

2467

REPORT ON  
GEOLOGICAL & GEOCHEMICAL STUDIES  
MERC, LA, LEE AND WEDGE CLAIMS  
(LEIER MERCURY PROSPECT)  
OF JASON OILS LTD.

EAST OF  
CARABINE CREEK, BRITISH COLUMBIA  
(50° 120° NW)

FOR  
SAVANNA CREEK GAS & OIL LIMITED

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT  
NO. 2467 MAP.....

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GEOLOGICAL AND GEOCHEMICAL STUDIES  
LEIER MERCURY PROSPECT  
EAST OF CARABINE CREEK, BRITISH COLUMBIA

PREFACE

During the summer of 1969 a geochemical and geological survey was conducted on the Leier Mercury Prospect for Savanna Creek Gas and Oil Limited. About 2,000 soil samples from the "B" soil horizon were collected and tested for mercury with a Lemaire detector, and several geochemical anomalies were located. The report on this work recommended, among other things, that most of these anomalies be confirmed and delineated by detailed geochemical sampling of the "C" soil horizon.

Subsequent to the completion of the 1969 field work, eight full claims and one fractional claim were added to the property.

In May, 1970 the original geochemical survey grid was extended to include the new claims, and the previously recommended detailing of the "C" horizon was done on thirteen anomalies. About 500 soil samples were collected and tested, half of them from the "C" horizon. The geological map was extended to cover the new claims, and an old adit was cleaned up, mapped and sampled.

Results of the 1970 program have been correlated and combined with results reported in 1969, and all available data is here presented in one report.

SUMMARY AND CONCLUSIONS

On a bench plateau east of Carabine Creek, cinnabar occurs within or marginal to brecciated shear zones in or closely associated with felsic dyke swarms intruding a heterogeneous volcanic suite.

There are two sets of steeply dipping mineralized shears on the property. A minor set strikes N30°W to N45°W, and a dominant younger set strikes N20°E to N10°W. The best concentrations of cinnabar are in pods of breccia at the junctions of two or more shears.

There are two distinctive types of vein material. On Merc 17 and Merc 31 the breccia matrix is mainly dolomite with lesser amounts of calcite and pyritiferous quartz. On LA 5 and Lee 3 the breccia matrix is dense aphanitic quartz with little or no carbonate. Disseminated pyrite is common marginal to both types of breccia.

Significant geochemical anomalies have been located and defined on Merc 1, Merc 17, Merc 31, Merc 32, Merc 36, Merc 48 and LA 1. Additional anomalies believed to be significant but which have not been confirmed by detailed sampling of the "C" horizon have been located on LA 2, Lee 1 and Lee 2.

Three anomalies on Merc 17, Merc 31 and LA 1 are deemed sufficiently promising to warrant diamond drilling. They are large and are favourably located with respect to known cinnabar occurrences, shear trends and topography. The strengths of these anomalies greatly exceeds the highest mercury counts obtained from soils immediately adjacent to several small, high grade showings on the property.

Individual high grade veins and stringers on Lee 3 and LA 5 are of no economic interest, but they may be sufficiently numerous that, together with disseminated cinnabar in the wall rocks, they could yield a low grade orebody. This possibility warrants a small amount of preliminary drilling.

The total estimated cost of a proposed drilling program to test the three most promising anomalies and the LA 5 - Lee 3 showing is \$50,000.

LOCATION AND MEANS OF ACCESS

NW? The Leier mercury prospect is situated on the west slope of Hardie Hill above the valley of Carabine Creek at latitude 50° 51' N, longitude 120° 44' W. The geographic centre of the property is about 25 miles northeast of Kamloops and four miles north of the Canadian National Railway siding at Copper Creek.

From a point on the Trans Canada Highway about one mile west of Savona, the centre of the property is easily accessible via 21 miles of improved dirt road and two miles of logging trails.

PHYSICAL FEATURES OF THE AREA

Elevations on the property range between 2,100 feet on Merc 39 and about 4,600 feet on Merc 8. However, the main areas of interest are all on a broad, rolling terrace at an average elevation of 3,200 feet between the base of Hardie Mountain and the rim of the Carabine Creek valley.

Major drainage, ridge lines and escarpments in the area all trend northeasterly.

The northeast corner of the property has been logged within the last ten years, but most of the claims are well forested with spruce to more than three feet at the butt, jackpine, poplar and larch.

There is no reliable water source on the claims. Carabine Creek which skirts the lower edge of the property is an intermittent stream. Red Lake, a large but shallow lake of poor quality is about one mile north of the property. Kamloops Lake is three miles south of and 2,000 feet below the more promising areas.

#### HISTORY AND OWNERSHIP

Mercury was discovered on what are now the Merc 17 and Lee 3 claims in about 1895, and was investigated by several small adits and shallow trenches. Several claims in the area were Crown-granted, but they lapsed in about 1939, and the ground was relocated. Some bulldozer trenching was done during World War II. This work was unsuccessful and the claims lapsed. Interest in the area revived in about 1957. Most of the area has been more or less continuously staked, and sporadic trenching and shallow, poorly planned drilling has been done by various parties since that time.

The current claims were staked by various individuals during the period June, 1966 to November, 1969. The property now comprises the following sixty-four claims in good standing:

	<u>Record No.'s</u>
Merc 1-17	57202-57218
Merc 29-59	60435-60465
Merc 60-62	81715-81717
Merc 63-65	83147-83149
LA 1-3	75794-75796
LA 4-6	77458-77460
Lee 1-3	85813-85815
Wedge 1 Fr.	85816

Due to staking overlap within the group, many claims are less than full size, and the total area of the property is about 2,500 acres.

The registered owner of fifty-eight of the sixty-four claims is Jason Oils Limited of Calgary, Alberta. By virtue of an unregistered agreement, Savanna Creek Gas and Oil Limited, also of Calgary, has earned an 80% undivided interest in the property. Six claims, Merc 60 - Merc 65, are held in trust for the two parties to the agreement by J. M. Alston, an officer of both companies.

## SURVEY PROCEDURE

Locations were established from baselines cut more or less parallel to the major ridges and escarpments and from chained picket lines cut perpendicular to the baselines. Picket lines were spaced at intervals of 400 feet or 200 feet depending upon the degree of geochemical detail desired for specific areas.

Control for geological mapping was established from the cut lines, from aerial photographs and by pace and compass. Outcrops in the mapped area are scarce, and an attempt was made to define approximate geological contacts on the basis of rock fragments in the soil samples and the distribution of surface float.

Soil samples were initially collected from the "B" soil horizon at 100 foot stations along the picket lines. At stations where the soil profile was incomplete it was sometimes necessary to sample the "A<sub>2</sub>" or "C" horizon. It is believed that occasional sampling off of the preferred horizon did not seriously distort the results of the initial survey.

Areas in which the initial survey indicated significantly anomalous concentrations of mercury in the soil were surveyed in detail by sampling the "C" horizon, commonly at a depth of about 30 inches. The "C" horizon samples were taken at 50 foot stations, normally along lines 100 feet apart.

Samples were air dried in kraft envelopes and sieved to recover the minus 40 fraction. Mercury determinations were made in the field and in Calgary by the writer and D. A. Rees using a Johnson-Williams Model Sl Lemaire detector. This instrument operates on the principle of atomic absorption utilizing the 2537 Angstrom line for mercury.

Analytical procedure was as follows:

Samples of approximately one gram were measured volumetrically and heated in a closed steel bulb by a propane torch. Vapour, including mercury, was withdrawn from the bulb with a 0.2 liter hand pump. During withdrawal, the vapour was passed through a glass-fiber filter to remove particulate matter and through a steel coil at red heat to reduce organic interference. The vapour was then pumped into the detector and the mercury content in micrograms per liter was recorded.

Samples containing mercury in concentrations such that the mercury content in vapour from a one gram sample was beyond the range of the detector were tested in measured quantities of 0.25 gram or 0.10 gram.

Samples were run in duplicate. If results varied by less than 0.3 micrograms per liter in the 0.5 to 2.0 microgram per liter range or by less than about 15% above 2.0 they were averaged. If discrepancies were beyond these arbitrary limits, a third sample was tested. If the third result corresponded to one of the first readings, the erratic value was discarded; if all three readings were in disagreement they were averaged. It was found necessary to run about 20% of the "B" horizon samples and 60% of the more heterogeneous "C" horizon samples in triplicate.

