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Harvey property

Report to
Driftwood Mines Ltd. (N.P.L.)
Smithers, B. C.
on the
Drift Claims
on Harvey Mtn., near Smithers

by

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November 30, 1970

Report on Drift Claims

Smithers, B. C.

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SUMMARY

Extensive exploration of copper-silver deposits on Harvey Mtn., in the Babine range, a short distance northeast of Smithers, is recorded in the Annual Reports of the B. C. Minister of Mines between 1918 and 1929. Rich pockets of bornite, chalcopyrite and tetrahedrite were mined by C. G. Harvey and his associates, who searched for, and extracted only shipping ore, but exerted no efforts to follow or outline, the lower grade, disseminated sulphides. Small shipments were made of hand-sorted, copper-silver ore, running \$200 to the ton.

In September, 1970, I inspected numerous exposures which had been opened up by the early operators on both sides of Harvey Creek. These sulphide deposits are found principally in tuffs and andesites of volcanics in the Hazelton series, Jurassic in age. The Hazelton rocks have undergone considerable fracturing and some dislocation, during which silica, calcite and copper sulphides were emplaced in the early fractures, forming high grade veins, lenses and pockets. Sulphides also disseminated into the wall-rocks, to form halos of lower grade material.

Many of the veins strike northwesterly and dip flatly to the northeast, parallel to the bedding of the volcanics. Other dips and strikes are nevertheless abundant, indicating that the copper sulphide deposits could well be associated with an intersecting system of fractures of many orientations, forming a mineralized stockwork.

The predominantly inward dips of the volcanic beds of Harvey Mtn., may have been caused by the collapse of a central, magmatic chamber. The magma which formed it, conceivably was the source of the solutions which mineralized the surrounding volcanics. Sulphide content and copper grade could then be expected to increase as the source body of the mineralization is approached.

I examined and sampled eleven localities, some of them with multiple workings, involving trenches, pits, shafts, inclines and adits. Twenty four samples were taken and assayed. These showed copper ranging from 0.08% to 8.02%; silver from 0.51 to 40.90 ounces per ton, and lead from 0.01% to 6.80%. The arithmetical (not weighted) averages are: 2.01% copper, 8.89 ounces per ton in silver; and 0.98% lead.

Outcrops are not abundant on Harvey Mtn., and a large number of mineral zones was developed by C. G. Harvey on a few sparse and well-scattered surface exposures. It may reasonably be assumed that many more zones of copper-silver mineralization await discovery, beneath the extensive blanket of glacial overburden.

The history of this property and the present evidences of good copper and silver values, amply warrant a thorough and extensive exploration program. This should include geochemical soil analysis, magnetic and induced polarization surveys, geological mapping, further studies of old workings, and diamond drilling. A two-phase program is recommended. The first, to cost \$43,000, is for a detailed study of the area of the old workings which I examined. The second, to cost \$71,000, is for a reconnaissance, plus detail work where indicated, of the rest of the 24 claim group. The total of \$114,000 should serve to define those areas deserving a development program and facilitate the making of estimates for an on-going program.

INTRODUCTION

At the request of Lloyd Hodgson, President of Driftwood Mines Ltd. (N.P.L.), I investigated a group of claims on Harvey Creek, a tributary of Driftwood Creek, in the Babine Mountains near Smithers, British Columbia. The claims involved were Drift #1 to #24. I inspected a number of the old workings on these claims, in the company of Lloyd Hodgson and his assistant Lorne Robinson, September 11 to September 15, 1970. This report summarises my findings.

LOCATION AND ACCESS

The Drift group of 24 mineral claims is located in the Babine Mountains, nearly 12 miles in a straight line northeast of Smithers, B. C. The claims lie on the west-facing slope of an unnamed mountain, known locally as Harvey Mtn., between Lagopus Mountain on the northwest and Astlais Mountain on the southeast. Driftwood Creek flows westerly and then southerly around the northwest base of Harvey Mtn. and eventually joins the Eulkley River to the west. Harvey Creek and Lyon Creek drain the west slope of the mountain, Harvey Creek being a tributary to Driftwood Creek. Lyon Creek, with a more southerly course, flows into Carr Creek. The workings inspected were the principal ones, which lie on both sides of, and not far from Harvey Creek.

The Harvey Creek area is accessible by road, the latter portion of which requires a four-wheel drive vehicle. The old Highway #16, which is paved, is followed easterly and northerly from the Smithers Court House for 2.4 miles, at which point a turn-off is made to the east on the Babine Lake road. This is followed for 3.1 miles to the

Telkwa Highroad, where a turn north is made to follow this road 1.2 miles to the Driftwood Creek road. The latter leads off to the east and then turns northerly. It is followed for a distance of 6.8 miles to the access road to the claims, leading to the east. This latter road requires a four-wheel drive vehicle. At 15.2 miles from town is the old cabin on the north bank of Harvey Creek, long used as his centre for operations by the original owner of the claims, C. G. Harvey.

