

819

1965 FINAL REPORT  
KITIMAT RIVER MoS<sub>2</sub> PROPERTY  
SKEENA MINING DIVISION  
103 I 1

Vancouver Office  
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REFERENCES

- (1) Duffell, S., and Souther, J.G.; 1964 Geology of Terrace Map-Area, British Columbia (1031E $\frac{1}{2}$ ), G.S.C. Memoir 329, Ottawa
- (2) Moorehouse, W.W.; 1961 The Study of Rocks in Thin Section, Harper GeoScience Series.

## SUMMARY

The Kitimat River MoS<sub>2</sub> Property covers a new molybdenite occurrence which was found, and subsequently staked by, Southwest Potash Corporation's 1965 Central B.C. Prospecting Program. The property is accessible only by helicopter and is located about 32 airmiles SE of Terrace, B.C., on the upper reaches of the Kitimat River.

In addition to establishing a base camp, work done in 1965 included preliminary prospecting and geological mapping, surface sampling, geochemical sampling and an I.P. Survey totalling 8.5 line-miles. About 10% of the west central portion of the property was mapped in detail; therefore, this is essentially a preliminary report.

Two main showings are exposed in the outer two of three main V-shaped valleys which are deeply incised in the steep wall of the Kitimat River valley in the central portion of the property (See Plate I). Molybdenum mineralization is associated with weakly developed iron staining which is discontinuously exposed, in creek beds and on talus slopes, for a total distance of 30,000 feet along the west wall of the main valley. The width of the iron stained zones is greatest (5,800 feet) in the west-central part of the property, and tapers at



the northern and southern extremities of the claim group to 1,300 and 2,600 feet respectively.

The showings occur in igneous rocks and are located on the east flank of the Coast Range Batholithic Complex within five miles of the main contact with the Hazelton Group. A large mass of "greenstones", thought to be a roof pendant of altered Hazelton rocks, is exposed in the central and north-west portion of the property. In contrast to the surrounding batholith, which is mainly granodioritic in composition, six intrusive facies ranging from granitic quartz feldspar porphyry to soda granite, granodiorite, andesite and basalt, have been noted on the property.

The two main zones of molybdenum mineralization (Mantle and Gossan Creeks) are 8,500 feet apart.  $\text{MoS}_2$  occurs in each zone for horizontal distances of 2,000 to 2,500 feet and through a vertical distance of about 1,000 feet at elevations from 2000 to 3500 feet. Both zones have yet to be fully delimited. The  $\text{MoS}_2$  in these zones is very fine grained and occurs in four main forms:

(i) along the margins of narrow (< 1/2") quartz veins where it is frequently associated with small amounts of pyrite, hematite and chalcopyrite.

(ii) associated with pyrite and chalcopyrite on dry

fractures.

(iii) as disseminations in the quartz feldspar porphyry.

(iv) as a minor constituent of weakly to well developed quartz vein stockworks.

The weighted average of the surface samples taken in 1965 is 0.03% MoS<sub>2</sub> and 0.03% Cu, but locally derived MoS<sub>2</sub>-bearing float assaying 0.13 to 0.38% MoS<sub>2</sub>, indicates that some exposures of higher grade material are still to be located.

Barren and MoS<sub>2</sub>-bearing quartz vein stockworks localized in three major intrusive facies occur from Mantle to Gossan Creeks. In the Gossan Creek porphyry, stockworks carrying minor MoS<sub>2</sub> occur in areas 2200 feet apart. The average intensity of veining is 4-8 veins per square foot but locally there are 12-15 veins per square foot. Some porphyry float with as many as 10-15 hairline veins per square inch and carrying accessory MoS<sub>2</sub> has been found in the creek bed. In Mantle Creek three separate stockworks roughly 150 feet wide occur over a distance of 2,000 feet. The average intensity of veining in these weakly mineralized stockworks is about 4-6 veins per square foot.

Preliminary geochemistry indicates that the showings are associated with extensive anomalies. The MoS<sub>2</sub>-bearing quartz feldspar porphyry lies in the west half of an anomaly

5000 x 2000 feet (maxima) defined by highly anomalous waters, and the Mantle Creek showings are associated with a weak soil anomaly 3,300 feet long. Anomalous rock chips of granite (13 samples average 162 ppm Mo) in the Hony Group, 13,000 feet south of the Gossan Creek anomaly, illustrate the wide distribution of MoS<sub>2</sub> on the property.

Hydrothermal alteration occurs in widely separated areas, and, locally, is intensely developed. Pyritization, silicification, K-feldspathization, sericitization, argillization and hematization are associated with the MoS<sub>2</sub>, as are minor amounts of manganese oxides. No alteration zoning pattern has yet been established.

The structural picture is very incomplete, but dykes, faults, shears, and quartz vein stockworks indicate that the MoS<sub>2</sub> is associated with a structurally anomalous area.

A preliminary I.P. Survey of 8.5 line-miles in the west-central portion of the property did not reveal any large amounts of pyrite.

The property has many commendable features. These may be summarized as follows:

- (i) MoS<sub>2</sub> occurs over large areas in widely separated localities.
- (ii) The mineralized zones have not been fully delimited

and are associated with geochemical anomalies of even greater extent.

(iii) The  $\text{MoS}_2$  is very fine grained.

(iv) The area has a complex igneous history.

(v) Pervasive hydrothermal alteration is widespread and, locally, is intense.

(vi) Pyrite is widespread.

(vii) Single quartz veins and quartz vein stockworks occur in two zones 8,500 feet apart.

(viii) The area occupies a position near the roof of the main batholith.

(ix) The granitic quartz feldspar porphyry carries disseminated  $\text{MoS}_2$  and may be the source of the molybdenum mineralization.

#### CONCLUSIONS

1) The Kitimat River  $\text{MoS}_2$  property holds considerable promise and warrants thorough testing over a period of at least two field seasons.

2) Much detailed surface work over large, rugged and poorly exposed areas must be completed before specific drill targets can be outlined.

RECOMMENDATIONS

Detailed surface work is recommended for the property in the 1966 field season and consists of:

- 1) Cutting approximately 35 line-miles of grid.
- 2) Geological mapping on a scale of 1"=100 feet in the grid areas, and 1"=500 feet outside the grids on the west side of the Kitimat River.
- 3) Intensive prospecting and geochemistry in the grid areas and the Hony Group.
- 4) Detailed prospecting and geochemistry along creeks on the east side of the Kitimat River.
- 5) Surface sampling of all accessible areas.
- 6) Pitting and trenching where necessary and feasible

The estimated cost of the above program is \$61,300 (Canadian).

## INTRODUCTION

The Kitimat River MoS<sub>2</sub> Property covers a new molybdenite occurrence which was found by Southwest Potash Corporation's 1965 Central B.C. Prospecting Program. The stain zone with which the molybdenite mineralization is associated was first observed by the writer during a helicopter reconnaissance traverse on the 8th of June.

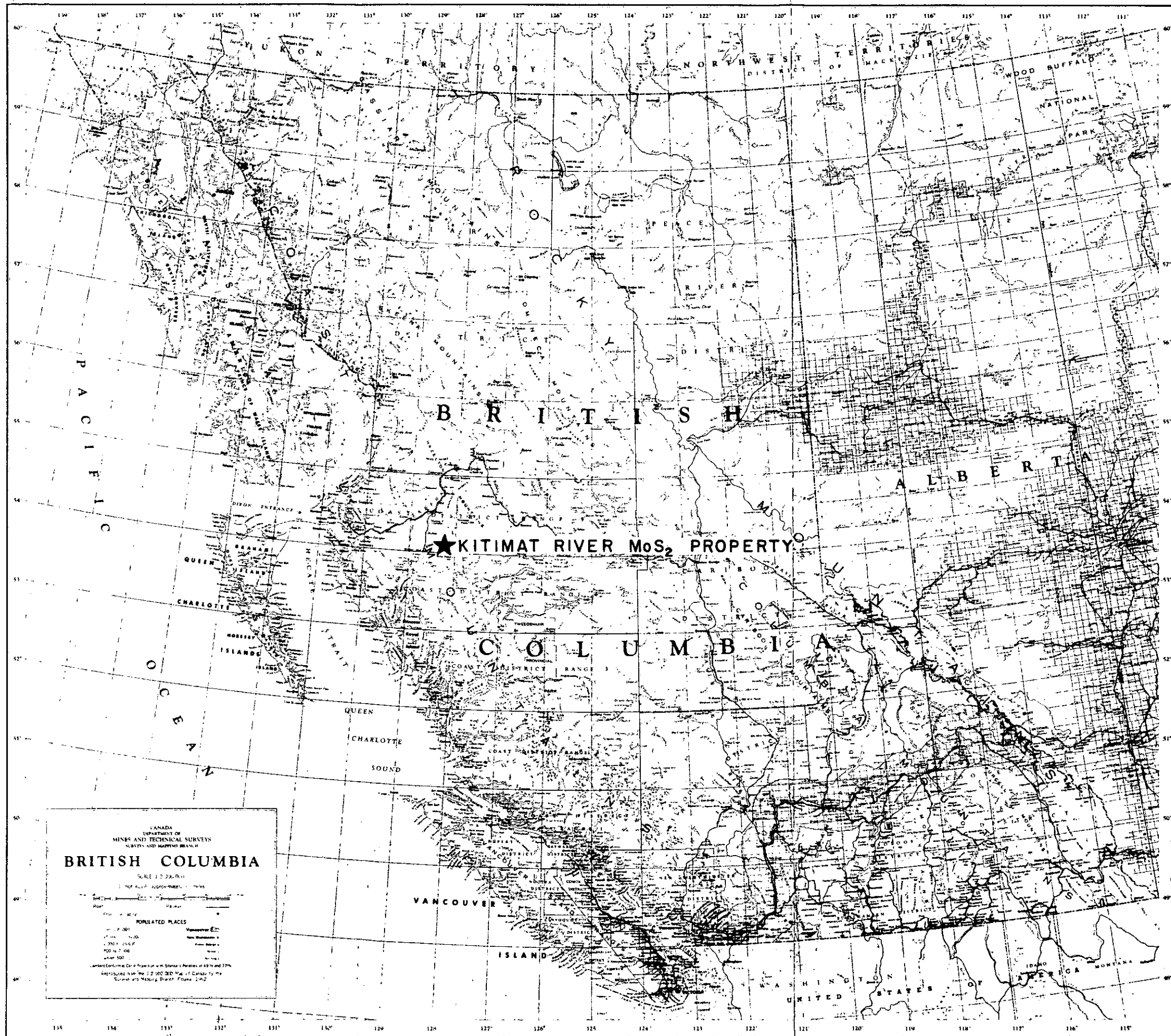
Two prospecting crews were moved into the area on 10th June and within two days had located widespread, but very low grade, MoS<sub>2</sub>. Accordingly, a total of 256 claims were staked from 12th-17th June inclusive by two four-man crews.