The optimum heating and withdrawal time was found to be about 20 seconds at which point the steel bulb was beginning to glow red.

Mercury concentration in each sample was calculated as follows:

$$\frac{\text{Reading in micrograms/liter} \times 0.2 \times 100}{\text{Sample size in grams}} = \text{parts per 100 million Hg}$$

Samples giving readings beyond the range of the detector from samples of 0.10 gram were recorded only as containing more than 2,000 parts per 100 million mercury.

## GENERAL GEOLOGY

### Carabine Suite

The basement east of Carabine Creek is a heterogeneous mixture of volcanic and possibly intrusive rocks reported by W. E. Cockfield to be of Cretaceous or Tertiary age. This suite comprises mostly dark andesite, basalt and related very fine grained intrusive (?) material, but outcrops range in composition from rhyolite to pyroxenite.

Most rocks of the Carabine suite weather easily and outcrops of the more basic members are scanty. Distribution of the suite has been interpreted almost entirely from float and from small, angular rock fragments in the soil samples.

Within the "B" grid on the north end of the property, the Carabine suite has been subdivided for mapping purposes, without reference to relative age, into two units:

#### (1) Dark Rocks:

- (a) Greenish or brownish grey to black, aphanitic massive andesite and basalt;
- (b) Dark green, grey or purple finely to coarsely porphyritic basalt containing from 10% to 50% of grey, subhedral to euhedral, 1 mm to 1 cm laths of plagioclase in an aphanitic groundmass;

- (c) Dark brown to very dark grey or black, very fine grained allotriomorphic trap. This dense, massive and heavy, locally variolitic rock is commonly flecked with minute grains of blood-red hematite. It may be of intrusive origin.
- (d) Medium grey, very fine grained allotriomorphic, hard, tough and massive andesite (?) or diorite (?). Float of this possibly intrusive rock is abundant on Merc 16 and Merc 30.

(2) Light Rocks:

The light brownish grey to brown, finely to coarsely porphyritic rocks probably range in composition from latite to andesite. They contain from 10% to 40% white or grey, subhedral to euhedral 1 mm to 1 cm feldspar laths and a few shreds of biotite in an aphanitic groundmass.

The most abundant facies of the light rocks is pale purplish grey to chocolate brown densely porphyritic material containing about 30% feldspar phenocrysts. This porphyry contains scattered clots of epidote, rare 2 mm to 1 cm amygdules of pale green chalcedonic quartz and a few widely scattered amygdules of dark green to black, soft, unidentified material resembling serpentine. This facies is mainly confined to claims LA 2, Lee 1 and Lee 2. It is spatially related to coarsely porphyritic basalt, and it is possible that all porphyry containing feldspar phenocrysts in the 5 mm to 1 cm range should be mapped as a unit on the basis of texture rather than subdivided on the basis of the writer's colour criteria.

Within the "A" grid at the south end of the property, there are two rock units which bear strong lithologic similarities to Kamloops volcanic members in the Ashcroft and Nicola map areas but which appear to lie within the Carabine suite. They are:

(1) Rhyolite and Porphyritic Rhyolite:

The equigranular facies of this rock is mauve to pale greenish grey, very fine grained and highly siliceous. It is hard, brittle and commonly well fractured by jointing.

The porphyritic facies is a very distinctive pale reddish brown to very light grey or brownish grey rock containing up to 5% each of euhedral to subhedral biotite plates and white 1 mm to 5 mm feldspar laths. The groundmass is very fine to aphanitic, highly siliceous and similar in general appearance to the equigranular rhyolite facies.

(2) Agglomerate:

This rock is in contact with the rhyolite and rhyolite porphyry along the edge of the bench overlooking Carabine



Creek. It is greenish grey, medium to very coarse grained material comprising sub-rounded to angular fragments of volcanic rock from less than 1/4 inch to more than six feet wide in a greenish grey, very fine grained matrix. The most common fragments are of the adjacent porphyritic rhyolite.

Ultrabasic Rock

Along the floor of Carabine Creek valley there is a broad, linear band of dark greenish brown to black, fine grained equigranular to medium grained and porphyritic, massive, moderately to strongly serpentinized ultrabasic rock. The most common variety comprises abundant relict anhedral to subhedral 3 mm phenocrysts of dark brown pyroxene in a pale green to bluish green aphanitic matrix of serpentine.

Copper Creek Intrusions

The Carabine suite and the ultrabasic rock are intruded by grey to pink, lithologically diverse rocks named Copper Creek intrusions by Cockfield. These have been subdivided by the writer into an early "diorite and granodiorite" and the late stage "felsite" with which mercury is associated on the property.

Diorite and Granodiorite:

On Merc 6, Merc 52 and Merc 54 and east of the graded road in the Carabine Creek valley there are scattered outcrops ranging in composition through granite, quartz-diorite, granodiorite and diorite. These rocks are light brown, brownish grey or pink, fine to medium grained, equigranular and massive to moderately foliated. The most common variety comprises more than two-thirds light grey, white or pale pink feldspar, up to 5% finely disseminated magnetite, less than 10% quartz and up to 20% chlorite and biotite. The foliated variety is strongly altered; it contains abundant bright bottle-green intergranular chlorite and small lenses of tan dolomite.

A narrow band of hornblende diorite near the Tuson ranch buildings on Merc 33 and Merc 38 is a contact zone of the more common biotite-bearing intrusive rock. It is commonly light grey, fine grained and porphyritic with abundant phenocrysts of acicular hornblende to 3 mm long. Moderately altered hornblende diorite near the road contains a little calcite, abundant dolomite and up to 5% finely disseminated pyrite.

Felsite:

The rocks collectively classed as felsite are tan, pink, light grey or reddish brown, aphanitic to fine grained. Varieties include aplite; very fine grained

alaskite and granite; and fine grained feldspar porphyry. The porphyry is the dominant type. It commonly contains a few specks of biotite and 5% to 10% white, subhedral partially resorbed and moderately kaolinized feldspar phenocrysts.

The felsite is commonly silicified and pyritized. The pyrite contributes to a distinctive tan to yellowish brown, soft weathered surface.

The main bodies of felsite are dyke swarms containing abundant included material of the Carabine suite.

Felsite dykes also cut the Copper Creek granodiorite in a few places.

### Kamloops Volcanics

Most of Hardie Mountain and a linear ridge extending northwesterly from it are overlain by Cenozoic flows with minor tuff interbeds. The flows are very light grey, reddish or brownish grey, dark purplish brown and black. They range in composition from rhyolite to basalt with basalt comprising more than two-thirds of the total. There is a general trend to increasing acidity towards the northeast boundary of the property.

The rhyolite is very light grey to light reddish brown, finely porphyritic with scattered euhedral 1 mm to 2 mm phenocrysts of hornblende or white feldspar in an aphanitic matrix. It is commonly very finely vesicular.

The darker flows are very rarely porphyritic. They are aphanitic and are commonly highly vesicular to scoriaceous. Vesicles are ovoid to tubular, and tubular vesicles are up to 10 cm long. In the basalt there are abundant irregularly shaped to ovoid amygdules of grey to greenish grey chalcedony.

Flow brecciation with angular breccia fragments to two feet wide is common in flows of all compositions.

Minor tuff interbeds in the sequence are red to greenish grey, fine to medium grained and massive to crudely stratified. They are probably mostly water-lain.

### Structure

There are two distinct sets of steeply dipping shears on the property. The older set strikes N30°W to N45°W and commonly dips to the southwest.

A younger, dominant set of shears, most major joints and most mineralized veins strike N20°E to N10°W and commonly dip steeply to the east.

Minor steeply dipping joints commonly strike northeast.

Strongly silicified shear zones striking more or less north and dipping to the east are locally resistive to weathering and stand in relief as outcrops in areas where outcrops are scanty.

There is probably a major fault striking north along the Carabine Creek valley.

