenum anomalies

and reducing, humus-enriched environments.

## MAGNETOMETER SURVEY

### Summary and Conclusions

The ground magnetometer survey undertaken on the Gavin Lake Copper-Molybdenum Property in south-central British Columbia failed to be a diagnostic tool in differentiating lithologies. An east-west magnetic trend and several northwest magnetic trends occur and are interpreted as conjugate fault structures. The central east-west trend coincides with the major axis of the elongate quartz monzonite porphyry dyke swarm and may represent a deep-seated structural break which controlled emplacement of the porphyry. There is no direct correlation between copper-molybdenum mineralization and specific magnetic highs and lows. However, faults interpreted from the magnetic pattern coincide with some of the surface showings.

### Procedure

#### Introduction and Theory

The magnetism of all rocks is controlled by their content of ferromagnetic material; i.e., substances possessing a relatively high magnetic susceptibility and capable of acquiring permanent magnetization. The different lithologies can be distinguished by their magnetic properties.

Often, intrusions are accompanied by widespread hydrothermal alteration zones in which ferromagnetic minerals may be redistributed to the periphery of the alteration. Thus a magnetometer survey may also aid in outlining zones of alteration and related mineralization.

Geological mapping of the Gavin Lake Property is

restricted by extensive overburden; consequently, a magnetometer survey was undertaken in an attempt to aid in the geological interpretation of the property.

Control Grid

Control for the survey consists of a 16,400 foot base line trending 120° azimuth and extending from 1200 feet west to 15,200 feet east and a parallel tie line cut 6000 feet south of the base line. Picket lines at 030° azimuth connect and extend beyond the base and tie lines at a spacing of 400 feet between 12W and 96E. The spacing is increased to 800 feet from 96E to 152E. The eastern end of the base line is off-set approximately 700 feet south to avoid a large marsh (See Figure 6). A total of 51.5 line miles were surveyed with a 100 foot station interval.

Instrument and Technique

The instrument used was the Model MF-1 magnetometer manufactured by Sharpe Instruments, a division of Scintrex Limited, Downsview, Ontario. It operates on the fluxgate principle and measures the vertical component of the earth's magnetic field.

The MF-1 has a temperature stability of less than 2 gammas per °C (1 gamma per °F).

The MF-1 measurement range is from +100,000 gammas to -100,000 gammas and, on the most sensitive scale, the sensitivity is 20 gammas per scale division or a readability of 10 gammas.

The MF-1 is a hand-held instrument and needs only coarse levelling and north orientation.

The MF-1 latitude adjustment was employed to establish

a background of approximately 100 gammas so that the majority of the readings would be observed on the most sensitive 1000 gamma scale.

The magnetometer survey was done in two parts; during the spring (April 1970) readings were obtained on the ice of Gavin Lake by L. Tattersall. During the summer (May and June 1970), when the rest of the grid had been cut, the land portion of the survey was completed by L. LeBel.

In April the east-west base line was surveyed at 100 foot intervals starting from the origin, working easterly to 144E and then returning to the origin to make the necessary diurnal corrections. Using the corrected values of the base line stations as references, 100 foot station intervals were read on the cross lines. The operator, in doing the cross lines, would begin a traverse at the baseline, proceed northerly or southerly to the end of the line, cross over to the adjacent line, return to the base line and loop back to his starting point. This enabled him to apply reference and diurnal corrections to his recordings.

Upon resuming the survey in the summer the now-extended base line was resurveyed as above and the results compared to the previous survey. Although the values at the same station points were not identical, the relative values along the baseline remained the same. The cross lines surveyed during the winter were recorrected to the second values obtained for the baseline. In making this correction only the reference correction was affected while the diurnal correction remained unchanged. The unsurveyed lines were completed by looping to the base line as

outlined previously.

The results, now all corrected to the same datum, were plotted and contoured at 200 gamma intervals. The final map on a scale of 1" = 400' is Figure 6 (in pocket). Note that magnetometer readings were not obtained over the lake along lines 52E, 72E and 96E-120E inclusive.