CLAIMS

The group of Drift claims consists of Drift #1 to #24, arranged in a rectangular block four claims wide and six claims long. The longer axis is oriented N 35° E; see Fig. 1.

Drift #1 to #14 were staked by Lloyd Hodgson and recorded by him on August 12, 1970. Drift #15 to #24 were staked by Mike Church and recorded by him on August 11, 1970. They were recorded in the office of the Mining Recorder in Smithers, which is currently understaffed and overwhelmed with work. At the time of my visit, the "A Forms" had not yet been issued and no Bill of Sale had been recorded.

These claims include the old "Harvey Group" and some others as well. The principal workings, but not all, of the prior owner, C. G. Harvey, are located on the present Drift #8, #10, #19, and #21, which presumably cover his former "Summer" and "Winter" claims.

CLIMATE, WATER, TOPOGRAPHY, AND TIMBER

The climate of the area is typical of the interior of the province at this latitude, which lies close to 55° north. Temperatures will go well below zero in the winter with fairly heavy snow-falls. The higher

mountains carry glaciers and snow fields; the timber line is close to 5,000 feet. In the claim area, the snow does not disappear until about May. Summer season is therefore short, but its days are long.

The creeks draining the mountain slopes will provide adequate water for exploration purposes, but for mining operations it will be necessary to investigate some of the other creeks and the lakes which occupy various basins in the uplands of the area.

The claims lie on the steep, wooded slope facing Driftwood Creek. Where they reach the top of the mountain, however, the summit is rolling and consists of alpine meadows with only occasional scrub timber.

Below the summit the slopes are covered with heavy stands of balsam, spruce and jackpine. There is therefore plenty of timber for mining purposes.

LABOR AND POWER

There is a considerable amount of mining exploration activity in this area and there are numerous settlements in Bulkley Valley, including the rapidly expanding one of Houston, where a large pulp mill is being installed. A supply of labor is therefore available.

The Smithers area is served by the B. C. Hydro, being on a heavy transmission line (230,000 volts) connecting Prince Rupert and Prince George. It is also interconnected with the Peace River power grid, serving Kitimat. Ample power is available.

TRANSPORTATION

Highway #16, connecting Prince Rupert and Kitimat at the coast, with the interior city of Prince George, passes through Smithers. The town is

also served by daily flights of Pacific Western Airlines from Vancouver, by the Canadian National Railway and by bus.

HISTORY OF PROPERTY

The Harvey group of mineral claims, now incorporated in the Drift claims, has over a half a century of exploration history. The principal exploration was carried out by the original locator, C. G. Harvey, working alone or occasionally with associates. No milling facilities were available, so the early prospectors were confined to the search for ore of high enough grade to be hand sorted for direct shipment to a smelter. Under these circumstances, the early exploration was not systematic, and resulted in producing scattered trenches, pits, small shafts and adits, where the prospectors could gouge out a bit of high-grade, or hoped they could. What we would today consider high grade milling ore, was but waste to them.

The progress of the early exploration was recorded in numerous volumes of the Annual Report of the Minister of Mines of British Columbia, beginning in 1917. Specifically, they were:- 1917, 1918, 1919, 1921, ~~1922~~, 1925, 1927, 1928, and 1929 and in addition, the 1924 Summary Report, Part A, of the Geological Survey of Canada. It is from the above publications that the following, summary historical account is drawn.

In 1917, the Report of the B. C. Minister of Mines states merely that a F. V. Harvey, of Smithers, shipped some copper-silver ore, but no information is given as to the property from which the ore came.

The 1918 report, however, states that C. G. Harvey and partner have held five claims by annual assessment and for three years have worked the claims in a small way. In that time Harvey shipped a total of 25 tons of high-grade, hand-sorted ore, worth \$200 per ton. The

most important metal in the ore was silver, apparently carried in the grey copper, or tetrahedrite. The principal minerals are given as chalcocite, grey copper, bornite, chalcopyrite, covellite and some carbonates. Occasional high copper values are found with only low silver, probably indicating that the chalcocite carries but little silver.

Two well-defined veins are noted, along with "several other mineralizations which represent mineral depositions in sheeted zones." The country rock is generally andesite, fine grained to porphyritic, usually purple, belonging to the Hazelton formation. The gangue of the veins is altered andesite and stringers and bunches of quartz. The veins are of the replacement-fissure type.

Two shafts had been sunk; one, 18 feet deep on the lower vein and another 65 feet deep on the upper vein, 75 feet away. A sample across 3.5 feet at the bottom of the first shaft, assayed: silver, 34 ounces to the ton; copper, 1.85%. The deeper shaft had 15 to 20 feet of water in it, but the article states that there was reported to be a good streak of shipping ore 18 inches wide, at the bottom. A 20 foot drift had been run on the vein from a point 25 feet down the shaft, and then a short winze put down. An irregular stope was worked upwards, from which most of the shipped ore was taken. A streak of nearly solid copper sulphide 3 to 4 inches wide, with lower-grade disseminated mineralization 1 to 4 feet wide, was visible in this working.