### MINERALIZATION

Felsite and included Carabine volcanic rocks on the Merc, Lee and LA claims are commonly silicified and pyritized. Cinnabar with or without pyrite occurs in or related to shears striking  $N15^{\circ}E$  to  $N40^{\circ}W$  and dipping steeply to the east. There are twelve known occurrences of cinnabar on the property: two on LA 1; two on LA 3; four on Merc 17; two on Merc 31; one on Merc 32; and a group of veins on Lee 3 and LA 5. Ten of these are exposed in turn-of-the-century exploratory pits and adits. All are in felsite or in Carabine rock at a felsite contact.

The most noteworthy of the cinnabar showings on the property are briefly described below. (Refer to Figures 2, 4 and 5 for locations.)

#### Merc 17 Showings

##### 91N, 40E:

Three brecciated shears with a matrix of white calcite and tan dolomite cut pink aplite across a width of six feet. Their average attitude is  $010^{\circ}/75^{\circ}E$ . The combined width of the three breccia veins is about 1.5 feet. The breccia matrix contains finely disseminated pyrite and cinnabar and hairlike lenses of cinnabar in quartz.

This shear zone outcrops at intervals for about 200 feet up dip and north along strike.

##### 92N, 41E:

A brecciated band six to eighteen inches wide strikes  $140^{\circ}/60^{\circ}NE$  in light grey to mauve aplite. A dolomite matrix contains abundant finely disseminated cinnabar and there are thin cinnabar encrustations on the slickensided walls of the shear.

##### 93N, 43E:

A series of strong joints and tight shears with attitudes of north to  $N20^{\circ}W/55^{\circ}NE$  cuts pinkish grey, fine grained feldspar

porphyry. There is an inclusion of dark volcanic rock on the footwall of the sheared zone. Within the zone there is one breccia band 18 to 24 inches wide.

Cinnabar is disseminated in the breccia band, in the wall rock, and along small, calcite-coated fractures. A four foot channel sample from just above the footwall assayed 0.27% Hg. The entire zone averaged 0.13% Hg across a width of 12.6 feet.

Merc 31 Showing at 101 + 60N, 40 + 60E

A band of red and yellow, highly leached pyritiferous material strikes about N50°W and dips 80°NE. North of the leached zone, a pit exposes a four foot width of mauve to tan aplite in which cinnabar is heavily disseminated.

A sample across the full width (3 feet) of the leached band assayed only 0.002% Hg, but a grab sample from the mineralized and unleached wall rock assayed 1.025% Hg.

Showings on LA 3

72N, 52E to 75N, 55E:

A sheared and brecciated zone 18 inches to four feet wide in pink to tan aplite and fine grained biotite-granite strikes north and dips steeply to the east. Veinlets and lenses of quartz and dolomite within the shear zone contain finely disseminated cinnabar and pyrite. The quartz carries more pyrite and less cinnabar than the dolomite, but the largest observed quartz lens assayed 0.14% Hg across a true width of 1.7 feet.

80N, 53E:

A felsite apophysis about 20 feet wide cuts dark brownish to purplish grey, coarsely porphyritic basalt of the Carabine suite.

Narrow brecciated shears from two inches to one foot wide cut both the basalt and the felsite at N15°E/80°SE. The breccia matrix of white to tan dolomite contains disseminated cinnabar; there is no cinnabar in the unsheared wall rock.

Four breccia bands and the intervening barren porphyry were channel sampled across a width of 17 feet. The best sample obtained contained 0.38% Hg across a width of 0.4 feet. The two best bands and 3.9 feet of intervening basalt averaged 0.05% Hg across a true width of 4.6 feet.

The brecciated shears are best developed in the porphyritic basalt; in the felsite they pinch, tighten and tend to be barren. This is a departure from the usual situation on the property; all other significant cinnabar showings are in felsite.

Showings on Lee 3 and LA 5 (cf. Figure 7 and Figure 8)

Between lines 52N and 56N ("B" Grid), from 63 + 50E to 67 + 50E, tan to brown aplite and fine grained porphyritic granite are cut by numerous veins and stringers of white to grey quartz along tight shears. These veins vary in thickness from a fraction of an inch to more than one foot, but the most common width is about six inches.

One group of veins is in a set of shears striking  $N30^{\circ}W$  to  $N45^{\circ}W$  and dipping steeply to the southwest, but the dominant group strikes  $N15^{\circ}E$  to  $N10^{\circ}W$  and dips  $70^{\circ}E$  to  $70^{\circ}W$ .

The veins in this area are unique in their lack of calcite or dolomite with the quartz. Cinnabar occurs as thin coatings on the edges of fragments of brecciated country rock within the veins and disseminated both in vein material and in silicified wall rock. In silicified breccia zones where northwest-trending shears are truncated by the north-trending dominant set there are small high grade pods estimated to contain 2% to 5% cinnabar.

An adit from 54 + 20N, 63 + 20E intersects a breccia zone about 60 feet from the portal. From this zone, ninety feet of drifting on a series of  $N45^{\circ}W$  shears near the intrusive contact has exposed sporadic lenticular veins along a strike length of sixty-five feet. At intersections with cross shears the quartz lenses are up to two feet wide. Limited channel sampling has defined one shoot 30 feet long x 1.5 feet wide containing 0.16% mercury and one shoot 10 feet long x 2.4 feet wide containing 0.48% mercury.

North of the adit, more than a dozen veins of the north-trending set are exposed in trenches and on scattered outcrops. A few channel samples from the trenches indicated mercury contents ranging from a trace to 0.26% for veins averaging less than one foot in width. Individual veins are too narrow and lenticular to be of economic interest, but cinnabar occurs finely disseminated in silicified country rock and in quartz stringers too narrow to sample individually. For example, at 55 + 60N, 65 + 20E silicified granite containing scattered quartz veinlets assayed 0.11% mercury across a width of 4.4 feet.

## GEOCHEMICAL SURVEY RESULTS

The geochemical studies indicated a marked increase in mercury content in soils overlying the felsite intrusion. This was predictable since all known cinnabar occurrences in the Carabine Creek-Hardie Mountain area are either within or closely associated with felsite. Background mercury values in parts per 100 million averaged 6 over fresh and unaltered Kamloops volcanic rocks, 15 over the Carabine suite and 30 over felsite.

Mercury anomalies on Merc 17, Merc 31, Merc 32 and LA 1 have their maximum intensities adjacent to contacts between felsite and dark Carabine rocks. This may be geologically significant, but it could be coincidence resulting from the great abundance of included material within the dyke swarm.

Soil geochemistry proved to be ineffective near the base of Hardie Mountain where background mercury values indicate that the soil is developed from piedmont colluvium composed largely of Kamloops volcanic rocks.

Sampling of the "B" soil horizon in 1969 and 1970 indicated nine significant mercury anomalies and eight anomalies of questionable interest.

As recommended in 1969, thirteen "B" horizon anomalies have been checked in detail by sampling the "C" horizon at intervals of fifty feet. Nine have been confirmed and delineated to varying degrees and four have been determined to be superficial.

The most interesting anomaly on the property is on Merc 17 centred at about 97N, 43E in an area of slight topographic relief. From the "B" horizon, mercury counts of three times background or higher were recorded in an area approximately 800 feet long and 100 to 200 feet wide. Counts of more than 15 times background were recorded from this area. This is much higher than counts obtained from soil in the immediate vicinity of any surface exposure of cinnabar on the property. Sampling from the "C" horizon confirmed the anomaly, and one count of more than 2,000 parts per 100 million was recorded. This anomaly is on strike and up dip from the main showing at 93N, 43E and is on strike from the showings at 91N, 40E and 92N, 41E.

On Merc 31 and Merc 36, a linear geochemical anomaly more than 2,500 feet long more or less parallels the edge of the plateau from 104N to 130N and extends into Merc 62. Anomalous values from double background to 15 times background in the "B" horizon were recorded both in scree below the rim of the valley and in soil on the gentle slope above the rim. The highest mercury counts were recorded coincident with a group of silicified and pyritized shears

striking about N10°W with an average dip of 60° northeast. Sampling of the "C" horizon confirmed both the size and the shape of this anomaly. Mercury counts of from 15 to more than 60 times background were recorded from several "C" horizon samples.