This report is concerned with the physical and geological environment of the MoS<sub>2</sub> on the property. It also deals with the work done during the 1965 field season, the exploration potential of the property, and recommendations for the 1966 exploration program.

## LOCATION AND ACCESS

The property is located on the upper reaches of the Kitimat River roughly thirty-two airmiles southeast of Terrace, and about twenty miles upstream from the intersection of the Kitimat River and Highway 25. This intersection, which was used as a helicopter staging area, is approximately twenty-one miles from Terrace and fifteen miles from Kitimat, where a deep-

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT  
NO. 819 MAP # 6



KEY MAP

FIG. 1

water harbour and docking facilities exist (See Figures 1 and 2).

For fourteen of the twenty miles between Highway 25 and the centre of the property, the Kitimat River valley is well braided, has an average width of one mile, and a grade of one and a half percent. For the remaining six miles the river traverses narrow canyons and the valley is severely constricted.

At the present time the property is accessible by helicopter only.

### PROPERTY

Initially the property comprised 256 claims staked in mid-June by personnel of the Central B.C. Prospecting Program acting as agents for Southwest Potash Corporation. Consolidation and restaking of claims in the west-central portion of the property was carried out in the latter half of August and early September, 1965. The relevant data of the 256 claims comprising the present property are given in Table I. (also see Figures 3 and 4).

### PHYSIOGRAPHY

#### Topography

The property lies on the upper reaches of the Kitimat



TABLE I

CLAIM STAKING AND RECORDING DATA

| <u>CLAIM</u> |        | <u>LOCATED</u> | <u>RECORDED</u> |
|--------------|--------|----------------|-----------------|
| Ax           | # 1-18 | 14 June        | 16 June         |
| Frankie      | # 1-22 | 14 June        | 16 June         |
| Hony         | # 1-6  | 1 Sept.        | 3 Sept.         |
| Hony         | # 7-16 | 2 Sept.        | 3 Sept.         |
| Hon          | #17-22 | 13 June        | 16 June         |
| Hon          | #23-28 | 17 June        | 17 June         |
| Ell          | # 1-15 | 27 Aug.        | 30 Aug.         |
| El           | #15-22 | 13 June        | 16 June         |
| El           | #24-28 | 17 June        | 17 June         |
| Bee          | # 1-15 | 21 Aug.        | 27 Aug.         |
| Be           | #13-22 | 13 June        | 16 June         |
| Be           | #26-28 | 17 June        | 17 June         |
| Liza         | # 1-16 | 22 Aug.        | 27 Aug.         |
| Liz          | # 1, 2 | 12 June        | 16 June         |
| Liz          | #13-22 | 13 June        | 16 June         |
| Barbs        | # 1-14 | 24 Aug.        | 27 Aug.         |
| Barbs        | #15-18 | 25 Aug.        | 27 Aug.         |
| Barbs        | #13-26 | 14 June        | 16 June         |
| Melo         | # 1-6  | 26 Aug.        | 30 Aug.         |
| Melo         | # 7-16 | 25 Aug.        | 30 Aug.         |
| Mel          | # 1, 2 | 12 June        | 16 June         |
| Mel          | #13-26 | 13 June        | 16 June         |
| Penny        | # 1-12 | 28 Aug.        | 3 Sept.         |
| Pen          | #13-26 | 13 June        | 16 June         |
| Syl          | # 1-14 | 13 June        | 16 June         |

River in mountainous terrain of the Coast Range physiographic province. Roughly 2/3 of the total number of claims lie to the west of the river which in this area flows approximately north. The topography is generally rugged and steep slopes rise from the floor of the main valley (elevation 1500 feet) to heights of 5000 feet in the mountains nearby. Below 4500 feet the property is covered by heavy growths of Coast Range timber.

In the area of most interest, the west-central portion of the claim group, the steep west side of the main valley is marked by three deep, V-shaped valleys. From north to south they are Gossan, Lamp and Mantle Creeks. Characteristically, slopes on the walls of the V-shaped valleys are either very steep as in Mantle and Lamp Creeks, or precipitous as on the south wall of Gossan Creek where shear cliffs 1500 feet high extend laterally for 2500 feet. Two narrow plateaus between 3500 and 4500 feet elevation separate the three V-shaped valleys. (See Plate I)

The MoS<sub>2</sub> showings are located below timberline on Gossan and Mantle Creeks between elevations of 2000 and 3500 feet.

#### Weather

The annual precipitation at Kitimat River is about

80 inches. Heavy snowfalls occur during the winter months, particularly at higher elevations, and warm rainy weather is the rule during the summer. On occasions the summers can be extremely wet.

With the exception of Gossan Creek where snow banks persist virtually all summer long, the property is probably free of snow below 3000 feet by mid-May. Snowslides are funnelled down Gossan Creek in the early spring and there is evidence of extensive spring flooding along the lower reaches of Mantle, Lamp and Gossan Creeks.

This year snow was recorded at the 2000 foot elevation at the end of the first week in October.

#### Water

Abundant water is available from the Kitimat River and within the drainage systems of its tributaries on the property.

#### Timber

Below the 4500 foot level the property is blanketed by a thick forest cover characterized by large trees and an absence of undergrowth. Hemlock and fir are common, and may be as much as four feet in diameter at the butt, rising to heights of 130 feet. However, much of the timber is overmature

and is rotten at the centre.