In 1919 the shaft on the lower vein was sunk to a depth of 40 feet following the incline of the vein. At the bottom, the vein was about 8 feet wide, carrying chalcopyrite and grey copper in a gangue of quartz and sheared andesite. A sample across 8 feet on the southeast side of the shaft yielded; silver, 24.88 ounces per ton and 3.5% copper. Across 7 feet on the northwest side, a sample assayed: silver 16.85 ounces per ton and 1.41% copper.

In subsequent years, a cross-cut tunnel was driven 233 feet to intersect the down-dip projection of the two lower ore zones, but was not driven far enough to reach this objective. The lower zone was investigated by an inclined shaft and short adit, located some 200 feet north of the tunnel. Work was also started on a third zone, higher up the hill.

In 1924, a more complete description was given of the country rock. It was found to consist of breccias, tuffs and lava flows of the upper volcanic division of the Hazelton group. These beds dip toward the centre of the mountain from all sides. Three or more ore-bearing zones were noted, consisting of mineralized, greyish volcanic rocks lying parallel to the enclosing strata. The mineralized beds were stated to vary in width from a few inches to over 8 feet. Ore shoots are restricted to quartz-sulphide lenses and veins lying in the mineralized band, although mineralization usually occurs across the whole band. Chief values are in copper and silver.

A 25-foot shaft had been sunk on the lower vein and above the long adit. It was sampled in 1925, taking the best mineral showing in the working. The assays were: gold, 0.04 ounces per ton; silver, 42 ounces per ton; copper, 4%.

The most comprehensive account of the early work appeared in the Minister of Mines report for 1928. In that report it is stated that the mode of mineral occurrence is in the form of replacement fissures in andesite, with more or less parallel north-west strikes and north-east dips. These appear to conform with the bedding planes of the enclosing volcanics. Ten such fissures were reported in a width of 1,500 feet, and an eleventh was said to lie another seven hundred feet to the north. Chalcopyrite and grey copper are the main minerals, with

galena occurring occasionally. It is stated that the silver ratio is high, probably averaging 10 to 15 ounces of silver for each percent of copper. Rich lenses occur in places, and the owners were said to have been able to hand sort and ship a small tonnage running as much as \$200 per ton. "While such rich lenses may prove narrow and irregular, the width of mineralization is in most cases very considerable, so much so as to suggest that possibilities may be found to exist along the lines of a large tonnage of low-grade material." The report furthermore notes that the elementary stage of development precludes making any firm conclusions on this score. Up to that time, work had been largely confined to only two fissures.

Most exposures are outcrops occurring on a steep mountain slope, on both sides of Harvey Creek and fairly close to it. The ten veins mentioned start with #1 at about 4,600 feet elevation, the others lying at progressively higher elevations. A shaft 25 feet in depth was sunk on vein #1 and a short adit drift run to meet it. The long adit cross-cut, previously mentioned, was driven from a portal about 100 feet lower, in an effort to encounter the downward continuation of vein #1. Vein #2 lies about 40 feet from #1; a shaft was sunk on this vein to a depth of 60 feet, with a drift extending southeast from the shaft. Good ore was taken from this working. The only other place on which workings were noted was vein #7, on which a short adit was run. This vein strikes N 15° E (mag.) and dips southeast. The prevailing strikes, however, lie between N 30° W (mag.) and N 65° W (mag.) and the dips are generally northeast, around 30°. An exception to the prevailing dips is found on vein #3, which dips southwest at a steep angle, although the strike is N 50° W (mag.). At the time of that report, the magnetic declination was probably about 28° E, so the true bearings of the various strikes quoted above would be, N 43° E, N 2° W, N 37° W, and N 22° W respectively, with dips ranging generally from southeast to northeast.

The various veins are separated by distances of 20 feet to 150 feet, except that #10 is reported to lie 700 feet north of #9. The vein widths, where clearly exposed, are from 4 feet to 40 feet, but because of the flat dip, the true widths may be narrower. Most of the exposures are natural ones, it is noted; in every case they show some mineralization and the majority exhibit strength.

The following year, 1929, Consolidated Mining and Smelting Co. of Canada took an option on the property but relinquished it. The cross-cut adit was continued easterly for a total distance of 392 feet. Some mineralization was encountered at 264 feet from the portal. The owners continued the tunnel after the option was relinquished, and had started a raise from it. The report speculates that the vein may be dipping at a flatter angle than anticipated, in which case, a vertical raise from the end of the cross-cut should prove it.

The only subsequent references found to the Harvey property, were in the 1927 and 1940 reports. In the 1927 report, there is recorded a shipment of 5 tons of ore from the property of C. G. Harvey, which yielded 3 ounces of gold; 256 ounces of silver; and 365 lbs. of copper. In the 1940 report it is stated that a shipment of 31 lbs of ore was made by J. J. Herman and was said to have come from the "Harvey Property;" no further data are given as to the origin. It assayed 0.04 ounces per ton in gold; 80.20 ounces per ton in silver; 7.30% copper; 0.30% lead; and 0.90% zinc.