There are three significant anomalies near the northeast boundaries of LA 1 and Merc 32. These are adjacent to the northeast contact of the felsite intrusion and they are all within 600 feet of minor cinnabar showings. Two of these anomalies have been detailed on the "C" horizon. One anomaly centred at about 93N, 58E has been very sharply delineated; one centred at 106N, 56E has been confirmed, but its configuration is not clear.

Other anomalies within the "B" Grid which have been checked by sampling of the "C" soil horizon are as follows:

- (1) 100N, 43E Area: Anomaly confirmed to be wider than previously indicated. Not delineated.
- (2) 116N, 88E Area: Confirmed as a small weak anomaly in a topographic depression. Soil is derived entirely from colluvium. No significance.
- (3) 104N, 88E Area: Confirmed but weak. Too much of the area is deeply covered by colluvium to permit effective geochemical evaluation.

New "B" horizon anomalies located by the extended survey in May, 1970 are centred at the following locations:

64N, 59E  
72N, 48E  
56N, 64E

The anomaly at 56N, 64E is down slope from the important group of cinnabar exposures on Lee 3, but it is nevertheless much weaker than several anomalies for which there is no visible explanation on the property.

In the "A" Grid area one anomaly centred at about 38N, 34E on Merc 48 has been delineated and confirmed to be important. It trends N70°W for 700 feet, and it is from 100 feet to 200 feet wide. Four "C" horizon samples within the anomalous area yielded mercury counts of from 15 to more than 60 times background.

Other anomalies within the "A" Grid which have been checked by sampling of the "C" soil horizon are as follows:

- (1) 6N, 32E Area: Weakly anomalous. No significance.

- (2) 4N, 39E Area: Weakly anomalous. No significance.
- (3) 20N, 47E Area: Confirmed and shifted about 50 feet to the southwest. Abundance of colluvium makes anomaly of doubtful interest.
- (4) 56N, 46E Area: Confirmed as a single "hot" spot near a basic intrusion.
- (5) 58N, 50E Area: Weakly anomalous. Colluvium too deep for useful sampling.

#### RECOMMENDATIONS

It is recommended that three strong geochemical anomalies coincident with favourable geological conditions on Merc 17, Merc 31 and LA 1 be tested by diamond drilling. Trenching with a large bulldozer with rippers is an alternative to drilling and the cost of exposing a given true width at surface by this method would be about one-quarter the cost of coring an equal width. However, trenching in the immediate area has proven unsatisfactory in the past because of the difficulty in reaching fresh, unleached rock.

Because the distribution of cinnabar in exposed veins on the property is very erratic a large diameter core would be an advantage. The minimum recommended core size is BQ, and NQ would be a definite advantage. Some cost saving and more accurate sampling could be gained by using a large diameter rotary percussion machine, but continuous coring will yield better geological information for the initial program.

It is further recommended that at least three holes be drilled at the Lee 3 showings to determine if mineralized veins and stringers may be sufficiently numerous and are associated with enough wall rock mineralization to make open pit ore.

No unusual drilling problems are anticipated, but sludge samples should nevertheless be collected.

The following initial drilling program of thirteen holes totalling 3,100 feet is proposed:

- (a) Four holes each 250 feet deep, to test the strong anomaly coincident with a silicified and pyritized shear zone near the edge of the plateau on Merc 31:

	<u>Location</u>	<u>Bearing</u>	<u>Inclination</u>
(1)	105 + 50N, 37E	S60°E	-55°
(2)	107 + 50N, 37 + 50E	S80°E	-55°
(3) & (4)	To be determined on the basis of (1) and (2)		



(b) Four holes inclined at  $-50^{\circ}$  in the major anomaly which centres around 97N, 42E:

	<u>Location</u>	<u>Bearing</u>	<u>Depth</u>	<u>Structural Target</u>
(1)	101N, 41+10E	S25 $^{\circ}$ W	200'	Strike to southeast from the showing at 101+60N, 40+60E
(2)	98+60N, 42+20E	S45 $^{\circ}$ W	250'	Strike to southeast from the showing at 101+60N, 40+60E and strike to northwest from the showing at 92N, 41E.
(3)	97N, 43+80E	S45 $^{\circ}$ W	300'	Strike to northwest from the showings at 91N, 40E and 92N, 41E
(4)	95+30N, 44+20E	S60 $^{\circ}$ W	250'	Strike to northwest from the showing at 93N, 43E.

(c) Two holes to test the anomaly centred at 93N, 58E on LA 1:

	<u>Location</u>	<u>Bearing</u>	<u>Depth</u>	<u>Inclination</u>
(1)	92N, 59+20E	S45 $^{\circ}$ W	200'	$-50^{\circ}$
(2)	94+20N, 57+30E	N60 $^{\circ}$ E	220'	$-50^{\circ}$

(d) Three holes at the Lee 3 showing:

	<u>Location</u>	<u>Bearing</u>	<u>Depth</u>	<u>Inclination</u>
(1)	55+60N, 63+70E	S85 $^{\circ}$ E	200'	$-35^{\circ}$
(2)	53+50N, 65+90E	West	300'	$-50^{\circ}$
(3)	54+40N, 63+20E	N75 $^{\circ}$ E	180'	$-30^{\circ}$

It is further recommended that about 15 man shifts of manual stripping and trenching be done to obtain geological information on which to base possible drill testing of the anomalies centred at 38N, 34E on Merc 48 and at 56N, 46E on Merc 1.


No further geochemical or geological studies are recommended at this time. Any additional work of this nature should be planned on the basis of the results of the proposed drilling.

COST ESTIMATES

The cost of the foregoing program is estimated as follows:

I. <u>Diamond Drilling</u>	
Mobilization	\$ 1,000
Water hauling	1,800
Preparation of drilling roads and drill sites, mainly on Lee 3	2,000
Coring 3,100 feet (NQ) at \$10.50	32,550
Geological supervision (30 days)	4,500
Allowance for assaying	<u>1,000</u>
	\$42,850
II. Trenching on Merc 1 and Merc 48	<u>600</u>
	\$43,450
Contingency (15%)	<u>6,550</u>
Proposed budget	<u><u>\$50,000</u></u>

Respectfully submitted,

  
 Lee G. Morrison  
 Consulting Mining Geologist



Expiry Date: Feb. 28, 1971

CERTIFICATE OF QUALIFICATIONS

I, LEE G. MORRISON, of the City of Calgary in the Province of Alberta,

HEREBY CERTIFY:

- (1) THAT, I am a licenced Professional Engineer in the Provinces of Alberta and British Columbia;
- (2) THAT, I am a graduate of the University of Saskatchewan with the degrees of Bachelor of Arts (1956) and Bachelor of Science in Geological Engineering (1957);
- (3) THAT, I am a Consulting Mining Geologist residing at 1608 - 49th Avenue S.W., Calgary 7, Alberta;
- (4) THAT, I have practiced my profession for more than thirteen years;
- (5) THAT, the geological information in this report is based upon my personal observations in the field; that geochemical sampling was conducted under my personal supervision and that sample analyses were made by me or under my supervision;
- (6) THAT, I have no direct or indirect interest in the Merc, Lee, Wedge or LA claims or in Savanna Creek Gas and Oil Limited, nor do I expect to receive any.

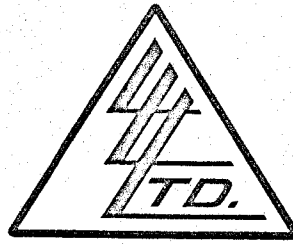


*Lee G. Morrison*  
Lee G. Morrison, P. Eng.

Expiry Date: Feb. 28, 1971

To: Mr. Lee Morrison  
1608 - 49th Ave. S.W.  
CALGARY 5, Alberta.

File No. 2749  
Date May 20th 1970  
Samples Grab

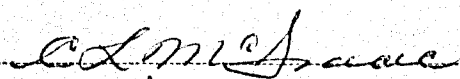


Certificate of  
ASSAY of  
LORING LABORATORIES LTD.