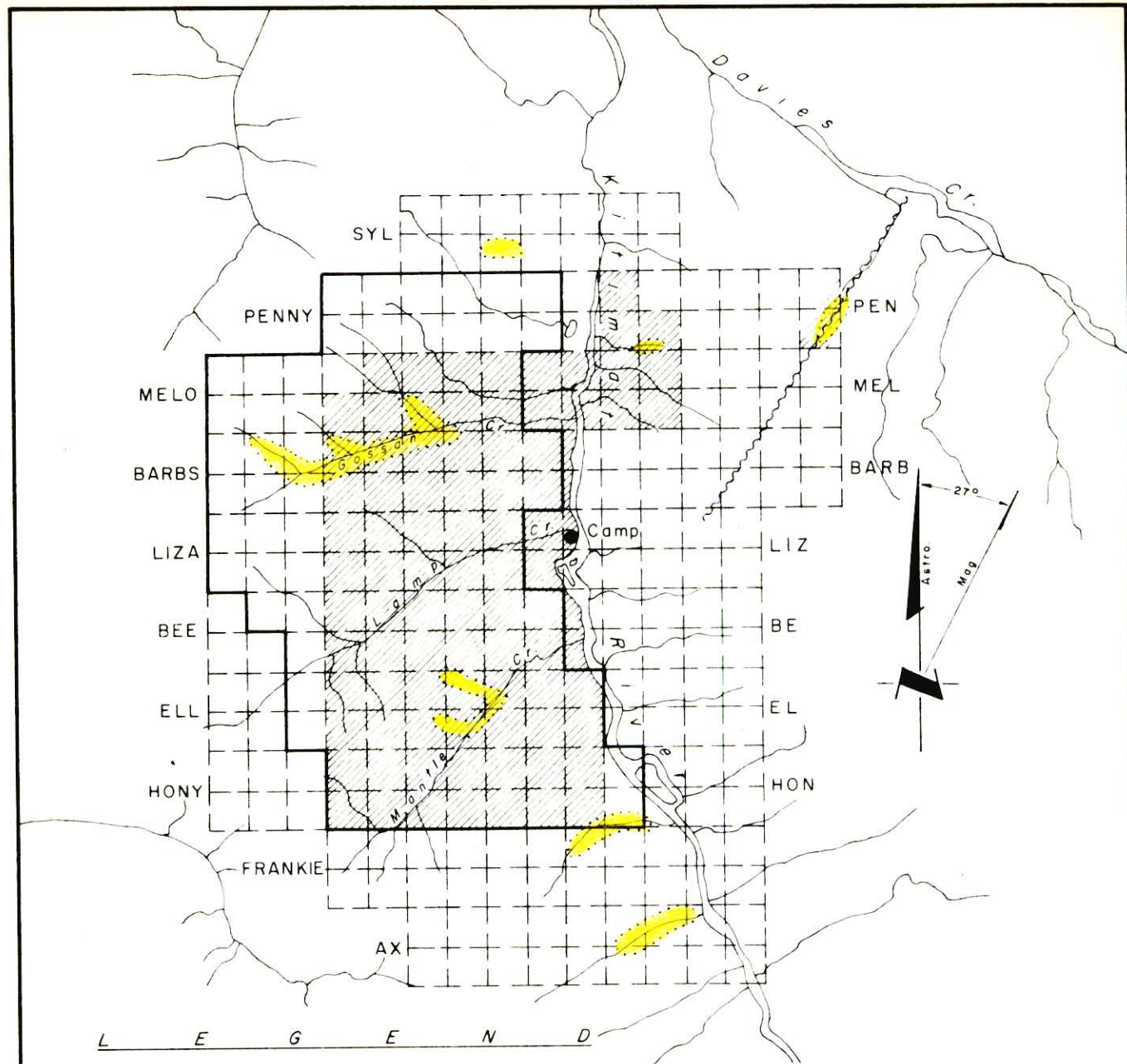
#### WORK DONE IN 1965

A total of three weeks was spent on the initial staking in June and the consolidation and restaking at the end of August. Some preliminary prospecting was carried out in the more remote areas of the property immediately after the initial staking. Also, one two-man crew carried out preliminary prospecting along the creeks in the west-central portion of the property in the period 5th July - 20th August.

Camp construction and preliminary assessment of the property started at the beginning of September. The camp is located three hundred feet south of the confluence of Lamp Creek and the Kitimat River, and consists of a helicopter pad capable of handling an S-55, five wooden tent frames and a winterized washroom.

Geological mapping by two senior assistants, S.J. Carryer and R.H. McMillan, was carried out on a scale of 1"=100 feet in Mantle, Lamp and Gossan Creeks, and on a scale of 1"=500 feet along the claim location lines in the west central area of the property. Preliminary geochemistry was done concurrently with the geological mapping.

An I.P. Survey, conducted by McPhar Geophysics Ltd. totalling 8.5 line-miles was completed during the first three



- |   |                             |  |                        |
|---|-----------------------------|--|------------------------|
|  | IRON STAINED ZONE OUTLINE   |  | SHEAR ZONE             |
|  | BOUNDARY OF RESTAKED CLAIMS |  | CLAIMS WHERE WORK DONE |

SOUTHWEST POTASH CORPORATION

KITIMAT RIVER  $MoS_2$  PROPERTY  
 SKEENA MINING DIVISION — BRITISH COLUMBIA

DISTRIBUTION OF WORK DONE IN 1965

SCALE 1" = 1 MILE

*H. P. Ranken*

Vancouver —

H. P.

FIG. 4

weeks of September.

A total of 61 feet of bedrock was sampled at surface using continuous chip and channel sampling techniques, but this phase of the program was seriously curtailed by a sudden deterioration in weather conditions.

The Kitimat River camp was closed and all personnel were moved out on October 7th.

## REGIONAL GEOLOGY

### General Statement

The property lies on the eastern margin of the Coast Range Batholithic Complex one mile inside the contact with the Hazelton Group. The regional setting of the property is shown in Figure 5, modified from GSC Map 1136A (1)\*.

Palaeozoic crystalline limestone associated with a sequence of Triassic sedimentary rocks has been mapped by the G.S.C. in a roof pendant on the upper reaches of Hirsch and McKay Creeks, just west of the property.

### Intrusive Rocks

Several phases of the Coast Range Batholithic Complex have been mapped in the area. From oldest to youngest these phases are:

---

\* References listed at front of report



- 1) a gabbro facies
- 2) green granodiorite
- 3a) white granodiorite
- b) a hornblende biotite facies

The bulk of these rocks are of Cretaceous Age.

One small mass of gabbro (olivine gabbro, pyroxene gabbro and diorite) has been noted on the headwaters of Davies Creek.

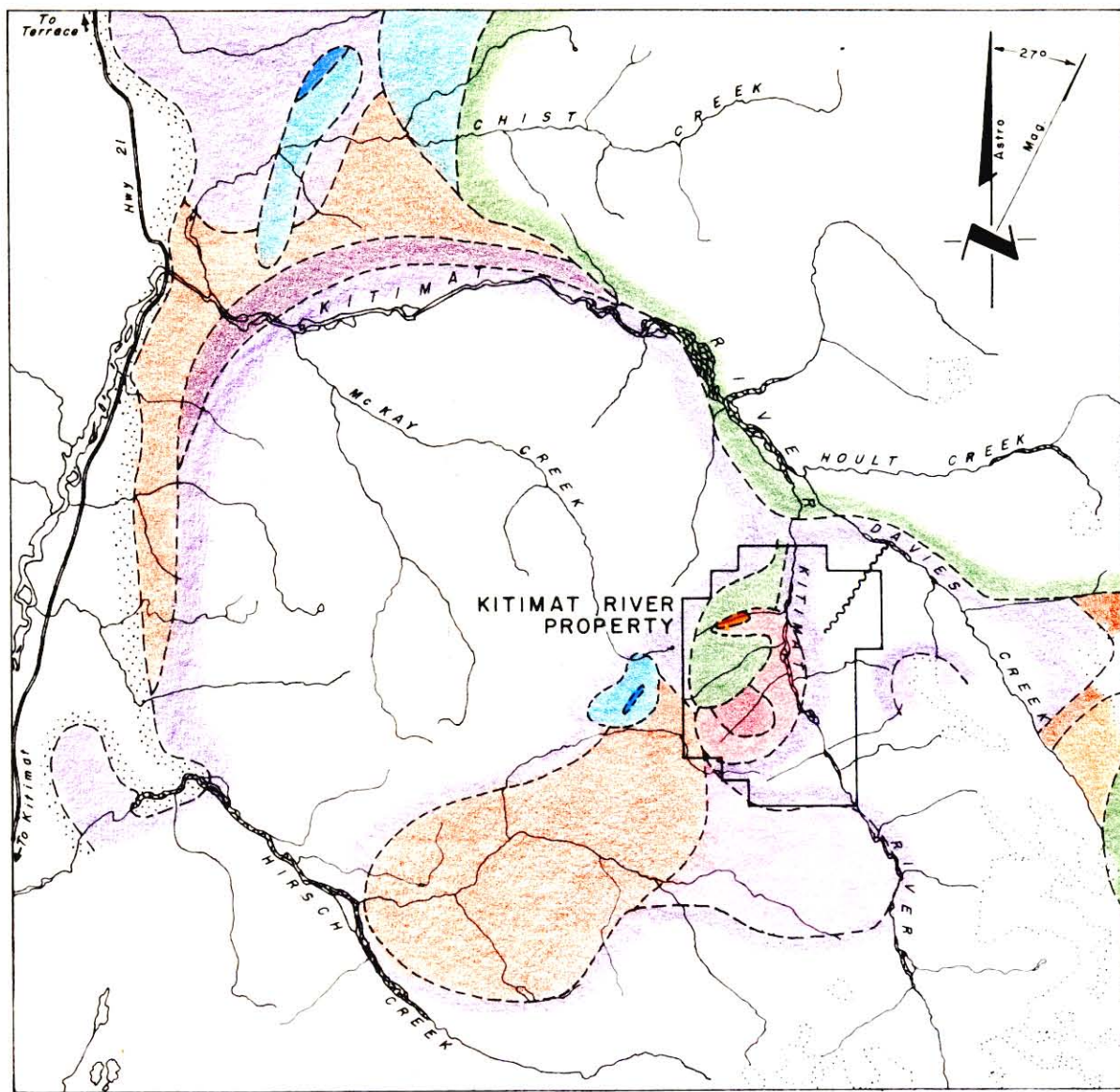
Green granodiorite occurs in two areas south and east of the property. It differs little in composition from the white, biotite granodiorite, which is the most common igneous rock in the area, and is intruded by it.

Hornblende, hornblende biotite granodiorite, hornblende diorite, quartz diorite and migmatite constitute a hornblende biotite facies ranging in age from that of the green granodiorite to that of the white biotite granodiorite.

The property is underlain predominantly by medium to coarse grained soda granite, hydrothermally altered in part. The exact relationship between this grey granite and the white, biotite granodiorite of regional extent is not known.

No exposures of quartz eye porphyry similar to that in Gossan Creek have been observed elsewhere in the immediate vicinity of the property. Narrow, acid, porphyritic dykes and





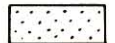



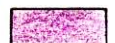


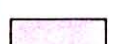




NOTE —  
Geology after Duffell and Souther, 1964 - modified.