WORKINGS

The above listing of old workings is by no means complete. I visited six trenches, five adits and three shafts and inclines. Lloyd Hodgson furthermore reports that C. G. Harvey's son, who has a ranch on Driftwood Creek near the access road to the claims, states there are

still more workings on the property which he, Lloyd Hodgson, has not yet seen.

There is now no equipment, surface or underground, on the property, other than a few, old hand steels for drilling blast holes.

GEOLOGICAL SETTING

The bedrock of the Babine Mountains consists of volcanics and sediments of Jurassic age, known as the Hazelton Series. This series is some 8,000 feet thick. It comprises a lower division of volcanic flows and tuffs, largely andesitic with minor basalt and rhyolite; a middle division consisting mostly of argillaceous sediments, quartzite and limestone, with some tuff; and an upper division of flows and tuffs, andesitic to rhyolitic in nature, with minor argillite. It is principally in this upper division that the Drift claims are located.


The geologic map of this area, "Houston," #671A, published in 1942 by the Geological Survey of Canada, shows 10 "Mines and Prospects" in the Babine Mountains. Inexplicably, the "Harvey Group" is not depicted. One of the prospects shown is in the lower volcanic division, three are in the middle, sedimentary series, and six are in the upper volcanic division. The one in the lower volcanic series and two of those in the sedimentary group, are shown on, or close to small intrusive plugs of granite or rhyolite, of Eocene age. No intrusives are mapped near the six prospects in the upper volcanic division.

In the marginal text on the above map, it is noted that many mineral deposits are associated with small intrusive bodies. It suggests that the vicinity of such intrusions constitutes favorable prospecting ground. In the Geological Survey of Canada, Summary Report for 1924, it is noted that the veins occurring in sills, dikes and small intrusive plugs, are essentially "gash" quartz veins, probably filling cooling

cracks that developed as the igneous intrusive cooled. The suggestion is offered that the deposits on Harvey Mountain, between Driftwood and Lyon creeks, have a possibly similar, common local source and that other deposits in the area may have more deep-seated sources.

In the B. C. Minister of Mines reports it was remarked that the ore-bearing zones lie parallel to the enclosing strata, and that the beds dip toward the center of the mountain from all sides. This points, I believe, to a deep-seated source of mineralization, an intrusive mass, from which the mineralizing solutions rose along radiating fracture zones in the enclosing strata. The small plugs, the dikes and the sills are probably themselves only minor offshoots from that main, intrusive mass.

Judging from my inspection of the showings, the sequence of events appears to have been:- a preliminary dislocation of the rocks of the Hazelton series, which fractured some of the beds of tuffs and flows; quartz entered and filled these fractures and was itself fractured by further movement; sulphide-bearing solutions deposited their minerals, principally chalcopyrite and tetrahedrite, in the openings thus formed in the quartz veins, and made their way into the adjoining rocks to form replacement deposits; more intensive rock movement occurred later, causing extensive shattering of the whole series of formations. Slickenside gouges on various fault faces indicate predominantly vertical movement. The inward-dipping beds, the fracturing and the vertical displacements, might have been consequent upon the cooling, contracting and ultimate collapse, of a magmatic chamber formed under the mountain, by an intrusive mass from which the dikes, the sills, the plugs and the mineralizing solutions all emanated.



MINERAL SHOWINGS

The mineralized exposures which I visited in the company of Lloyd Hodgson and Lorne Robinson, were located on the north and south banks of Harvey Creek and not very far from the creek. They all appeared to be outcrops which had been trenched, pitted, or on which adits had been driven years ago by C. G. Harvey. They all exhibit similar characteristics, consisting of quartz veins or silicified zones carrying chalcopyrite, some pyrite, a little bornite and varying amounts of tetrahedrite. In some localities, a little galena was observed. Occasionally, bornite would be the predominant mineral. In addition to the siliceous veins, the sulphide mineralization usually penetrates the wall rocks to create zones of disseminated mineralization of varying widths. Extensive fracturing of the country rock is characteristic of all exposures.

Some eleven exposures, or groups of exposures were examined, located within an area extending 1200 feet (horizontal map distance) NE-SW, up and down the hillside, by 700 feet NW-SE, roughly parallel to the hill contours. The vertical range is in the neighbourhood of 600 feet; the median elevation is probably around 4,700 feet. All the showings visited were on claims Drift #8, #10, #19, and #21. The descriptions below start with the highest exposure visited and terminate with the lowest one, located not far from the old cabin on Harvey Creek. This cabin was once the base of operations of the original owner, C. G. Harvey; it is reported to be at an elevation of 4,330 feet.

The area has been very well surveyed by Lloyd Hodgson, using Brunton compass and tape. He has surveyed the roads, trails and the locations of the workings, placing numbered stakes at crucial points.

Thus, each working can be identified by the number on the survey stake marking its location. The stakes are marked by the letter A, followed by a number. These designations are used to identify each of the following workings.