SAMPLE No.	Hg %
426	.26
427	.12
428	.11
429	.11
430	.01
431	.005
432	.005
433	.01
19661	.44
19662	.60
19663	.02
19664	.10
19665	.20
19666	.01
19667	.08
19668	.27
19669	.09
19670	.54
19671	.58
19672	.57
19673	.27

I Hereby Certify THAT THE ABOVE RESULTS ARE THOSE  
ASSAYS MADE BY ME UPON THE HEREIN DESCRIBED SAMPLES . . . .

Objects Retained one month.  
Pulps Retained one month  
unless specific arrangements  
made in advance.

  
Assayer

BIBLIOGRAPHY

Cockfield, W. E. (1948)

"Geology and Mineral Deposits of  
Nicola Map-Area, British Columbia"  
Geol. Surv. of Canada Memoir 249.

Morrison, L. G. (1969)

"Report on Geological and Geochemical  
Studies, Merc and LA Claims, East  
of Carabine Creek, British Columbia"  
Unpublished.

A STATEMENT OF COSTS  
 FOR GEOCHEMICAL AND GEOLOGICAL INVESTIGATIONS  
 ON MERC 1-17, MERC 29-65, LA 1-6, LEE 1-3 AND WEDGE 1  
 AT CARABINE CREEK IN THE KAMLOOPS MINING DIVISION  
 FOR SAVANNA CREEK GAS AND OIL LIMITED  
 BY LEE G. MORRISON  
 CONSULTING MINING GEOLOGIST

MAY 7 TO JUNE 16, 1970

Field Survey Crew

L. G. Morrison, Geological Engineer	11½ days @ \$150*	\$1,725.00
D. A. Rees, Geochemical technician	24 days @ \$ 50*	1,200.00
A. J. Sekella, Assistant	24 days @ \$ 35*	840.00
R. F. Etienne, Line cutter	3 days @ \$ 35*	105.00
R. W. Calhoun, Line cutter	3 days @ \$ 35*	<u>105.00</u>
	Total	\$3,975.00

\* Includes overhead, mobilization and field maintenance.

Operational Costs

4-wheel drive rental	24 days @ \$ 20	\$ 480.00
Assays		<u>130.00</u>
		\$ 610.00

Geochemical Sample Analysis, Draughting  
and Report Preparation

L. G. Morrison	4½ days @ \$140	\$ 630.00
D. A. Rees	7 days @ \$ 40	<u>280.00</u>
		\$ 910.00
	Total Expenses	<u><u>\$5,495.00</u></u>

PERSONNEL ON LEIER PROSPECT

Field Crew:

L. G. Morrison	May 14 - 20	1970
1608 - 49th Avenue S.W.	May 24 - 28	1970
Calgary 7, Alberta		

David A. Rees	May 7 - 30	1970
8048 - 24th Street S.E.		
Calgary, Alberta		

Alex J. Sekella	May 7 - 30	1970
2427 - 25th Street S.W.		
Calgary, Alberta		

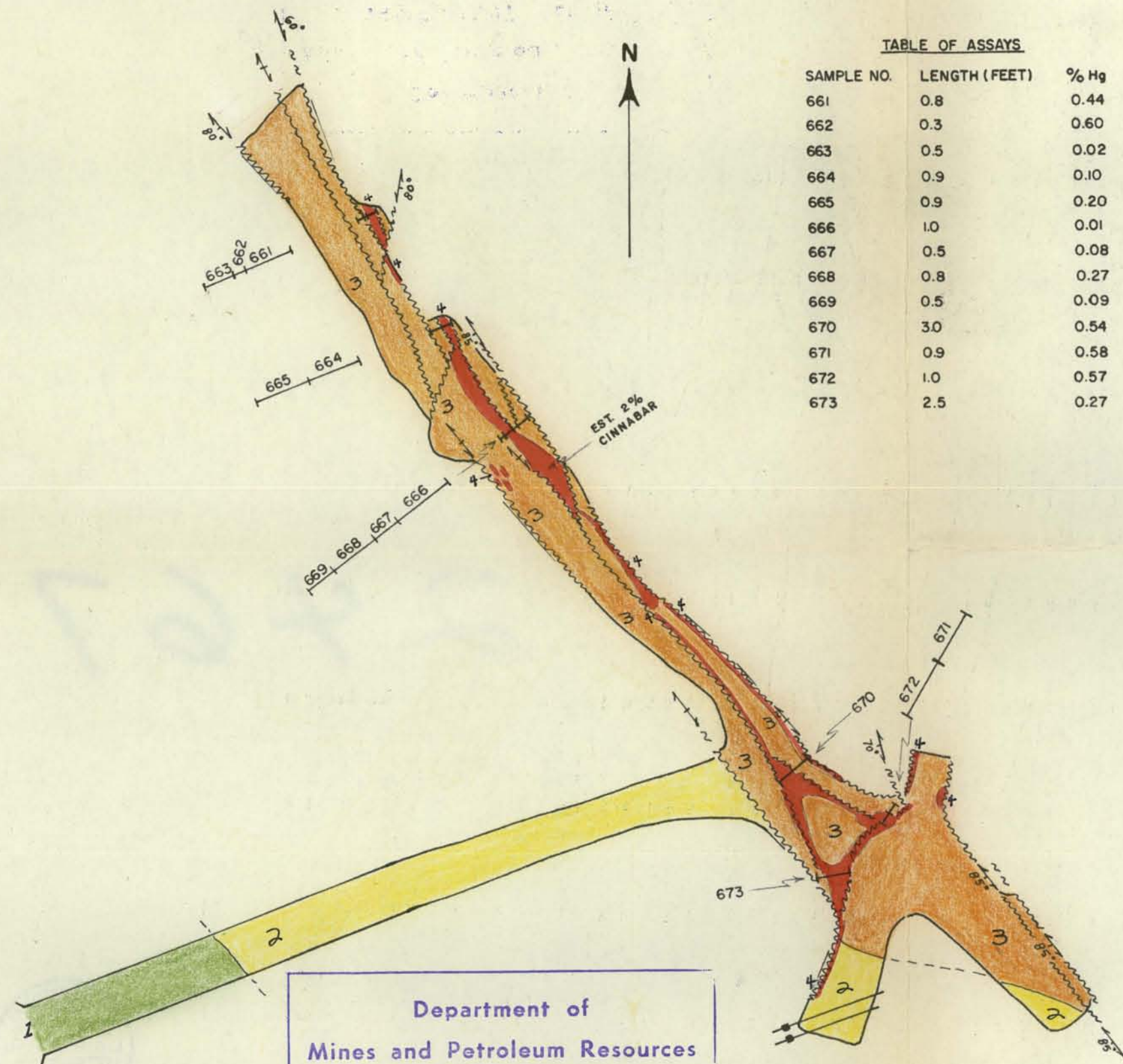
Ronald F. Etienne	May 14 - 17	1970
Deadman Creek I.R.		
Savona, B.C.		

Roger W. Calhoun	May 14 - 17	1970
Deadman Creek I.R.		
Savona, B.C.		

Sample Analysis, Draughting and Report  
Preparation in Calgary, Alberta:

L. G. Morrison	June 12 - 16	1970
----------------	--------------	------

D. A. Rees	June 2 - 6	1970
	June 13 - 14	1970



**TABLE OF ASSAYS**

SAMPLE NO.	LENGTH (FEET)	% Hg
661	0.8	0.44
662	0.3	0.60
663	0.5	0.02
664	0.9	0.10
665	0.9	0.20
666	1.0	0.01
667	0.5	0.08
668	0.8	0.27
669	0.5	0.09
670	3.0	0.54
671	0.9	0.58
672	1.0	0.57
673	2.5	0.27

- LEGEND**
- 4  QUARTZ - CINNABAR VEIN
  - 3  APLITE: Brown to grey  
FELDSPAR PORPHYRY > 1/3 Imm. to 6mm phenocrysts
  - 2  Light brown to grey. Strongly kaolinized
  - 1  Very dark grey to black. Sandy weathering
  - NARROW SHEAR. Commonly 1/4" gouge
  - CHANNEL SAMPLE

SCALE: 1"=10'