S Y M B O L S

----- Geological contact.

~~~~~ Shear zone.

L E G E N D

- PLEISTOCENE AND RECENT {  Sand, gravel, clay.
- POST-CRETACEOUS ? {  Quartz feldspar porphyry.
- {  Grey, soda granite.
- {  "Leucocratic/altered" granite.
- UPPER CRETACEOUS OR LATER { **COAST RANGE BATHOLITHIC COMPLEX**
- {  Hornblende and hornblende biotite granodiorite.
- {  Hornblende diorite, quartz diorite.
- {  White granodiorite.
- {  Green granodiorite
- {  Olivene gabbro, pyroxene gabbro, diorite.
- JURASSIC {  HAZELTON GROUP: basalt, andesite, dacite rhyolite and related pyroclastic rocks.
- TRIASSIC ? {  Sedimentary Rocks (limestone, boulder conglomerate).
- PERMIAN {  White crystalline limestone.

SOUTHWEST POTASH CORPORATION

KITIMAT RIVER MoS<sub>2</sub> PROPERTY  
SKEENA MINING DIVISION — BRITISH COLUMBIA

REGIONAL GEOLOGY MAP

SCALE 1 : 250,000  
APPROXIMATELY 1" = 4 MILES

*H.P. Souther*

Vancouver —

H.P.

basic dykes from two to twenty feet wide have been noted on the divide between Gossan and McKay Creeks.

#### Structure

In the area west of Gossan Creek and east of McKay Creek, dykes, shear zones and barren quartz veins trend either due north or due east, but overburden and vegetation preclude the possibility of tracing the regional extent, if any, of the wide variety of dykes exposed on the property.

A twenty foot wide shear zone which is silicified, and pyritized in part, extends southwest from Davies Creek into the northeast corner of the property.

#### GEOLOGY OF THE MINERALIZED AREA

##### General Statement

$\text{MoS}_2$  occurs on the westwall of the main valley in two V-shaped valleys roughly 8500 feet apart. The mineralization in these two zones is contained by acid igneous rock separated by barren, "greenstones", a roof pendant of altered Hazelton volcanic rocks. Weak iron staining is associated with the  $\text{MoS}_2$  mineralization, and is exposed in steep gullies and on talus slopes along the west wall of the Kitimat River valley for a distance of about 30,000 feet. These iron-stained areas which may be several zones, or one large zone, lie between 2,000 and 4,000 feet above sea level, vary from 1300 - 5300

feet in width, and are most intensely developed in Gossan and Mantle Creeks. Also, two iron-stained areas associated with pyritized shear zones are located east of the Kitimat River in the Pen Group of claims (see Figure 4).

#### Hazelton Group

A large mass of "greenstones", composed essentially of saussuritized feldspar, quartz, green hornblende and epidote, which occupies the north and west-central portion of the property, consists of altered acid and intermediate rocks of the Hazelton Group.

Although no structure has been observed in the "greenstones", they are intruded by a wide variety of dykes ranging in composition from granite to gabbro.

#### Intrusive Rocks

##### (a) General Statement

The intrusive rocks on the property show considerable variation both in texture and composition and, therefore, differ significantly from the rocks of the surrounding batholith. Three main intrusive facies, soda granite, altered granite, and granitic quartz-eye feldspar porphyry, and a wide variety of dykes have been mapped on the property.

The age relations of the intrusive rocks are not known, but a tentative age relation of these rocks with respect to  $\text{MoS}_2$  mineralization is given in Table 2.

TABLE 2

TABLE OF FORMATIONS

Post- MoS<sub>2</sub>

Basic Dykes  
Andesite and Gabbro Dykes  
Granodiorite and Quartz  
Monzonite Dykes

?

? Acid Aphanitic Dykes (Porphyritic in Part)?  
Foliated Feldspar Biotite Porphyry  
Granitic Quartz Feldspar Porphyry  
Altered Granite  
Soda Granite

Pre-MoS<sub>2</sub>

White Granodiorite  
Hazelton Group

(b) White Granodiorite

Typical, medium grained white Coast Range granodiorite outcrops in the Mel and Pen claims east of the Kitimat River, and is probably the oldest intrusive rock on the property.

(c) Soda Granite

Although this rock has the megascopic appearance of a medium grained granodiorite it has been classified, using Moorehouse's classification as a soda granite because more than 2/3 of the total feldspars are silicic and the An content ranges from An<sub>8</sub> - An<sub>15</sub>.

Soda granite, thought to be part of the same mass exposed in Mantle and Lamp Creeks, also occurs in Gossan Creek where it shows gradational contacts with the quartz feldspar porphyry.

(d) Altered Granite

Several altered intrusive facies comprising soda granite, pink granite and syenite are included in this unit. Compared to the soda granite to the northeast these facies are leucocratic.

(e) Granitic Quartz Feldspar Porphyry

Light grey to pinkish granitic quartz-eye feldspar porphyry outcrops for about 2,500 feet along the south side

of Gossan Creek, mostly along the base of steep cliffs 1,000 feet high (Plate I), and is thought to be exposed as an elliptical body with major and minor axes of 6,200 feet and 3,000 feet respectively.

The northern limits of the granitic quartz feldspar porphyry are generally marked by a foliated feldspar biotite porphyry which appears to be conformable with the contact. In some areas, however, the granitic porphyry intrudes the "greenstones" with narrow dykes.

(f) Dykes

Numerous dykes, generally less than 20 feet wide, and ranging in composition from acid to basic have been observed. Difficulty has been experienced in distinguishing between intermediate dyke rocks and the "greenstones", therefore it is possible that dykes are more numerous in the Gossan Creek area than is indicated in Figure 6.

Structure

The overall structural picture of the property is still very incomplete, but quartz vein stockworks, dykes, faults and shears indicate that the  $\text{MoS}_2$  mineralization is associated with a structurally anomalous area.

(a) Quartz Vein Stockworks

The "greenstones" excepted, quartz vein stockworks

occur through a wide area between Mantle and Gossan Creeks. The stockworks are best developed in the granitic quartz feldspar porphyry where they have been noted in areas 2,000 feet apart, averaging 4-8 veins per square foot. An extensive stockwork is indicated in this area by abundant quartz veined porphyry float along the lower reaches of Gossan Creek carrying, in some instances, 10-15 hairline fractures per square inch.

Three separate stockworks about 150 feet wide occur over a distance of 2000 feet in the Mantle Creek area. The intensity of veining averages 4-6 veins per square foot, but is as high as 12 veins per square foot.

MoS<sub>2</sub>-quartz veins in the granite stockworks are cut by numerous hairline fractures indicating that post-mineralization stresses were active.

(b) Dykes, Faults and Shears

Two main structural components trending due north and due east are suggested by the orientation of dykes, faults and shears.

The most conspicuous structural feature in the area is a silicified, twenty foot wide shear zone which is co-linear with Mantle Creek. It shows up as a prominent lineament from the air and trends roughly southwest from Davies Creek for approximately two and a half miles. Pyrite is the only sulfide associated with this shear.