In the assays of the samples taken from the exposures visited, gold varied from a "Trace" to 0.03 ounces per ton; molybdenum occurred only as a "Trace." The returns on these two metals are therefore not reported on further, in the following discussion; for details, see the assay sheets bound in back of this report.

A-46
Sample #1

The highest working visited was a trench at survey point A-46, on Drift #8, some 500 feet SW from the NE mutual corner of Drift #8 and #19. It is on the northwesterly bank of Harvey Creek about 260 feet SW of that stream. The cut is roughly 20 feet long and 10 feet high, exposing a flow of amygdaloidal basalt overlying a bed of tuffs. The tuff is interleaved with fingers of basalt at the contact, which dips easterly about 19 degrees. The strike is apparently northerly or northwesterly, but an accurate determination could not be made. The bed of tuffs is 5 to 10 feet thick and carries quartz-calcite veins mineralized with tetrahedrite.

Sample #1 was cut across 5 feet vertically and yielded

Copper.....	0.64%
Silver.....	0.74 oz/ton
Lead.....	0.40%

A-53 & A-54
Samples #2
and #3

West from A-46, some 420 feet downhill, there are some workings which have sloughed in. These workings are on Drift #19, close to its southeast boundary and are about 500 feet northwesterly, along the upper trail, from Harvey

Creek. There appears to have been a short vertical shaft here, from which an adit ran easterly into the hillside. The workings are not readily accessible. A fracture in the face of the cut at the shaft strikes N 47° W (astronomic) and dips vertically. It carries vein material, including chalcopyrite. Fragments on the dump are well mineralized with chalcopyrite and carry some galena. Selected pieces were taken, those in sample #2 show galena and chalcopyrite mineralization, but the sulphides in sample #3 are principally chalcopyrite. The mineralized material consists of a silicified fracture system carrying chalcopyrite, in a tuff formation. The samples assayed as follows:-

Sample #2

Copper.....	2.34%
Silver.....	2.88 oz/ton
Lead.....	6.80%

Sample #3

Copper.....	1.32%
Silver.....	8.99 oz/ton
Lead.....	3.60%

A-41
Samples #4
to #8

Three hundred and fifty feet southeast along the trail from A-53 and A-54, towards Harvey Creek, there is a short adit extending about 20 feet northeasterly into the hillside. It is approximately 330 feet southwest (downhill) from A-46, and is located on Drift #8, close to the mid-point of its northwest boundary.

A fracture in the east wall of the adit strikes N 28° E (astronomic, as are all of the bearings given in this section) and dips southeasterly, at 58°. In the west wall, there is a fracture striking N 43° E and

dipping southeasterly at 50°. It is cut by fractures with the same strike but dipping 50° to the northwest. Samples were taken horizontally, across the 7-foot face of the edit. Sample #4 is five feet above the floor and sample #5 is 1.5 feet above the floor. Sample #6 was taken across a five foot width of a rock exposure just outside of, and on the west side of the portal; sample #7 is a chip sample extending from #6 to a point 5 1/2 feet west of #6. Sample #8 was a collection of selected specimens. These samples assayed:-

Sample #4

Copper.....	0.09%
Silver.....	0.86 oz/ton
Lead.....	0.12%

Sample #5

Copper.....	0.08%
Silver.....	0.51 oz/ton
Lead.....	0.02%

Sample #6

Copper.....	2.86%
Silver.....	14.25 oz/ton
Lead.....	0.23%

Sample #7

Copper.....	1.44%
Silver.....	10.61 oz/ton
Lead.....	0.02%

Sample #8

Copper.....	8.02%
Silver.....	11.97 oz/ton
Lead.....	1.31%

A-29
Sample #9

The trail from the last-mentioned showing continues easterly down to Harvey Creek, across the creek and southwesterly up the south bank for a total distance of about 660 feet. It terminates at a shallow excavation driven east into the steep hillside. This cut is at the top of a precipitous scarp, looking down 100 feet or so into the creek.

A fault contact, striking easterly and dipping northerly at 75° , forms the north wall of the cut. An andesite flow about 12 feet thick, forms the principal part of the face of the cut. In the north wall, however, the top of this andesite flow is about 3 feet lower than the bottom of the andesite in the face, indicating a downward displacement of about 15 feet on the north side of the fault. Tuffs lie above and below the bed of andesite. In the floor of the cut, on its south side, the tuffs below the andesite flow are silicified and show some malachite staining, with chalcopyrite. Random chip samples were taken from these silicified tuffs in the floor. This sample #9 assayed:-

Sample #9

Copper.....	0.76%
Silver.....	1.28 oz/ton
Lead.....	0.05%

A-59
Samples #10
and #11

Returning along the trail which ended at A-29, to a point 90 feet north of A-53, another trail branches off downhill to the west and south. Two hundred and ninety feet south from the junction point there is a trench at survey station A-59. It extends northeasterly into the hillside about 18 feet. The rocks are heavily fractured, many fractures showing slickenside grooves extending nearly up and down. On the southwest end of the trench there is a fault scarp striking $N 42^{\circ} W$ and dipping northeasterly about 71° . On this scarp the slickenside grooves dip south-easterly at 58° .