2467

PLAN OF ADIT  
ON LEE 3

LEIER MERCURY PROSPECT  
CARABINE CREEK  
KAMLOOPS MINING DIVISION  
BRITISH COLUMBIA

TO ACCOMPANY REPORT BY LEE G. MORRISON P. ENG  
DATED JUNE 16, 1970

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT

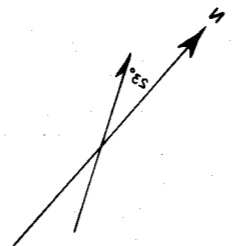
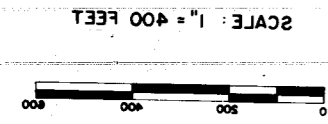
NO. 2467 MAP #7

Lee Morrison

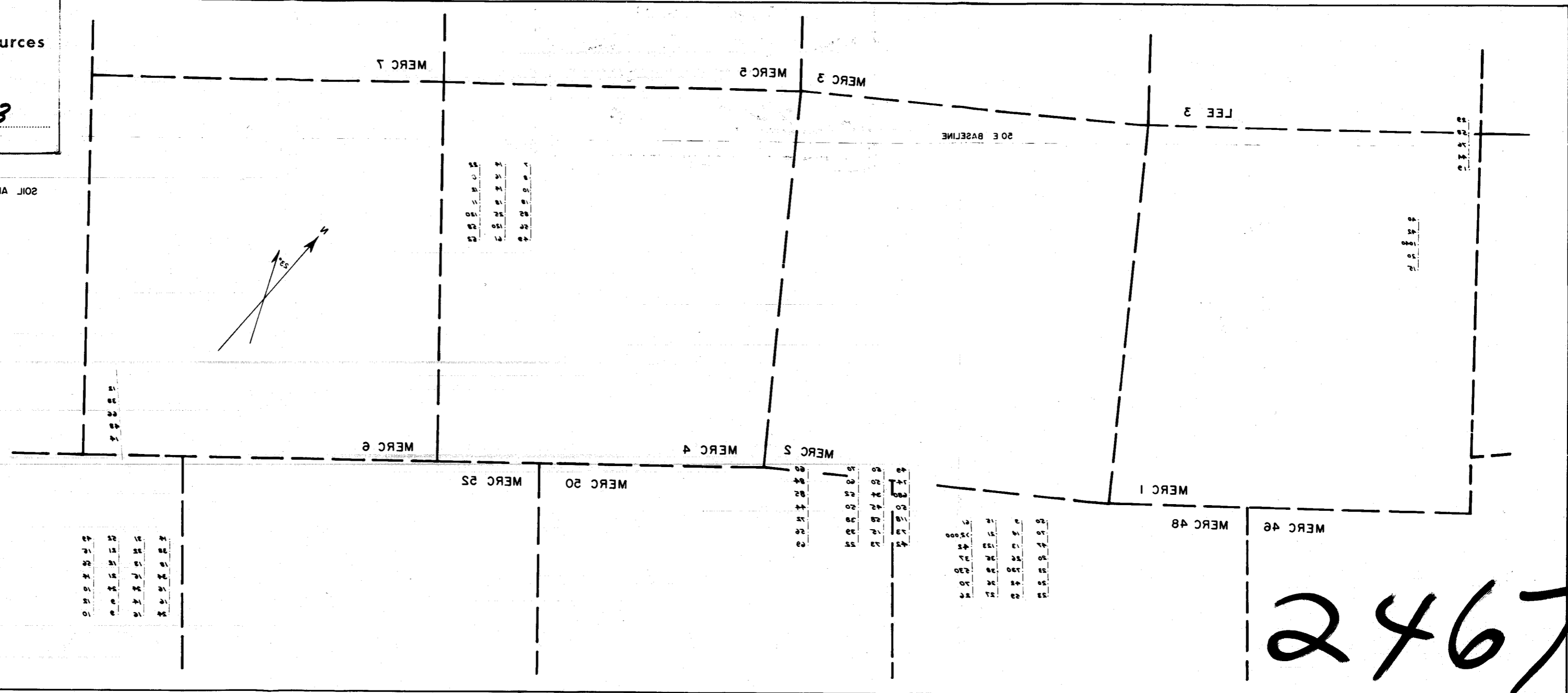


Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT  
NO. **2467** MAP **#3**

SOIL ANALYSES FOR MERCURY IN PARTS PER 100,000



BRITISH COLUMBIA  
KAMLOOPS MINING DIVISION  
CARABINE CREEK  
LEIER MERCURY PROSPECT  
'A' GRID  
C HORIZON SOIL SAMPLES  
GEOCHEMICAL OVERLAY  
DATED JUNE 16, 1970  
TO ACCOMPANY REPORT BY LEE G MORRISON P ENG

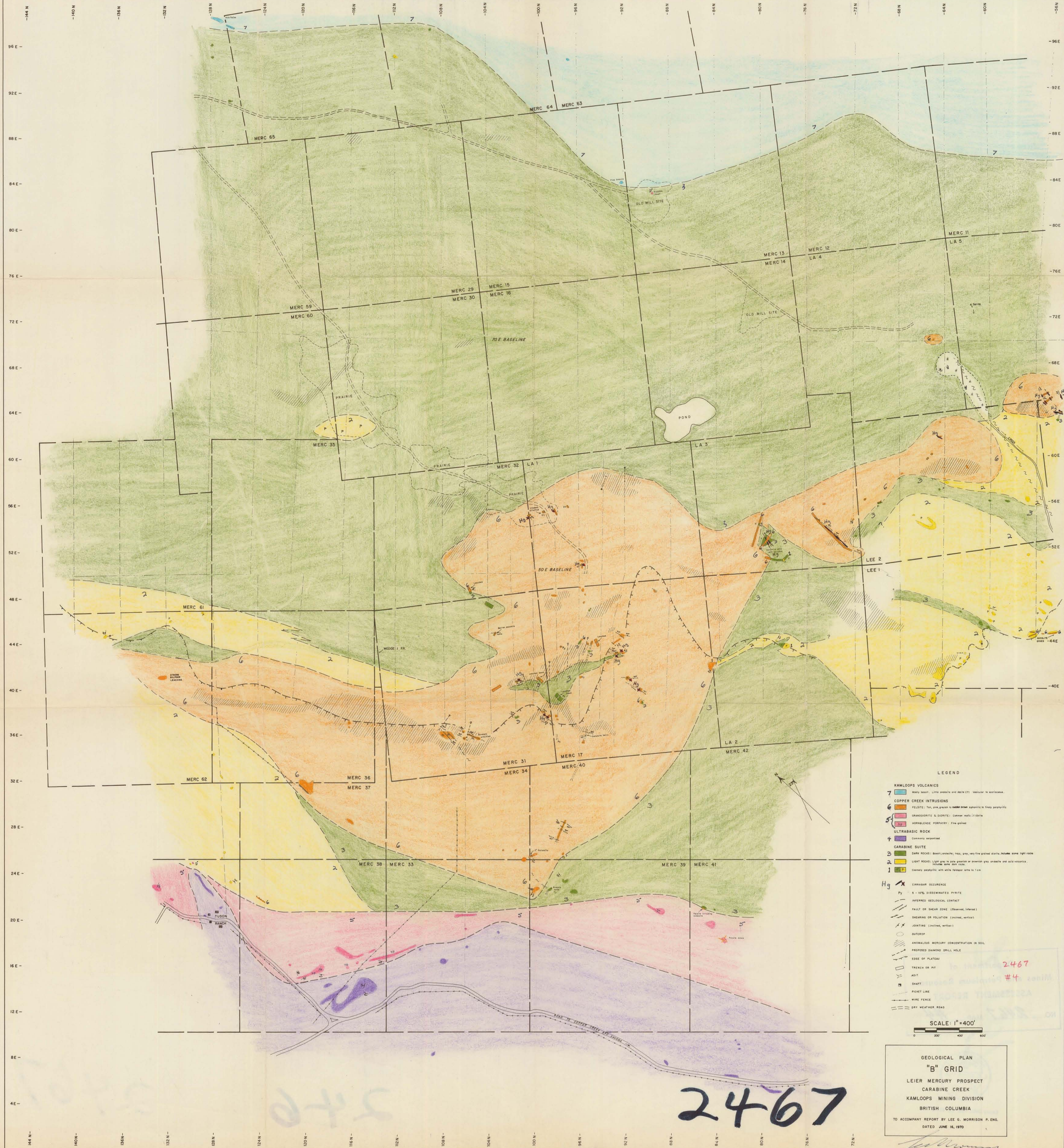


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88	97	97	97
89	98	98	98
90	99	99	99
91	100	100	100