### Sulphide Mineralization

The following sulphides, in order of decreasing abundance, have been observed; pyrite, molybdenite and chalcopyrite.

#### (a) Pyrite

Pyrite is generally present in amounts less than 2% but is very widespread. It occurs in the barren and  $\text{MoS}_2$  - quartz veins and is frequently associated with hematite. It has also been noted in accessory amounts as fine grained disseminations in most of the igneous rocks.

#### (b) Molybdenite

Very low grade  $\text{MoS}_2$  is exposed in the Mantle and Gossan Creek areas between the 2,000 - 3,500 foot elevations.  $\text{MoS}_2$  in both zones is very fine grained and occurs, i) in narrow ( $< 1/4"$ ) quartz-pyrite veins, either as individual veins or in stockworks, ii) on dry fractures.

In Mantle Creek the  $\text{MoS}_2$  zone, which is localized in altered and unaltered granite, extends for 2000 feet, through a height of 1000 feet and is open in two directions at right angles to the creek. The zone is defined by narrow quartz- $\text{MoS}_2$  veins separated by 30-40 feet of barren granite, and contains three weakly mineralized quartz vein stockworks.

The  $\text{MoS}_2$  zone in the Gossan Creek area has still to be completely defined, but  $\text{MoS}_2$  has been noted over a distance



Hematite is present as specularite and earthy hematite. Specularite occurs in both barren and  $\text{MoS}_2$ -quartz veins in the granite and the quartz feldspar porphyry. Earthy hematite is localized in fractures in the soda granite.

Thin films of manganese oxides are present in fracture planes in the  $\text{MoS}_2$  zones of Mantle and Gossan Creeks.

#### SAMPLING METHODS AND RESULTS

A total of 29 samples were collected from three separate sample sites from the two main mineralized zones. Of these samples 20 were from Mantle Creek, 4 from Gash Creek, and 5 were from Gossan Creek. The relevant data and assay results of these samples are given in Tables 3 and 4.

One boulder of altered granite from the lower reaches of Mantle Creek was sampled by two samplers and gave values of 0.15, 0.38, and 0.37%  $\text{MoS}_2$  equivalents (#'s COT25A, COT25B, 2830). Another float fragment (6 x 9 inches) from the same area and comprising quartz-pyrite- $\text{MoS}_2$  vein stockwork in silicified granite assayed (#2831) 0.13%  $\text{MoS}_2$  equivalents (see Table 4).

#### GEOCHEMISTRY

##### General Statement

Preliminary geochemical sampling was carried out in 1965 in an attempt to locate new areas of significant  $\text{MoS}_2$

TABLE 3  
SURFACE SAMPLING RESULTS

| Host Rock       | Location     | No. of Samples<br>(and type) | Effective<br>Sample<br>Length (Ft.) | Weighted Averages                 |      |
|-----------------|--------------|------------------------------|-------------------------------------|-----------------------------------|------|
|                 |              |                              |                                     | % MoS <sub>2</sub><br>Equivalents | % Cu |
| Altered Granite | Mantle Creek | 8 (continuous chip)          | 36                                  | 0.02                              | 0.03 |
| Altered Granite | Mantle Creek | 12 (7/8" core)               | 60                                  | 0.03                              | 0.03 |
| Granite         | Gash Creek   | 4 (channel)                  | 16                                  | 0.04                              | 0.03 |
| Quartz Porphyry | Gossan Creek | 2 (continuous chip)          | 9                                   | 0.04                              | 0.05 |
| Quartz Porphyry | Gossan Creek | 2 (7/8" core)                | 6                                   | 0.02                              | 0.03 |
| Quartz Porphyry | Gossan Creek | 1 (60# Bulk)                 | 9                                   | 0.02                              | 0.01 |

TABLE 4

SURFACE SAMPLING AND ASSAY DATA

| SAMPLE LOCATION | SAMPLE NO. | SAMPLE TYPE     | SAMPLE INTERVAL (FEET) | TOTAL Mo % | MoS <sub>2</sub> EQUIVALENT (%) | %Cu   |
|-----------------|------------|-----------------|------------------------|------------|---------------------------------|-------|
| Mantle Cr.      | 2832       | 7/8" core       | 5                      | 0.01       | 0.02                            | 0.03  |
| "               | 2833       | "               | 5                      | 0.02       | 0.03                            | 0.01  |
| "               | 2834       | "               | 5                      | 0.02       | 0.03                            | 0.01  |
| "               | 2835       | "               | 5                      | 0.01       | 0.02                            | Trace |
| "               | 2836       | "               | 5                      | 0.02       | 0.03                            | 0.03  |
| "               | 2837       | "               | 5                      | 0.02       | 0.03                            | 0.04  |
| "               | 2838       | "               | 5                      | 0.02       | 0.03                            | 0.01  |
| "               | 2839       | "               | 5                      | 0.01       | 0.02                            | 0.04  |
| "               | 2840       | "               | 5                      | 0.02       | 0.03                            | 0.01  |
| "               | 2841       | "               | 5                      | 0.05       | 0.08                            | 0.05  |
| "               | 2842       | "               | 5                      | 0.02       | 0.03                            | 0.04  |
| "               | 2843       | "               | 5                      | 0.01       | 0.02                            | 0.03  |
| Gossan Cr.      | 2844       | "               | 3                      | 0.01       | 0.02                            | 0.05  |
| "               | 2845       | "               | 3                      | 0.01       | 0.02                            | 0.01  |
| Gash Creek      | 2846       | Channel Sample  | 4                      | 0.01       | 0.02                            | 0.04  |
| "               | 2847       | "               | 4                      | 0.05       | 0.08                            | 0.04  |
| "               | 2848       | "               | 4                      | 0.01       | 0.02                            | 0.03  |
| "               | 2849       | "               | 4                      | 0.01       | 0.02                            | Trace |
| Mantle Cr.      | 2850       | Continuous Chip | 5                      | 0.01       | 0.01                            | Trace |
| "               | 2851       | "               | 5                      | 0.02       | 0.03                            | 0.04  |
| "               | 2852       | "               | 3                      | 0.02       | 0.03                            | 0.04  |