Results and Discussion

Magnetic boundaries between the major rock types on the property are not sufficiently distinct to accurately locate geological contacts. Unfortunately the quartz monzonite porphyry occurs more or less as a dyke swarm intermingled with the sediments and does not display a unique magnetic signature. However, a subtle change in the magnetics is recognized across a major east-west magnetic trend parallel to and just north of Gavin Lake. South of this feature readings are generally from -200 to +200 gammas with very gentle gradients; this area is underlain by sedimentary strata, mainly volcanic siltstones. North of this feature the magnetics are not as uniform. The quartz monzonite which straddles the east-west trend is characterized by values between 0 and 400 gammas. The sediments on the north side of the intrusion display the highest magnetic gradients.

Possible reasons for the difference in magnetic activity north of the central feature may be (a) minor recrystallization and concentration of ferromagnetic minerals along the northern intrusive contact, (b) more abundant, higher susceptibility volcanic flows interbedded with the volcanic sediments on the north side, and/or (c) less overburden thickness on the

north side (0-10') compared to up to 200 feet beneath the lake on the south side.

In the north-western portion of the claims a second set of northwest trends is evident and is parallel to the regional aeromagnetic trend. The two magnetic highs in this area are unexplained by surface geological observations. Other small localized highs are essentially one-station anomalies and are probably due to erratics in the overburden.

The two dominant magnetic trend directions intersect at angles common for a conjugate fault system, and are interpreted as such. These trends and other magnetic features are illustrated in Figure 6.

C.J. Hodgson

AMAX Kamloops Office

November, 1970

C.J. Hodgson. P.Eng. (B.C.)

APPENDIX I ASSESSMENT DATA

GAVIN and WET Claims

Work done on Gavin #1 - #18 inclusive and
Wet #1 - #48 inclusive

from March 1 to October 24, 1970.

| | |
|---|---|
| Geological Survey | - 4 square miles |
| Geochemical Survey | - 4 square miles |
| Geochemical Analyses | - 1368 samples |
| Magnetometer Survey | - 51.5 line miles |
| Line Cutting | - 28.1 line miles |

Personnel Employed

| | |
|---|---|
| C.J.Hodgson-Geologist I/C; | 601-535 Thurlow Street, Vancouver 5, B.C. |
| G.M.DePaoli-Geophysicist; | 601-535 Thurlow Street, Vancouver 5, B.C. |
| R.F.Horsnail-Geochemist; | 601-535 Thurlow Street, Vancouver 5, B.C. |
| R.E.W.Lett-Geochemist; | 601-535 Thurlow Street, Vancouver 5, B.C. |
| R.J.Bailes-Sr.Assistant; | 36 Greenwich Bay, Winnipeg 9, Manitoba |
| D.C.Smith-Sr.Assistant; | 14 Pirie's Lane, Aberdeen, Scotland |
| P.J.Vanstone-Sr.Assistant; | P.O. Box 39, Bowmanville, Ontario |
| T.R.Underwood-Jr.Assistant; | Box 150, Montrose, B.C. |
| A.S.C.Lau-Jr.Assistant; | 2105 E 61 Ave., Vancouver 16, B.C. |
| J.M.Muff-Jr.Assistant; | 11 Millcrest Ave., Deep River, Ontario |
| D.J.Matier-Jr.Assistant; | 1003-1640 Alberni St., Vancouver, B.C. |
| J.L.LeBel-Mag.Operator; | R.R.#4, Belleville, Ontario |
| A.A.Almond-Prospector; | P.O. Box 242, Vanderhoof, B.C. |
| L.E.Tattersall-Prospector; | General Delivery, Williams Lake, B.C. |
| K.F.Zurbuchen-Cook; | General Delivery, Williams Lake, B.C. |