**LEGEND**

- KAMLOOPS VOLCANICS**
  - 7: Mainly basalt. Little andesite and dacite (?) Volcanic to workstone.
- COPPER CREEK INTRUSIONS**
  - 6: FELSITE: Tan, with green to reddish brown apophyses to fine porphyry.
  - 5: GRANODIORITE & DIORITE: Coarse matrix, dioritic.
  - 5: HORNBLENDE PORPHYRY: Fine grained.
- ULTRABASIC ROCK**
  - 4: Commonly serpentinized.
- CARABINE SUITE**
  - 3: DARK ROCKS: Basalt, andesite; red, grey, very fine grained diorite, including some light rocks.
  - 2: LIGHT ROCKS: Light grey to pink granitic or brownish grey, andesitic and acid volcanic, including some dark rocks.
  - 1: Coarsely porphyritic, with white feldspar ortho to 1 cm.
- Mineral Occurrences:**
  - Hg: CINNABAR OCCURRENCE
  - Py: 5-10% DISSEMINATED PYRITE
- Structural Features:**
  - INFERRED GEOLOGICAL CONTACT
  - FAULT OR SHEAR ZONE (Dissevered, inferred)
  - SHEARING OR FOLIATION (Inferred, vertical)
  - JOINTING (Inferred, vertical)
- Other Features:**
  - OUTCROP
  - ANOMALOUS MERCURY CONCENTRATION IN SOIL
  - PROPOSED DIAMOND DRILL HOLE
  - EDGE OF PLATEAU
  - TRENCH OR PIT
  - ADIT
  - SHAFT
  - PICKET LINE
  - WIRE FENCE
  - DRY WEATHER ROAD

SCALE: 1" = 400'

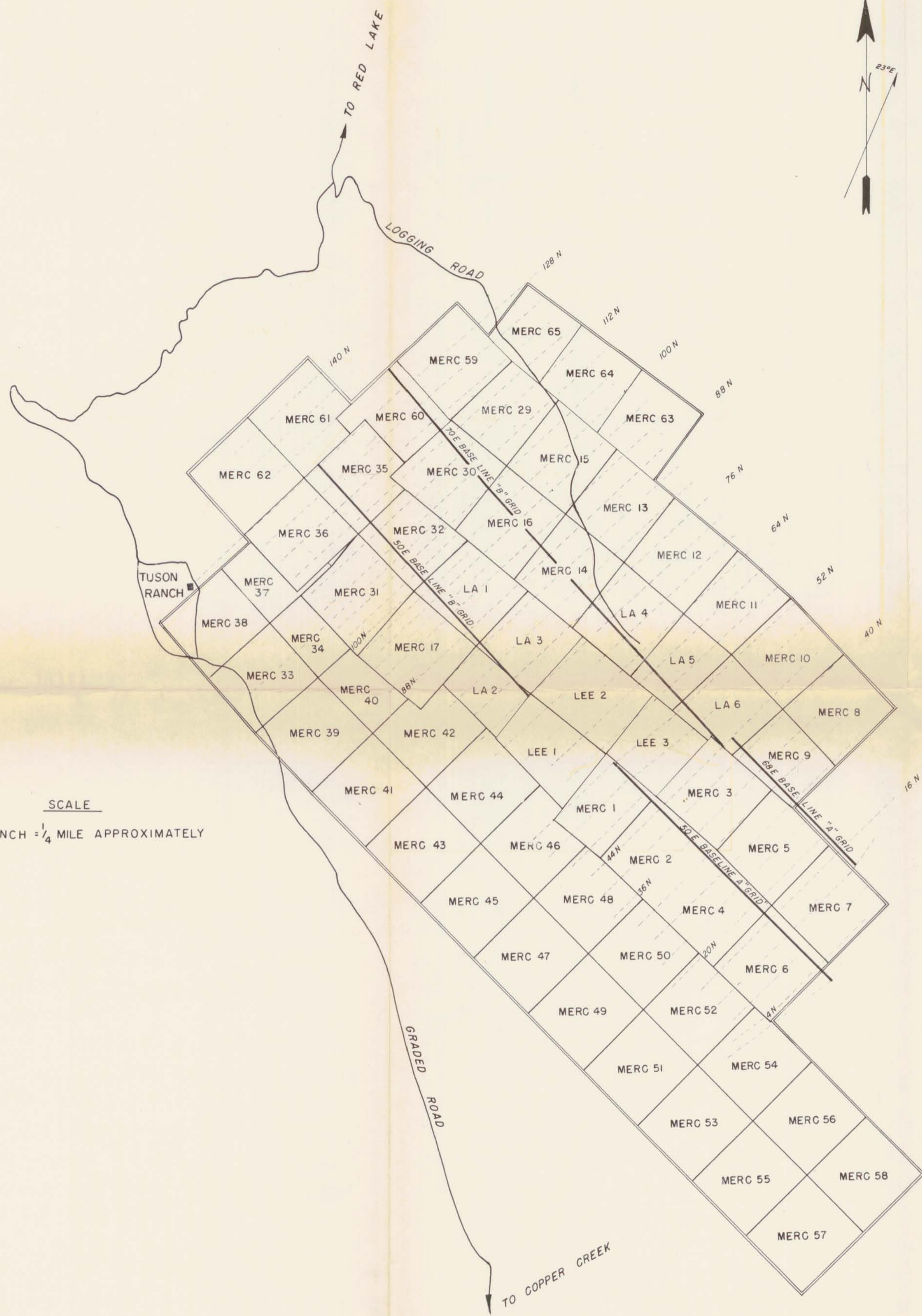
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**GEOLOGICAL PLAN**  
**"B" GRID**  
 LEIER MERCURY PROSPECT  
 CARABINE CREEK  
 KAMLOOPS MINING DIVISION  
 BRITISH COLUMBIA  
 TO ACCOMPANY REPORT BY LEE G. MORRISON P. ENG.  
 DATED JUNE 16, 1970