| "               | 2853       | "               | 4                      | 0.03       | 0.05                            | 0.03  |
| "               | 2854       | "               | 4                      | 0.02       | 0.03                            | 0.04  |
| "               | 2855       | "               | 5                      | 0.02       | 0.03                            | 0.04  |
| "               | 2856       | "               | 5                      | 0.02       | 0.03                            | 0.04  |
| "               | 2857       | "               | 5                      | 0.02       | 0.03                            | 0.04  |
| Gossan Cr.      | 2858       | "               | 3                      | 0.05       | 0.08                            | 0.08  |
| "               | 2859       | "               | 6                      | 0.02       | 0.03                            | 0.04  |
| "               | 2860       | 60 lb. bulk     | 9                      | 0.01       | 0.02                            | 0.01  |
| Mantle Cr.      | COT 25A    | chip            | Float                  | 0.09       | 0.15                            | 0.08  |
| "               | COT 25B    | "               | "                      | 0.23       | 0.38                            | 0.04  |
| "               | 2830       | "               | "                      | 0.22       | 0.37                            | 0.01  |
| "               | 2831       | "               | "                      | 0.08       | 0.13                            | 0.10  |

mineralization with surface expression. Soil samples were collected at approximately 300 foot centres along the claim location lines, and along the I.P. Survey lines. Water and silt samples were collected along the drainage systems of Gossan, Lamp and Mantle Creeks as well as in several creeks on the east side of the Kitimat River in the vicinity of the Mel and Pen claims (see Figure 7).

### Results

#### (a) Gossan Creek Area

An anomalous area 5,000 feet from east to west and 2,000 feet in a northerly direction is defined by highly anomalous creek waters (ten north flowing tributaries of Gossan Creek average more than 80 ppb Mo (average pH 6.9) in the Gossan Creek area.

#### (b) Mantle Creek Area

No zones which could qualify as prime exploration targets have emerged from the soil sampling program, but the association of weakly anomalous soils (12 to 40 ppm) along the Ell location line for a distance of about 3,300 feet combined with the mineralized zone in Mantle Creek indicates that further work is warranted in this area.

#### (c) Hony Claims

In the Hony #2, 6, 8, claims, thirteen rock chips of

granite average 162 ppm Mo (range 40 to 320 ppm) in an area where no visible MoS<sub>2</sub> has been reported. These anomalous values are 13,000 feet south of the Gossan Creek anomaly and illustrate the wide distribution of MoS<sub>2</sub> on the property.

#### I. P. SURVEY

A preliminary I.P. survey totalling 8.5 line miles was carried out by McPhar Geophysics Ltd. during September. The details and results of this survey are contained in a separate report written in November 1965 by McPhar Geophysics Ltd. No significant concentrations of pyrite were located by the survey, but several weak anomalies due to "contact effects" correlated with known contacts.

#### EXPLORATION POTENTIAL

Although the known MoS<sub>2</sub> mineralization exposed on surface is very low grade, the mineralized areas are outlined along very narrow zones of detailed mapping and prospecting. Locally derived, MoS<sub>2</sub>-bearing float indicates that some exposed areas carrying ore grade mineralization are still to be located.

Further, the property has several favourable geologic features.

(1) MoS<sub>2</sub> mineralization has been noted over distances

of 2000 feet in areas 8500 feet apart.

(2) The mineralized zones of Mantle and Gossan Creeks are open in two directions and are associated with much more extensive geochemical anomalies.

(3) The  $\text{MoS}_2$  is associated with a structurally anomalous area.

(4) Hydrothermal alteration is widespread and, locally, there is intense silicification, argillization and K-feldspathization.

(5) Barren and weakly mineralized quartz vein stockwork occur over widely separated areas in several rock types.

(6) The  $\text{MoS}_2$  is associated with weakly developed iron-stained zones which may be part of a larger stain zone with a total length of 30,000 feet.

(7) The presence of Mn-oxides (and to a lesser extent specular hematite) associated with  $\text{MoS}_2$  in Mantle and Gossan Creeks suggest these may be zones of peripheral metallization.

(8) The area lies on the margin of the Coast Range Batholithic Complex and has a complicated intrusive history.

(9) The molybdenum-bearing host rocks are located near the roof of the batholith.

The present situation is therefore, one in which very low grade  $\text{MoS}_2$  is known over a large area of the property,

in a favourable geologic environment. However, much detailed surface work over large, poorly exposed, and rugged areas is necessary before worthwhile drill targets can be defined.

#### PROPOSED 1966 PROGRAM

The proposed 1966 exploration program includes line-cutting, geological mapping, prospecting, geochemistry, surface sampling, trenching and pitting, and is summarized as follows:

(1) Two grids, one on the plateau south of Gossan Creek, the other in the Mantle Creek area are necessary for control. Using a line interval of 500 feet, an estimated 35 line-miles of grid will be required. Claim boundaries in the west-central portion of the property should be cut and chained.

(2) Geological mapping to be carried out in the grid areas on a scale of 1"=100 feet, and on a scale of 1"=500 feet along claim boundary and location lines up to, and including, the Penny and Hony Groups.

(3) Intensive prospecting in the grid areas and the Hony Group. Detailed prospecting along the creeks on the east side of the Kitimat River.

(4) Detailed soil sampling (sample interval 250 feet) in the grid areas. Also, reconnaissance geochemistry in the outlying areas of the west central portion of the property and

on the east side of the Kitimat River.

(5) Surface sampling, by continuous chip or channel samples, of all accessible mineralized areas.

(6) Pitting and trenching where warranted and feasible.

COST

The estimated cost of the proposed 1966 exploration program is;

|                                                                                                                                      |          |
|--------------------------------------------------------------------------------------------------------------------------------------|----------|
| Salaries and fringe costs for<br>Amax personnel                                                                                      | \$17,850 |
| Provisions, supplies, and food                                                                                                       | 6,950    |