Salaries

| | | | |
|---|---|---|---|
| C.J.Hodgson | 20 days @ $55.00/day | $1,100.00 | |
| G.M.DePaoli | 3 days @ $45.00/day | 135.00 | |
| R.F.Horsnail | 2 days @ $60.00/day | 120.00 | |
| R.E.W.Lett | 3 days @ $38.00/day | 114.00 | |
| R.J.Bailes | 24 days @ $26.00/day | 624.00 | |
| D.C.Smith | 25 days @ $25.00/day | 625.00 | |
| P.J.Vanstone | 31 days @ $21.16/day | 655.96 | |
| T.R.Underwood | 20 days @ $17.50/day | 350.00 | |
| A.S.C.Lau | 27 days @ $15.83/day | 427.41 | |
| J.M.Muff | 36 days @ $16.67/day | 600.12 | |
| D.J.Matier | 16 days @ $15.83/day | 253.28 | |
| J.L.LeBel | 25 days @ $20.00/day | 500.00 | |
| A.A.Almond | 20 days @ $30.00/day | 600.00 | |
| L.E.Tattersall | 75 days @ $25.00/day | 1,875.00 | |
| K.F.Zurbuchen | 25 days @ $21.67/day | 541.75 | |
| | | | $8,521.52 |

Board - 342 man days @ $5.00/day 1,710.00

| | |
|---|---|
| Geochemical Sample Analyses | |
| 1360 samples for Cu and Mo @ $2.00/sample | $2,736.00 |
| Magnetometer Rental | |
| 25 days @ $9.00/day | 225.00 |
| Report Preparation | |
| Including drafting and typing | 200.00 |
| | Total $13,392.00 |

C J Hodgson

# APPENDIX II

## SAMPLE HANDLING PROCEDURE

# 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

R.F. Horsnail

## 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 mls 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.

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 to the AMAX geochemical laboratory in Vancouver.

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 $\frac{1}{2}$ 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

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 85% 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 290B 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 $Ag_2SO_4$ dissolved in 20 mls $Hx10_3$ and dilute to 500 mls

2. 100 gamma/ml Ag - 10 mls of above + 20 mls $HClO_4$, 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% $HClO_4$. 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 calculated in oz/ton.

1 ppm = .0292 oz/ton

conversion factor

oz/ton = .0292 x ppm Ag

Zn Geochemical AA Setting

Lamp Zn

Current 8 #3 Slit 20A

Wave length 2138 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, $H_2O$, HCl, $HNO_3$, $HClO_4$, fumed to $HClO_4$ - make up to 100 mls $H_2O$

1000, 100 gamma/ml and 100 ml by dilution in 20 % $HClO_4$

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% $HClO_4$ 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, HNO, and fumed into $HClO_4$, dilute to 1 liter

Pipette

1, 2, 10, 20 mls into 100 ml vol flasks diluted to mark with 20% $HClO_4$

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

Pippette

.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% $HClO_4$. 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 $N_2O$ 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/ml

Dissolve .750 gms $MoO_3$ (acid molybdic) with 20 mls $H_2O$, 6 lumps NaCH, 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% $AlCl_3$ and dilute to 100 mls with 20% $HClO_4$

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/ml

Weigh 5.000 gms iron wires, into beaker, add $H_2O$, HCl, $HNO_3$, $HClO_4$, heat to $HClO_4$ fumes. Add $HClO_4$ to 100 mls + 100 mls $H_2O$, warm, dilute to 500 mls

Pipette

1, 5, 10, 20, 30, 50, 80 mls 10,000 gamma/ml dilute to 100 mls with 20% $HClO_4$ 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

Fule - 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 118

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

Standards 10,000 gamma/ml

1.000 gm pure Ni metal dissolved in HCl, $HNO_3$, $HClO_4$ to perchloric fumes, dilute to 100 ml $H_2O$