*Lee G. Morrison*

2467

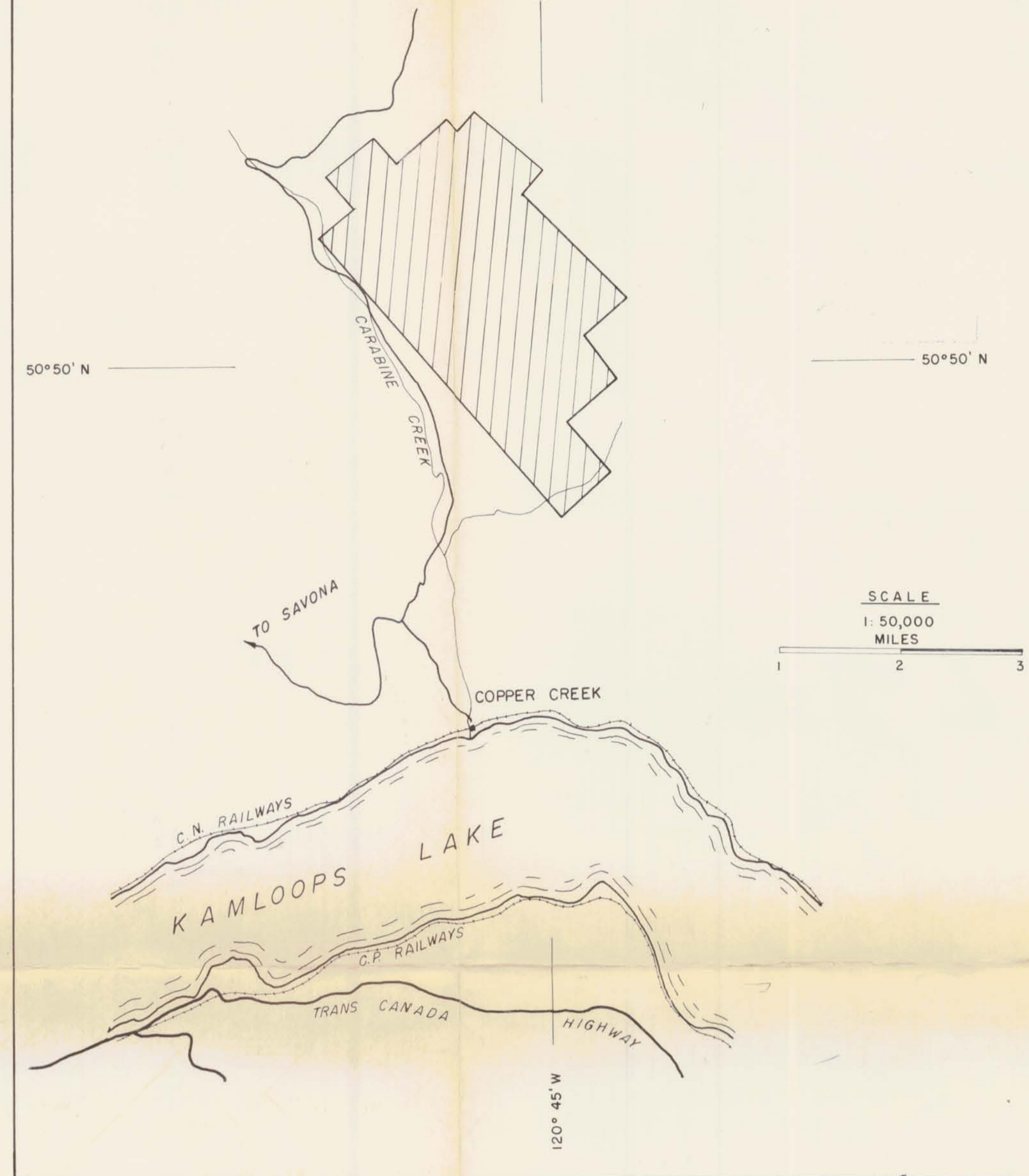
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 #4



SCALE  
1 INCH = 1/4 MILE APPROXIMATELY

50°50' N

120°45' W



SCALE  
1:50,000  
MILES

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— LEGEND —

- OUTER BOUNDARY OF PROPERTY (APPROX.)
- INTERNAL CLAIM BOUNDARY (APPROX.)
- BASELINE
- PICKET LINE

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT  
NO. 2467 MAP #1

LOCATION MAP  
CARABINE CREEK MERCURY PROSPECT  
(MERC AND LA GROUPS)  
OF  
L.J. LEIER  
IN THE  
KAMLOOPS MINING DIVISION

TO ACCOMPANY REPORT BY L.G. MORRISON P. ENG.  
FOR SAVANNA CREEK GAS & OIL LTD., JUNE 16, 1970

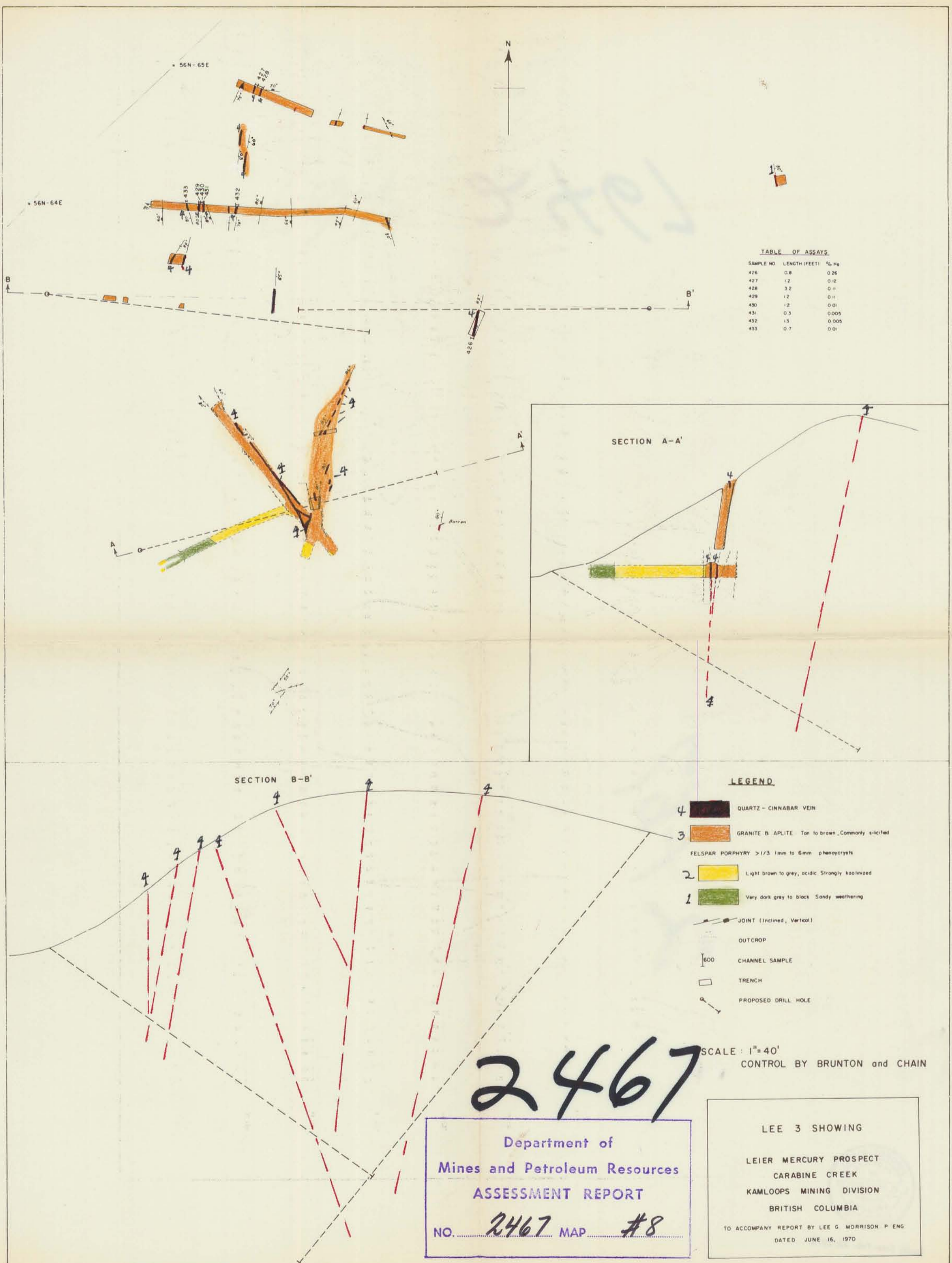


TABLE OF ASSAYS

SAMPLE NO	LENGTH (FEET)	% Hg
426	0.8	0.26
427	1.2	0.12
428	3.2	0.11
429	1.2	0.11
430	1.2	0.01
431	0.3	0.005
432	1.3	0.005
433	0.7	0.01

SECTION A-A'

SECTION B-B'

LEGEND

- 4 [Black box] QUARTZ - CINNABAR VEIN
- 3 [Orange box] GRANITE B. APLITE Tan to brown, Commonly silicified  
FELSPAR PORPHYRY > 1/3 1mm to 6mm phenocrysts
- 2 [Yellow box] Light brown to grey, acidic Strongly kaolinized
- 1 [Green box] Very dark grey to black Sandy weathering
- [Dashed line with arrow] JOINT (Inclined, Vertical)
- [Dotted line] OUTCROP
- [Vertical line with 600] CHANNEL SAMPLE
- [Rectangle] TRENCH
- [Arrow with circle] PROPOSED DRILL HOLE

SCALE: 1" = 40'  
CONTROL BY BRUNTON and CHAIN

2467

Department of  
Mines and Petroleum Resources  
ASSESSMENT REPORT  
NO. 2467 MAP #8

LEE 3 SHOWING  
LEIER MERCURY PROSPECT  
CARABINE CREEK  
KAMLOOPS MINING DIVISION  
BRITISH COLUMBIA  
TO ACCOMPANY REPORT BY LEE G. MORRISON, P. ENG.  
DATED JUNE 16, 1970

*Lee Morrison*