The southeast wall of this trench was sampled, #10 extending southwesterly from the face for a distance of 8 1/2 feet. Sample #11 continued from the end of #10, for a distance of nine feet, to the trail. The samples assayed:-

Sample #10

Copper.....	1.56%
Silver.....	6.18 oz/ton
Lead.....	0.34%

Sample #11

Copper.....	0.48%
Silver.....	6.79 oz/ton
Lead.....	0.15%

A-61
Samples #12
and #13

About 40 feet further to the southeast along this same trail, a rock scarp trending southeasterly, has been stripped along its base for a distance of 60 feet. Rich bornite mineralization in volcanic agglomerate is prominent near the southeasterly end of this cut. Five feet from the northwest end of this trench, or stripping, sample #12 was chipped across three feet of mineralized zone. Twelve feet further southeast sample #13 was chipped across 2 1/2 feet of the mineralized zone.

The rich bornite showing at the southeast end of the stripping is a nearly solid vein of bornite up to 6 inches wide, in a fracture striking N 43° E and dipping SE at 21°. It was not sampled, because a representative sample of the zone could not be taken. Chipping here and there showed that disseminated mineralization was evident in the wall rock of the vein, not far below the surface, even where none could be seen on the surface. The scarp face has therefore been weathered

and leached; a surface sample would consequently be unrealistically low. This is a rich showing, and it would be worthwhile to blast some clean, fresh faces in the scarp in order to get representative samples across the entire mineralized zone, whose width there is not now evident.

The samples across the mineralized zone on the northwestern end of this exposure assayed:-

Sample #12

Copper.....	1.92%
Silver.....	4.90 oz/ton
Lead.....	0.27%

Sample #13

Copper.....	1.84%
Silver.....	2.86 oz/ton
Lead.....	0.02%

The showings described above at A-59 and A-61 are located on Drift #19, near its southeast boundary and are 500 feet southwest (downhill) from A-46.

A-20, A-21
Samples #14
to #17

Following the same trail southerly down a steep slope, across Harvey Creek, and up the south bank, for about 330 feet leads to another set of workings, consisting of an open cut and two adits, at survey stations A-20 and A-21. This site is 180 feet due west of A-29 and lies 730 feet southwesterly from A-46. It is on the northwest boundary of Drift #8 near its southwest end. The two adits are close together and are only 12 feet apart vertically. The lower tunnel is close to survey stake A-21. It was driven southeasterly and extends about 9 feet into the hillside. The wall rocks are heavily fractured and in the southwest wall there is

a prominent fault which strikes N 47° W and dips northeasterly at 44°. It is marked by slickenside grooves which run vertically. Another fault in the southwest wall strikes N 37° W and dips northeasterly at 43°. The better mineralization is in the hanging wall of this fault.

A continuous chip sample was taken of the face for a vertical distance of 4 1/2 feet, close to the southwest wall. It is sample #14. Sample #15 was taken by random sampling of the face in the northeast portion, where better mineralization was evident. These samples assayed:-

Sample #14

Copper.....	0.72%
Silver.....	5.11 oz/ton
Lead.....	0.65%

Sample #15

Copper.....	1.28%
Silver.....	13.07 oz/ton
Lead.....	0.14%

The adit at stake A-20 is 12 feet above the one just described. It also runs southeast into the hillside, and is 27 feet long. It is inclined downwards at 24°. The wall rocks are heavily fractured with numerous faults, similar to the lower adit described above. A mineralized zone in the andesite or andesitic tuffs, was sampled in the southwest wall of this adit from the back to the footwall of the mineralized zone, for a vertical distance of 5 feet. The sample was taken from a point 13 feet into the adit from the stake, A-20, which is close to the mouth of the adit. This sample assayed:-

Sample #16

Copper.....	0.78%
Silver.....	2.96 oz/ton
Lead.....	4.00%

Sample #17 was taken across the rock face into which the two adits were driven. Its location is two feet southeast of survey stake A-21. Samples were chipped across a vertical distance of two feet above a 2 1/2 foot barren zone. The sample was then continued at an angle of about 45° from vertical, for 6 1/2 feet across a mineralized zone below the barren one. The total length of the sample was therefore 8 1/2 feet. This sample assayed:-

Sample #17

Copper.....	1.76%
Silver.....	15.11 oz/ton
Lead.....	4.99%

These workings are also accessible by another trail which switch-backs up the mountain side from the trail leading across Harvey Creek, from the old cabin to the lowest workings inspected during this visit.

A-15
Sample #18
to #20

Three hundred feet along the trail running south from A-20, there is an old shaft with some workings off it, at survey station A-15. These workings are in the southeast corner of Drift #19 where it overlaps the northwest corner of Drift #10. The backs are in bad condition, so the sampling of these workings was scanty.

A slightly inclined shaft goes down S 82° E for a depth of about six feet. It was probably deeper originally, as there is considerable loose material at the bottom. An inclined cross-cut extends 60 feet

east from the bottom of this shaft. A drift was also run southerly from the shaft for about 25 feet where a cross-cut turns east and inclines downward for another 40 feet.