1000 gamma/ml and 100 gamma/ml Successive 10x dilutions in 20% $HClO_4$

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 Ni

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, $H_2O$, HCl, $HNO_3$ until dissolved, add $HClO_4$, fume dilute to 100 mls

1000 gamma/ml 10x dilution above in 20% $HClO_4$

2000 gamma/ml 20 mls 10,000 gamma/ml - dilute to 100 mls in 20% $HClO_4$

100 gamma/ml 10x dilution 1000 gamma/ml dilute to 100 mls in 20% $HClO_4$

200 gamma/ml 10x dilution 2000 gamma/ml dilute to 100 mls in 20% $HClO_4$

Pipette

1, 2, 3, 5, 8, 10 mls 100 gamma/ml - dilute to 100 mls with 20% $HClO_4$ 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 $HNO_3$, fumed to $HClO_4$ make up to 100 mls in 20% $HClO_4$

1000 gamma/ml and 100 gamma/ml Successive 10x dilutions in 20% $HClO_4$

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% $HClO_4$ 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 $Na_2CO_3$

4 parts NaCl

1 part $KNO_3$ pulverized to -80 mesh

7% $SnCl_2$ in 70% HCl

20% KSCN in $H_2O$

Extractant - 1 part tri-n-butyl phosphate

9 parts carbon tetrachloride

Standards

1000 gamma/ml W

.18 gms $Na_2WO_4$ $2H_2O$ dissolved in $H_2O$, 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 read for one minute)
3. Cool, add 10 mls $H_2O$, 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 $SnCl_2$, 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 lemmon 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 $SnCl_2$
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 $H_2O$, 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 $H_2O$ to methanol to match. Seal tightly

$SnCl_2$ - 15% in 15% HCl

300 gm $SnCl_2 \cdot 2H_2O$ + 300 mls HCl, until $SnCl_2$ dissolved dilute to 2 liters

KSCN - 5% in $H_2O$

Mixed $SnCl_2$ - KSCN

3 parts $SnCl_2$ to 2 parts KSCN

Water Samples Run for AA

1. Cu - 2 gamma/ml reads 80 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 $H_2O$, shake for one hour. Add 46.3 grams ferric perchlorate [ $Fe(ClO_4)_3 \cdot 6H_2O$ ] (GFS 39) and 47 grams aluminum perchlorate [ $Al(ClO_4)_3 \cdot 8H_2O$ ] (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 Acumet 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.

C. J. Hodgson

DOMINION OF CANADA:

PROVINCE OF BRITISH COLUMBIA.

TO WIT:

**In the Matter of** expenses incurred on the Gavin Lake Property, Gavin 1-18 incl. & Wet 1-48 incl. between 1 March and October 24, 1970.

I, C.J. Hodgson

of 601 - 535 Thurlow St., Vancouver 5, B.C.

in the Province of British Columbia, do solemnly declare that

I - I am Agent for Amax Exploration, Inc. and as such am duly authorized to make this declaration.

II - The detailed account of expenses incurred on Gavin 1-18 incl., and Wet 1-48 incl. mineral claims between March 1 and October 24, 1970 is as follows:-