| Assay charges                                                                                                                        | 1,250    |
| Helicopter charter                                                                                                                   | 18,200   |
| Property recording charges                                                                                                           | 2,500    |
| General expenses, equipment, vehicles<br>operation and maintenance, travel and<br>entertainment, postage, telephone and<br>telegraph | 14,550   |
|                                                                                                                                      | <hr/>    |
|                                                                                                                                      | \$61,300 |
|                                                                                                                                      | <hr/>    |

Vancouver Office  
January 31, 1966

*J. N. Schindler*  
J. N. Schindler and

*R. A. Barker*  
R. A. Barker, P.Eng. (BC)



**ADDENDA TO GEOLOGICAL AND GEOCHEMICAL REPORT  
ON KITIMAT RIVER PROPERTY**

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**SOIL SAMPLES:** If at all possible, soil samples were collected from the B horizon, which is the dark brown soil horizon of deposition. At some samples sites, only organic material of the A horizon could be collected. In some aplite areas where a normal soil profile has not been developed, it was necessary to collect C horizon samples of unaltered clay or rock flour. All samples were collected by digging a hole with a mattock or a shovel. The profile was examined and, as stated above, a sample of the B horizon was usually collected.

**SEDIMENT SAMPLES:** Fine-grained stream sediment samples with as low an organic content as possible were collected. It was often necessary to roll large rocks aside to get sufficient fine-grained material in steep drainage systems. Collectors were cautioned to avoid slumpage areas of clay from the banks. A shovel or large spoon was used to take the samples.

**ROCK CHIP SAMPLES:** Numerous small chips of rock were broken and collected in order to make the samples as representative as possible of the mass of rock.

**WATER SAMPLES:** Water samples were collected in clean, 100 ml. screw top, polyethylene bottles. Great care was taken to minimize the amount of sediment in the water samples.

DOMINION OF CANADA:  
 PROVINCE OF BRITISH COLUMBIA.  
 To Wit:

**In the Matter of itemized breakdown of Assessment Work  
 Costs at Kitimat River MoS<sub>2</sub> Property, British Columbia**

I, P.W. Richardson

of Suite 601-535 Thurlow Street, Vancouver 5,

in the Province of British Columbia, do solemnly declare that

- I - I am agent for Southwest Potash Corporation, and as such am duly authorized to make this declaration.
- II - The detailed account of expenditures on the Kitimat River MoS<sub>2</sub> Property between September 9, 1965 and August 1, 1966 are as follows:

|                              | <u>1965</u>        | <u>1966(Costs to August 1)</u> |
|------------------------------|--------------------|--------------------------------|
| Helicopter Expenses          | \$ 5,600.00        | \$ 9,509.00                    |
| Salaries                     | 3,355.00           | 7,367.00                       |
| Cost of Lockwood Contour Map | --                 | 1,051.76                       |
| Cost of Sample Analysis      | 632.00             | 982.00                         |
| Cost of Board                | 570.00             | 1,212.00                       |
|                              | <u>10,157.00</u>   | <u>20,121.76</u>               |
| Grand Total                  | <u>\$30,278.75</u> |                                |

Contour Map 1" = 1000' = \$965.51 + Blowing up to 500 scale \$86 = \$1051.76

Samples 1965 - 316 samples @ \$2.00 = \$632.00  
 1966 - 491 samples @ \$2.00 = 982.00 (to July 31) 1614.00

Board 1965 - 228 man-days @ \$2.50/day = 570.00  
 1966 - 485 man-days @ \$2.50/day 1212.00 1782.00

**Salaries - 1965**

| <u>Name &amp; Address</u>                        | <u>DATES WORKED</u> | <u>DAYS</u> | <u>SALARY</u> | <u>Amount</u> |
|--------------------------------------------------|---------------------|-------------|---------------|---------------|
| S. Carryer, Box 396, Wavers, New Zealand         | Sept. 9-Oct. 7      | 29          | \$525.        | \$ 507.00     |
| R. McMillan, 733 Moffatt Rd., Richmond, B.C.     | Sept. 9-Oct. 7      | 29          | 600.          | 580.00        |
| J.D. Scott, 88 Albany Ave., Toronto, Ont.        | Sept. 9-17          | 9           | 500.          | 150.00        |
| I.M. Hedley, 1542 Prospect Place, Victoria, B.C. | Sept. 9-15          | 7           | 400.          | 93.00         |
| Wayne Henze, 772 #4 Rd., Richmond, B.C.          | Sept. 9-14          | 6           | 375.          | 75.00         |
| E. Muldoe, Houston, B.C.                         | Sept. 9-27          | 19          | 400.          | 253.00        |
| H. Lund, Houston, B.C.                           | Sept. 9-Oct. 7      | 29          | 400           | 387.00        |
| B. Wulff, Houston, B.C.                          | Sept. 9-Oct. 7      | 29          | 400           | 387.00        |

Cont'd Page 2

And I make this solemn declaration conscientiously believing it to be true, and knowing that it is of

DOMINION OF CANADA:  
 PROVINCE OF BRITISH COLUMBIA.  
 To Wit:

**In the Matter of itemized breakdown of Assessment Work Costs at Kitimat River MoS<sub>2</sub> Property, British Columbia**

I, **P.W. Richardson**

of **Suite 601-535 Thurlow St., Vancouver 5,**

in the Province of British Columbia, do solemnly declare that

- I - I am agent for Southwest Potash Corporation, and as such am duly authorized to make this declaration.
- II - The detailed account of expenditures on the Kitimat River MoS<sub>2</sub> Property between September 9, 1965 and August 1, 1966 are as follows:

**Salaries - 1965 (Cont'd)**

| Name & Address              | Dates Worked    | Days | Salary | Amount           |
|-----------------------------|-----------------|------|--------|------------------|
| H. Hertel, Terrace, B.C.    | Sept. 22-Oct. 7 | 15   | \$400. | \$ 200.00        |
| P. Marshall, Hazelton, B.C. | Sept. 9-Oct. 6  | 28   | 375.   | 350.00           |
| L. Zwienka, Mundare, Alta.  | Sept. 9-Oct. 6  | 28   | 400    | 373.00           |
|                             |                 |      |        | <u>\$3355.00</u> |

**Salaries - 1966**

| Name & Address                                   | Dates Worked    | Days | Salary | Amount           |
|--------------------------------------------------|-----------------|------|--------|------------------|
| I. Church, 11755-18th Ave., Haney, B.C.          | July 20-July 31 | 12   | \$385. | \$ 149.00        |
| A. Gambardella, 259 Lanark St. Winnipeg, Man.    | May 27-July 3   |      |        |                  |