Sample #18 was a random chip sample taken 25 feet south of the shaft, in the west wall of the drift where the cross-cut turns east. This sample assayed:-

Sample #18

Copper.....	4.96%
Silver.....	20.16 oz/ton
Lead.....	0.26%

Sample #19 was one random piece taken from a section of bad back about 10 feet east of sample #18. This one assayed:-

Sample #19

Copper.....	0.96%
Silver.....	12.97 oz/ton
Lead.....	0.04%

Random samples were taken from the south wall of the incline running east from the shaft. These samples were from a point about 40 feet down the incline and extended the height of the wall, 8 feet. This was sample #20 which assayed:-

Sample #20

Copper.....	2.64%
Silver.....	8.49 oz/ton
Lead.....	0.02%

A-16 & A-17
Sample #21

From a point about 130 feet north of A-15, a trail branches off southwesterly from the one leading from A-20 and A-21 to A-15. Sixty feet southwesterly along this trail there

is an old shaft at survey station A-16 and an adit 20 feet further along the trail, at survey station A-17. These workings are in the southeast corner of Drift #19 where it overlaps the northwest corner of Drift #10 and the southwest corner of Drift #8.

Access to the workings, which are badly sloughed, is via the inclined adit, running N 38° E from near station A-17. Twelve feet in from the portal a cross-cut inclines downward to the southeast, at 36°. Twenty-one feet in from the portal there is another cross-cut running N 83° E for about 25 feet. This cross-cut leads from the bottom of the shaft, which is an inclined shaft directed S 57° E at -40°. The condition of the workings inhibited any extensive sampling.

A brecciated zone was visible at the foot of the shaft and the breccia in the northeast wall was sampled across four feet. This was sample #21; it assayed:-

Sample #21

Copper.....	1.92%
Silver.....	4.18 oz/ton
Lead.....	0.01%

A-162
Sample #22

At the point where this access trail branches off from the one to A-15, 80 feet northwesterly from the adit just described, the first leg of the previously mentioned switch-back trail down the mountain also branches off, to the northwest. Measured in a straight line from the branch-off, 200 feet northwesterly down the mountainside, it joins the trail from the old cabin, at survey station A-1. The latter trail runs from the cabin easterly for 120 feet to Harvey Creek, which it crosses and then turns south for 80 feet, to survey station A-1. One hundred and eighty feet further south from A-1, along this trail, is the portal of the long adit which C. G. Harvey drove easterly into the mountain. Survey station A-161 is on the trail

opposite the portal and stake A-162 is at the portal. The portal lies 1050 feet southwesterly from A-46, in the northeast corner of Drift #21 where this overlaps the northwest corner of Drift #10. This adit is described in the report of the B. C. Minister of Mines for 1929, on page C 165, with a map on page C 166. At the time of that report, the adit had been driven for a total distance of 392 feet. Further work was subsequently done on it, and at the time of my visit the total length was 473 feet. It was driven slightly north of east for a distance of 200 feet, then turns southeasterly for 195 feet, southwesterly for 28 feet and southeasterly for another 50 feet. The report referred to, states that a small seam with slight mineralization was encountered at a point 264 feet from the portal and followed for about 70 feet to the northeast. This, and some other short workings off this tunnel, shown on the map referred to, can be identified in the adit, but they are inaccessible because muck had been piled in them. As stated in that report, this cross-cut adit was in a light-colored, almost white phase of andesite, carrying thin layers of pyrite in the fissures. It states that appreciable gold values were found, but my sample from further along in the tunnel, showed only a "Trace."

Mineralization shows in the next to the last leg of this adit, which runs S 45° E for about 20 feet. A strong fault zone with gouge 1 inch thick is evident in this working, striking N 47° W and dipping southwesterly at 29°. Chip samples were taken over a height of four feet in the mineralized zone from both the southwest wall and the northeast wall, two thirds of the way along this leg of the adit. This was sample #22.

In the next leg, which runs S 63° E for 30 feet to the face, the

mineralized zone seems to pinch out. A thin sliver, about a foot thick and not uniformly mineralized, lies about half way up the north-east wall. These last two legs of this adit show very heavy fracturing of the wallrock and several zones of gouge.

The sample from the mineralized zone assayed:-

Sample #22

Copper.....	1.26%
Silver.....	11.89 oz/ton
Lead.....	0.14%

A-164, A-165
Samples #23
and #24

Another 120 feet south along this same trail from the above adit portal, there are a couple of old trenches. They are in the northeast corner of Drift #21 where it overlaps the northwest corner of Drift #10. They are 170 feet southwesterly from A-15, and 1150 feet southwesterly from A-46. The trench at A-164 extends five feet southeasterly into the hillside and is four feet wide. A chip sample was taken across 2 1/2 feet vertically in the face of this trench. This was sample #24.