PAGE 2

| SALARIES | | | | | |
|---|---|---|---|---|---|
| C. J. Hodgson | - | 20 days | @ $55.00/day | = | $1,100.00 |
| G. M. DePaoli | - | 3 " | @ 45.00/day | = | 135.00 |
| R. F. Horsnail | - | 2 " | @ 60.00/day | = | 120.00 |
| R.E.W. Lett | - | 3 " | @ 38.00/day | = | 114.00 |
| R. J. Bailes | - | 24 " | @ 26.00/day | = | 624.00 |
| D. C. Smith | - | 25 " | @ 25.00/day | = | 625.00 |
| P. J. Vanstone | - | 31 " | @ 21.16/day | = | 655.96 |
| T. R. Underwood | - | 20 " | @ 17.50/day | = | 350.00 |
| A.S.C. Lau | - | 27 " | @ 15.83/day | = | 427.41 |
| J. M. Muff | - | 36 " | @ 16.67/day | = | 600.12 |
| D. J. Matier | - | 16 " | @ 15.83/day | = | 253.28 |
| J. L. LeBel | - | 25 " | @ 20.00/day | = | 500.00 |
| A. A. Almond | - | 20 " | @ 30.00/day | = | 600.00 |
| L. E. Tattersall | - | 75 " | @ 25.00/day | = | 1,875.00 |
| K. F. Zurbuchen | - | 25 " | @ 21.67/day | = | 541.75 |
| | | | | | $ 8,521.52 |
| BOARD - ~~352~~ 342 man days @ $5.00/day | | | | | 1,710.00 |
| GEOCHEMICAL SAMPLE ANALYSES - 1368 samples for Cu & Mo @ $2.00 | | | | | 2,736.00 |
| MAGNETOMETER RENTAL - 25 days @ $9.00/day | | | | | 225.00 |
| REPORT PREPARATION - including drafting and typing | | | | | 200.00 |
| | | | | | $13,392.00 |

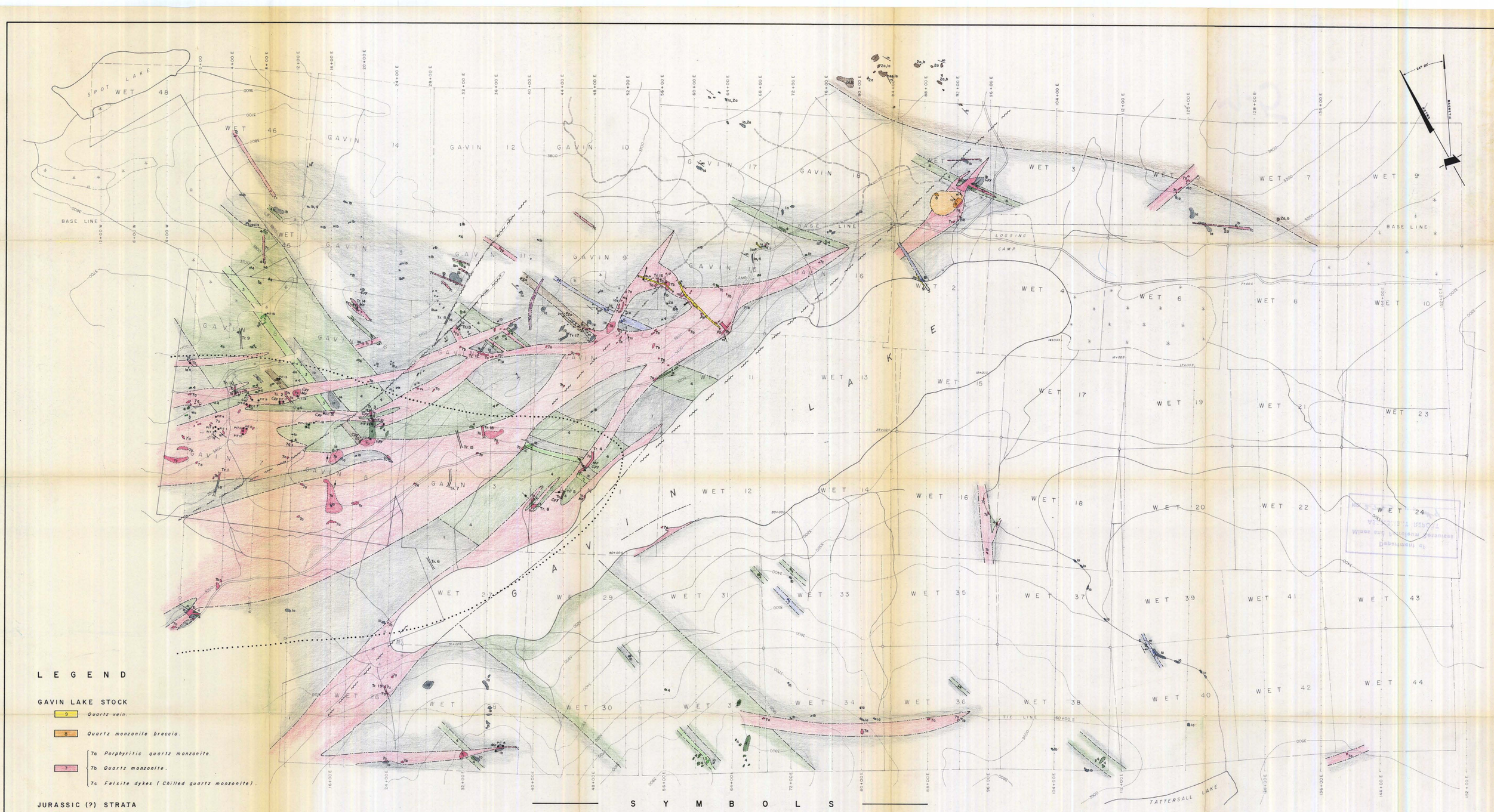
✓ REPORT TO BE FILED BY NOV. 26/70 ✓ cjh