|                                                  | July 8-July 31  | 62   | 650.   | 1300.00          |
| A. Gates, 10812-130 St., Edmonton, Alta.         | June 20-July 15 | 26   | 475.   | 412.00           |
| T. Jack, Box 307, Houston, B.C.                  | June 20-July 31 | 42   | 425.   | 595.00           |
| S. Louie, Telegraph Creek, B.C.                  | May 22-June 14  |      |        |                  |
|                                                  | June 19-July 19 |      |        |                  |
|                                                  | July 25-July 31 | 61   | 425.   | 836.00           |
| B. Munday, General Delivery, Smithers, B.C.      | May 22-June 14  |      |        |                  |
|                                                  | June 19-July 19 |      |        |                  |
|                                                  | July 25-July 31 | 61   | 450.   | 885.00           |
| I. Murray, Smithers, B.C.                        | June 25-July 4  |      |        |                  |
|                                                  | July 20-July 31 | 22   | 425.   | 312.00           |
| J. Phillips, 808-103 Ave., Dawson Creek, B.C.    | May 22-June 20  |      |        |                  |
|                                                  | June 25-July 31 | 67   | 400.   | 864.00           |
| D. Sloan, 1291 Devonshire Cresc. Vancouver, B.C. | May 22-June 20  |      |        |                  |
|                                                  | June 25-July 31 | 67   | 350.   | 756.00           |
| A. Wenban-Smith, Lybington, Hants, England       | May 26-July 7   |      |        |                  |
|                                                  | July 10-July 31 | 65   | 600    | 1258.00          |
|                                                  |                 |      |        | <u>\$5367.00</u> |

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 **VANCOUVER, B.C.**

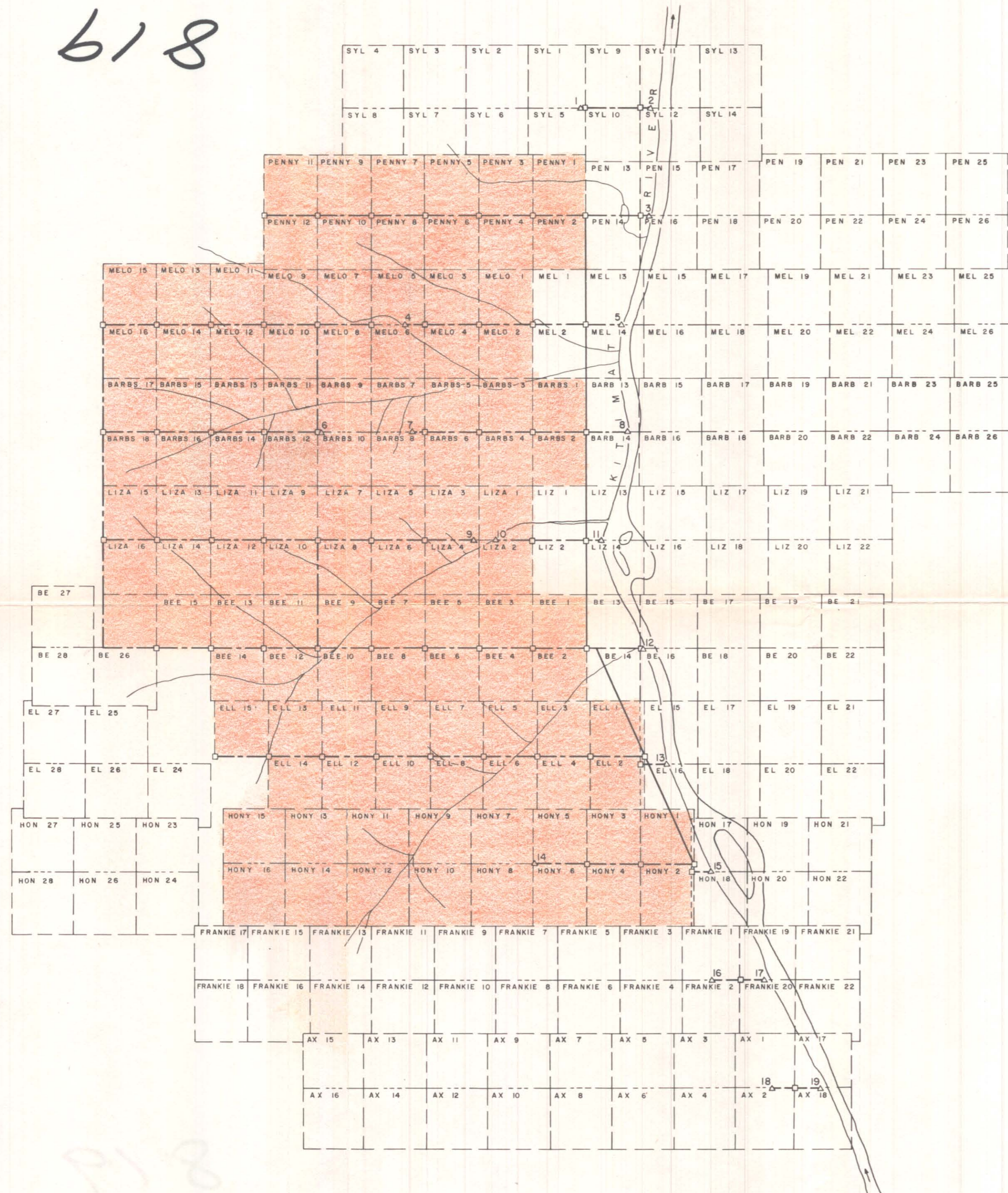
of **AUG 26 1965**, in the  
 Province of British Columbia, this  
 day of **Sub-Mining Recorder**, A.D.

*P. W. Richardson*

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



618



NO 819 MAP # 9  
ASSESSMENT REPORT  
Department of  
Mines and Petroleum Resources

**LEGEND**

- Claim Post.
- △— Witness Post.
- Claim Boundary Line.
- Blazed and Chained Line.
- Claim Location Line.
- Witnessed Claim Location Line.
- █ West Central Portion of Property Restaked August, 1965.

**KEY TO WITNESS POSTS**

| WITNESS POST No | INITIAL POST FOR   | FINAL POST FOR      |
|-----------------|--------------------|---------------------|
| 1               | SYL 2-8 incl.      | SYL 1-8 incl.       |
| 2               | SYL 13 and 14      | SYL 11-14 incl.     |
| 3               | PEN 17-26 incl.    | PEN 15-26 incl.     |
| 4               | ---                | MELO 5 and 6        |
| 5               | MEL 15-26 incl.    | MEL 13-26 incl.     |
| 6               | ---                | BARBS 9 and 10      |
| 7               | ---                | BARBS 7 and 8       |
| 8               | BARB 15-26 incl.   | BARB 13-26 incl.    |
| 9               | LIZA 3 and 4       | ---                 |
| 10              | ---                | LIZA 1 and 2        |
| 11              | LIZ 15-22 incl.    | LIZ 13-22 incl.     |
| 12              | BE 17-22 incl.     | BE 15-22 incl.      |
| 13              | EL 17-22 incl.     | EL 15-22 incl.      |
| 14              | HONY 9-16 incl.    | HONY 7-16 incl.     |
| 15              | HON 19-22 incl.    | HON 17-22 incl.     |
| 16              | FRANKIE 3-18 incl. | FRANKIE 1-18 incl.  |
| 17              | FRANKIE 21 and 22  | FRANKIE 19-22 incl. |
| 18              | AX 3-16 incl.      | AX 1-16 incl.       |
| 19              | ---                | AX 17 and 18        |

SOUTHWEST POTASH CORPORATION  
**KITIMAT RIVER MoS<sub>2</sub> PROPERTY**  
SKEENA MINING DIVISION — BRITISH COLUMBIA

**1965 — CLAIM MAP**

SCALE 1" = 2,000'

To accompany report "KITIMAT RIVER MoS<sub>2</sub> PROPERTY" by: J. N. Schindler.



819 (M1)

Vancouver—





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L E G E N D

- Picket lines and base lines (chained).
- - - Claim boundary lines.
- I.P. Survey lines.
- 120 M 55 Soil Sample site: sample number, values in p.p.m. Mo.
- 120 C 592 Silt Sample site: sample number, values in p.p.m. Mo.
- ▲ S 103 Water Sample site: sample number, values in p.p.b. Mo.
- 160 C 603 Rock Chip Sample site: sample number, values in p.p.m. Mo.

GEOCHEMICAL RESULTS  
SOIL SAMPLES (p.p.m. Mo)

- > 10 Anomalous.
- 4 - 10 Positive.
- < 4 Background.

SILT SAMPLES (p.p.m. Mo)

- > 10 Anomalous.
- 4 - 10 Positive.
- < 4 Background.

WATER SAMPLES (p.p.b. Mo)

- ▲ > 4 Anomalous.
- ▲ < 4 Background.

pH RESULTS

|                  | AVERAGE | RANGE     |
|------------------|---------|-----------|
| 151 Soil Samples | 5.7     | 4.2 - 6.9 |
| 36 Silt Samples  | 6.9     | 5.7 - 8.0 |
| 79 Water Sample  | 6.9     | 6.6 - 8.4 |

GEOCHEMICAL ANALYTICAL METHOD

- a 1 gm measured volumetrically.
- b Hot, dilute (3%) nitric acid digestion.
- c Molybdenum determined by thiocyanate-stannous chloride, isopropyl ether colorimetric method.

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT  
NO. 819 MAP # 10

SOUTHWEST POTASH CORPORATION

KITIMAT RIVER MoS<sub>2</sub> PROPERTY  
SKEENA MINING DIVISION - BRITISH COLUMBIA

GEOCHEMISTRY AND I.P. SURVEY LINES

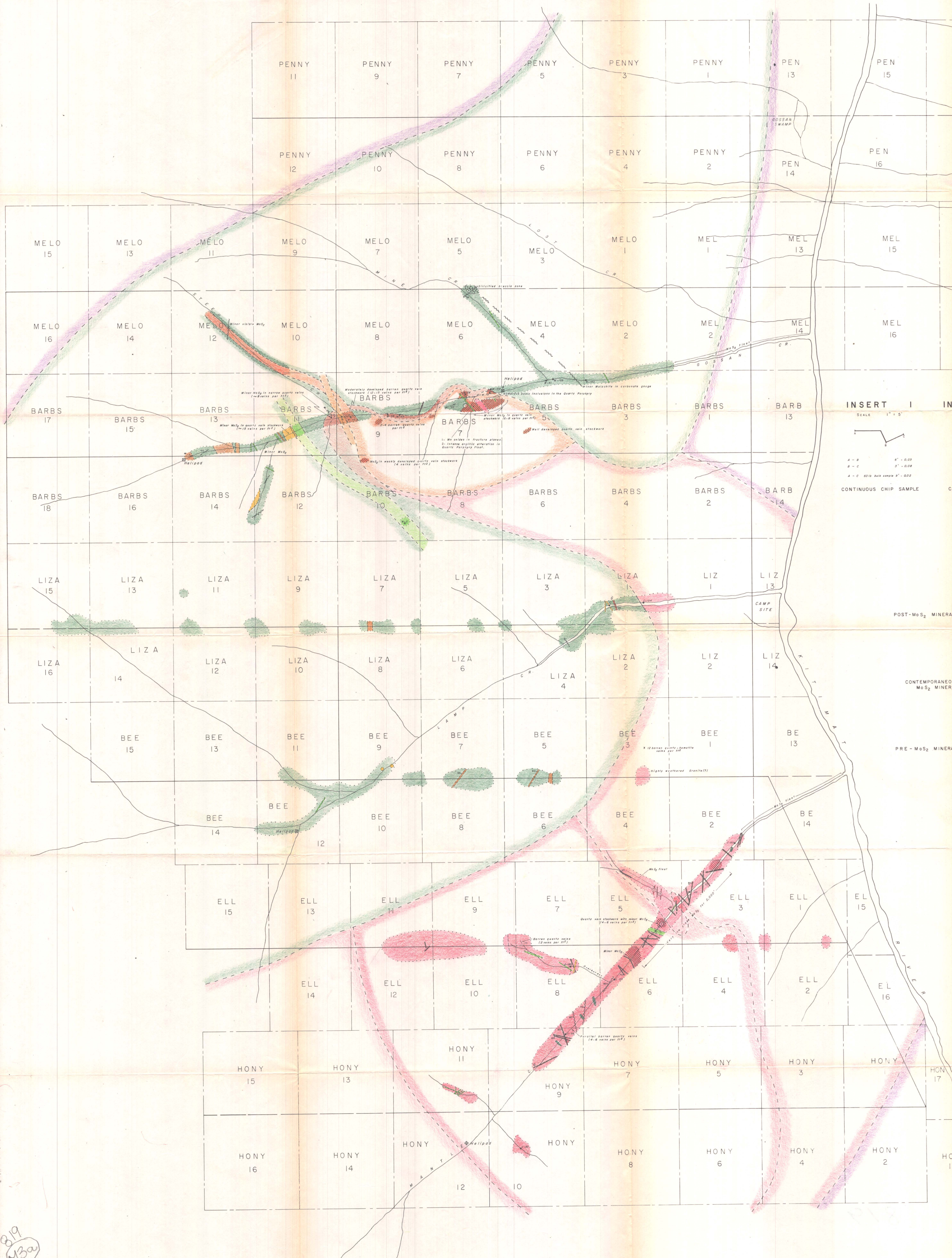
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SCALE 1" = 500'

To accompany report "KITIMAT RIVER MoS<sub>2</sub> PROPERTY" by J.N. Schindler.

M26

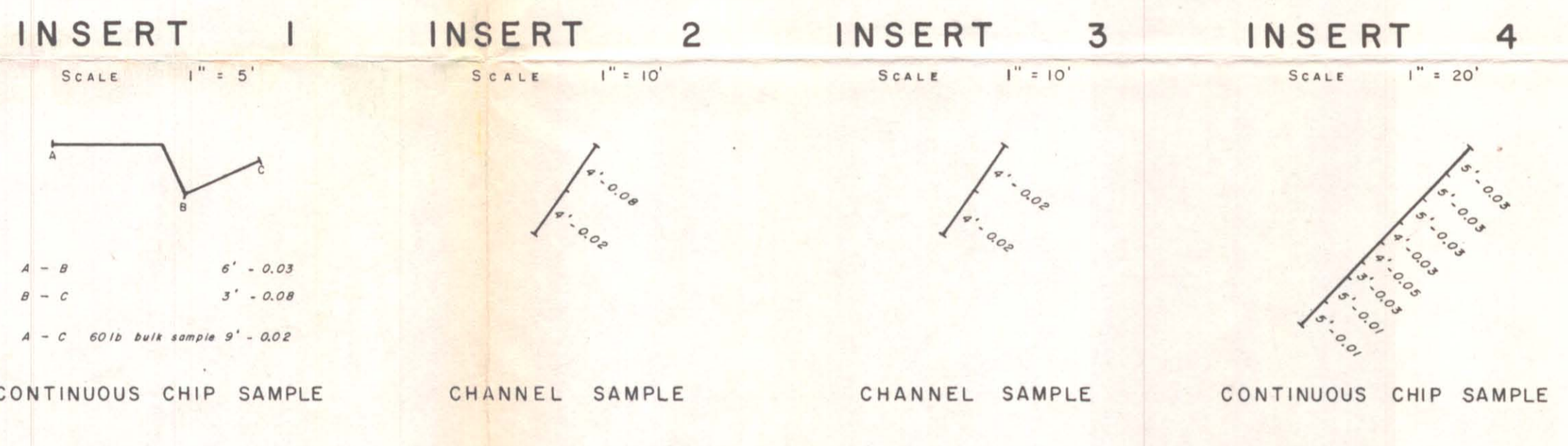
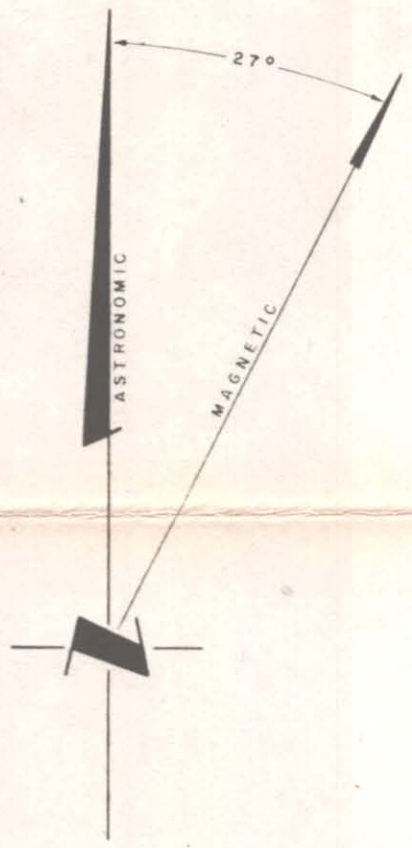
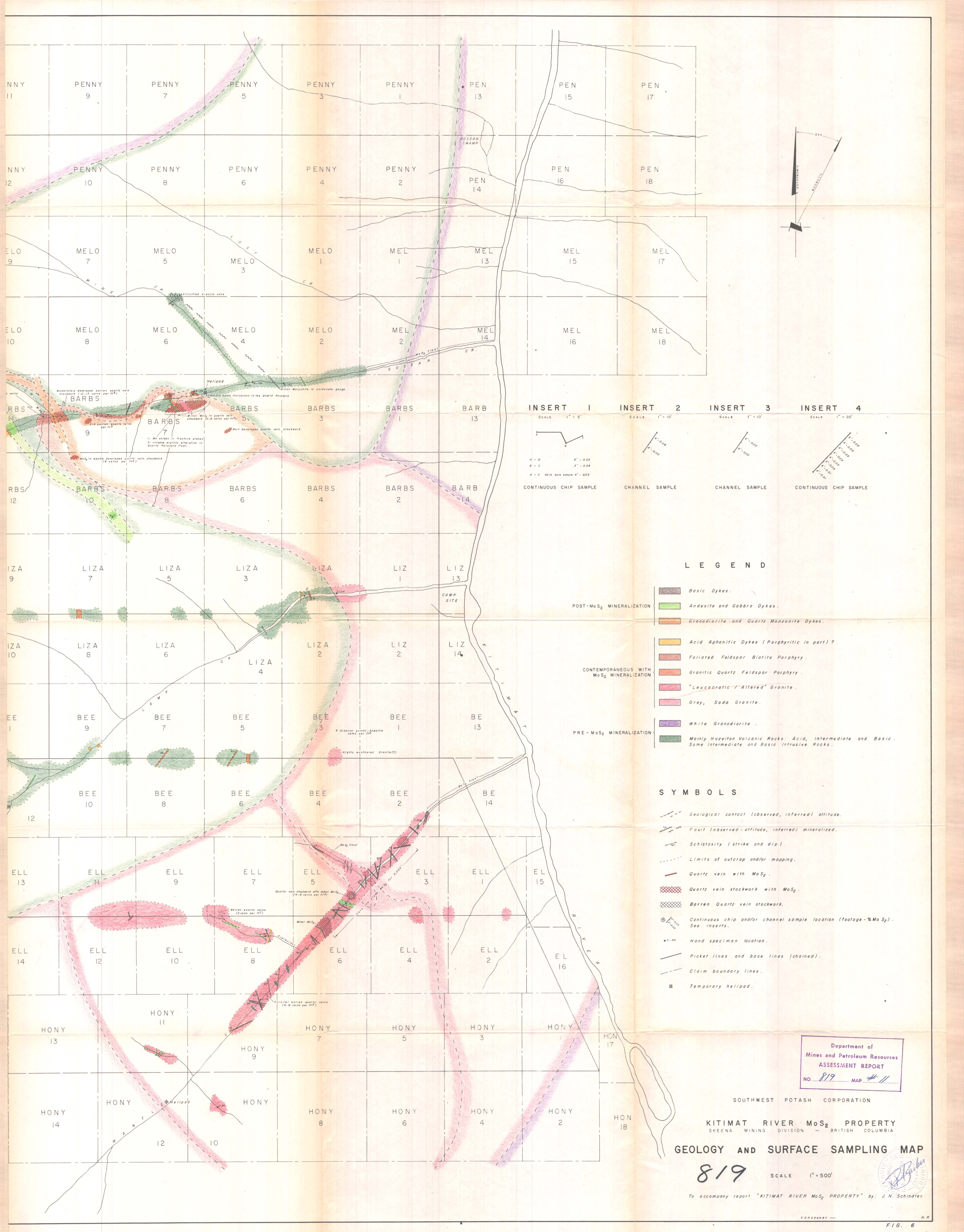




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- LEGEND**
- Basic Dykes.
  - Andesite and Gabbro Dykes.
  - Granodiorite and Quartz Monzonite Dykes.
  - Acid Aphanitic Dykes (Porphyritic in part)?
  - Foliated Feldspar Biotite Porphyry.
  - Granitic Quartz Feldspar Porphyry.
  - "Leucocratic" / Altered Granite.
  - Grey, Soda Granite.
  - White Granodiorite.
  - Mainly Hazelton Volcanic Rocks: Acid, Intermediate and Basic. Some Intermediate and Basic Intrusive Rocks.

- SYMBOLS**
- Geological contact (observed, inferred) attitude.
  - Fault (observed - attitude, inferred - mineralized).
  - Schistosity (strike and dip).
  - Limits of outcrop and/or mapping.
  - Quartz vein with MoS<sub>2</sub>.
  - Quartz vein stockwork with MoS<sub>2</sub>.
  - Barren Quartz vein stockwork.
  - Continuous chip and/or channel sample location (footage-%MoS<sub>2</sub>). See Inserts.
  - Hand specimen location.
  - Picket lines and base lines (chained).
  - Claim boundary lines.
  - Temporary heliport.

Department of  
 Mines and Petroleum Resources  
 ASSESSMENT REPORT  
 NO. 819 MAP # 11

SOUTHWEST POTASH CORPORATION

KITIMAT RIVER MoS<sub>2</sub> PROPERTY  
 SKEENA MINING DIVISION - BRITISH COLUMBIA

**GEOLOGY AND SURFACE SAMPLING MAP**

819 SCALE 1" = 500'

To accompany report "KITIMAT RIVER MoS<sub>2</sub> PROPERTY" by: J. N. Schindler.