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of the same force and effect as if made under oath and by virtue of the "Canada Evidence Act."

Declared before me at the Town of Quesnel, in the Province of British Columbia, this 26 day of October, 1970, A.D.

C. J. Hodgson

*A Commissioner for taking Affidavits within British Columbia* or
*A Notary Public in and for the Province of British Columbia.*




## LEGEND

### GAVIN LAKE STOCK

- 9 — Quartz vein.
- 8 — Quartz monzonite breccia.
- 7 — 7a Porphyritic quartz monzonite. 7b Quartz monzonite. 7c Felsite dykes (Chilled quartz monzonite).

### JURASSIC (?) STRATA

- 6 — Minette dyke.
- 5 — Andesite porphyry.
- 4 — Basalt.
- 3 — Potassic basalt.
- 2 — 2a Volcanic conglomerate; 2b Breccia.
- 1 — 1a Banded siltstone; 1b Argillite.

## SYMBOLS

- Outcrop boundary.
- Geological contact (defined, approximate, assumed).
- Fault (approximate, assumed).
- Attitude of sedimentary bedding.
- Attitude of quartz and quartz, K feldspar veins.
- Limit of area of quartz and quartz, K feldspar veining.
- Mo, Cpy, Pb — Mineral occurrences (Molybdenite, Chalcopyrite, Galena).
- Diamond drill hole.
- Tr 18 — Old trench; Trench, trench number.
- PIT 16 — Pit, pit number.
- Claim post, claim location line.
- Claim boundary line.
- Swamp.
- Stream.
- Road, Trail.
- Gravel pit.
- Western boundary of Gavin Lake Property.
- 3500 — Topographic contour (contour interval 100').

NOTE — Geology by C.J. Hodgson, R. Bailes, D. Smith.

2733 M-4

C.J. Hodgson

AMAX EXPLORATION INC.

# GAVIN LAKE COPPER - MOLYBDENUM PROPERTY

CARIBOO MINING DIVISION — BRITISH COLUMBIA

## GEOLOGICAL MAP

SCALE 1" = 400'

| DATE REVISED | | DATE REVISED | | Drawn by: H.C.P. Date: 4/11/70 N.T.S. File: 93 A 5. | FIG. 4 |
|---|---|---|---|---|---|

To accompany report "GAVIN LAKE COPPER - MOLYBDENUM PROPERTY" by: G.M. DePaoli, R.E.W. Lett, C.J. Hodgson. Nov. 70

## SYMBOLS

- Soil sample ; sample number ; p.p.m. Mo, Cu.
- Silt sample, sample number, p.p.m. Mo, Cu.
- Water sample, sample number, p.p.b. Mo, Cu.
- Rock chip sample, sample number; p.p.m. Mo, Cu.
- Geological outline of Quartz Monzonite Porphyry.
- Old trench.
- Claim post, claim location line.
- Claim boundary line.
- Swamp.
- Stream.
- Road, trail.
- Gravel pit.
- Western boundary of Gavin Lake Property.
- Topographic contour (contour interval 100').

**RANGE ( p.p.m.)**
**MOLYBDENUM IN SOIL AND SILT**

- 0 - 4 Background.
- 5 - 7 Positive.
- 8 - 10 Anomalous.
- >10 Highly Anomalous.

**RANGE ( p.p.b.)**
**MOLYBDENUM IN WATER**

- 0 - 2 Background.
- >2 Anomalous

Sampling by :-

- OWV samples P. Vanstone
- OWL samples A. Lau
- OWR samples R. Lett

2733 M-5

AMAX EXPLORATION INC.

# GAVIN LAKE COPPER - MOLYBDENUM PROPERTY

CARIBOO MINING DIVISION — BRITISH COLUMBIA

## GEOCHEMICAL MAP

SCALE 1" = 400'

| | | | |
|---|---|---|---|
| DRAWN | | Drawn by: H.C.P. | |
| TRACED | | Date 2/11/70 | |
| PRINTED | | N.T.S. File 93 A 5. | FIG. 5 |

To accompany report "GAVIN LAKE COPPER - MOLYBDENUM PROPERTY" by: G.M. DePooli, R.E.W. Lett, C.J. Hodgson. Nov. 70

SPOT LAKE

BASE LINE

GAVIN 1 GAVIN 2 GAVIN 3 GAVIN 4 GAVIN 5 GAVIN 6 GAVIN 7 GAVIN 8 GAVIN 9 GAVIN 10 GAVIN 11 GAVIN 12 GAVIN 13 GAVIN 14 GAVIN 15 GAVIN 16 GAVIN 17 GAVIN 18

WET 1 WET 2 WET 3 WET 4 WET 5 WET 6 WET 7 WET 8 WET 9 WET 10 WET 11 WET 12 WET 13 WET 14 WET 15 WET 16 WET 17 WET 18 WET 19 WET 20 WET 21 WET 22 WET 23 WET 24 WET 25 WET 26 WET 27 WET 28 WET 29 WET 30 WET 31 WET 32 WET 33 WET 34 WET 35 WET 36 WET 37 WET 38 WET 39 WET 40 WET 41 WET 42 WET 43 WET 44

CROSSING

CAMP

TIE LINE

TATTERSALL LAKE

MAGNETIC NORTH

## SYMBOLS

- Old trench.
- Claim post, claim location line.
- Claim boundary line.
- Swamp.
- Stream.
- Road, trail.
- Gravel pit.
- Western boundary of Gavin Lake Property.
- Topographic contour (contour interval 100').

## LEGEND

- Picket line, magnetometer survey readings in gammas (negative, positive).
- Isomagnetic contour.
- Magnetic depression
- P Geological outline of Quartz Monzonite Porphyry.

Instrument: Scintrex MF-1 Fluxgate Magnetometer.
Contour interval: 200 gammas.

Magnetic Interpretation
- Possible fault.
- Area of high magnetic susceptibility.

Instrument operator: L. Lebel.

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AMAX EXPLORATION INC.

GAVIN LAKE COPPER-MOLYBDENUM PROPERTY
CARIBOO MINING DIVISION — BRITISH COLUMBIA

# MAGNETOMETER SURVEY MAP

SCALE 1" = 400'

| DATE REVISED | DATE PRINTED | |
|---|---|---|
| | | Drawn by: H.C.P. |
| | | Date 6/11/70 |
| | | N.T.S. File 93 A 5 |

FIG. 6

To accompany report "GAVIN LAKE COPPER-MOLYBDENUM PROPERTY" by: G.M. DePaoli, R.E.W. Lett, C.J. Hodgson Nov. 70