Seven feet southwesterly of the above mentioned trench, there is another at station A-165. This trench is six feet wide and extends about eight feet southeasterly into the hillside. Fractures evident in the northeast wall of this trench strike N 47° W and dip north-easterly at 70°. A chip sample was taken over a height of five feet in the east corner of this trench. This was sample #23.

These samples assayed:-

Sample #23

Copper.....	4.32%
Silver.....	5.70 oz/ton
Lead.....	0.04%

Sample #24

Copper.....	4.24%
Silver.....	40.90 oz/ton
Lead.....	0.07%

The above sampling of exposures and old workings covered some eleven localities and involved taking 24 samples. The assays on those samples vary, in copper from 0.08% to 8.02%; the silver ranges from 0.51 to 40.90 ounces per ton; and the lead runs from 0.01% to 6.80%. The arithmetical (not weighted) averages are:- for copper, 2.01%; silver, 8.89 ounces per ton; and for lead 0.98%.

The only underground working which could unquestionably be correlated with any of those described in the annual reports of the B. C. Minister of Mines, is the long adit extending easterly from survey station A-162. The workings on the hillside above it, consisting of the shaft at A-15 and the shaft and adit at A-16 and A-17, are at the proper locations, however, to correlate with the No. 2 shaft and No. 1 shaft respectively, shown on the map on page C 166 of the Report of the Minister of Mines for 1929.

The No. 1 shaft probably correlates with the shaft and adit at station A-16 and A-17. In the Minister of Mines report for 1928, on page C 167 it is stated that "... a short adit-drift is run to meet the downward continuation of a shaft 25 feet in depth, sunk following the mineral from a higher point. The shaft is continued a short distance below the adit. Seams and disseminations of copper mineral occur here over a width of apparently about 24 feet, but, the dip being very flat, the true width may be much less. The strike of this mineralization here seems to be about N 30° W (mag.), with a flat dip

north-east." The true bearing of the strike is therefore just about north, and the dip is easterly, corresponding to the direction of the cross-cut off the bottom of the shaft. The workings are now sloughed in, as previously noted, and continuation of the shaft below the adit may have filled in.

Concerning shaft No. 2, which may correspond with the one at station A-15, the same report states that "... a shaft is sunk about 60 feet and a drift has been run south-east from the shaft. Good ore was taken from this working and the width of the fissure seems to be about 4 feet. The strike is N. 30° W. (mag.)." If it is assumed that the vertical shaft and the incline extending from it were both included as "the shaft" in this description, then the depths correspond.

The No. 3 shaft, shown on the map in the Minister of Mines report for 1929, may correspond to the workings at A-20 and A-21, although no shaft is evident there now. There may have been one which later was obliterated by the open cut, in the wall of which the two adits now open. Or, the designation "shaft" may have been given to the incline adit at stake A-20.

Other veins and workings mentioned in the various reports of that era, can not be confidently correlated without further, extensive exploration.

CONCLUSIONS

The copper mineralization which I saw and sampled during my examination of the Drift claims on Harvey Mtn., confirms descriptions of the widespread occurrence of such mineralization, found in various reports of the B. C. Minister of Mines, between 1917 and 1940. The exploration conducted during those years by C. G. Harvey, was confined to developing high grade veins, lenses and pockets. He could not handle

milling ore, so never attempted to follow any zones of disseminated sulphides. The showings of copper which were developed, at least to some extent, were evident on a remarkably large proportion of the few natural rock outcrops. It may therefore be at least tentatively concluded, that the glacial overburden masking much of the mountainside, conceals many more sulphide occurrences.

The strikes and dips of the rock fractures which apparently served as conduits for mineralizing solutions, are not confined to north-westerly strikes and northeasterly dips, but exhibit a wide variety of orientations. This leads to the speculation that the mineralization in this area may not be in parallel, flat-dipping layers like a stack of hot-cakes, but rather consists of a stockwork of intersecting zones of many orientations.

Furthermore, if the hypothesis of a deep-seated, central igneous source of mineralization is correct, then the sulphide mineralization may be expected to become more abundant, with higher copper content, as the zones and fracture-filling veins are followed, on dip and strike, into the mountain and approach more closely to the source intrusive.

These concepts of the probable patterns of copper mineralization on Harvey Mtn., lead to the conclusion that a thorough exploration of this area is amply warranted. Such a program could well develop a substantial tonnage of disseminated, milling grade copper-silver ore, sweetened by pockets, lenses and veins of high grade material. An intensive exploration program is therefore recommended.

RECOMMENDATIONS

The 24 claims of this group should be subjected to a thorough surface exploration program, as a first step for the development of the property. A system of grid lines should be cut and picketed, to serve

as a basis for a geochemical soil survey, a magnetic survey, an induced polarization survey and for geological mapping. The area of the showings, herein reported, should be covered in detail. The rest of the property may be subjected primarily to a reconnaissance survey, during which other areas requiring detail investigation, will doubtless be indicated.

The exploration program is divided into two phases. The first comprises detailed investigations in the area of the known showings. The second involves reconnaissance work over the balance of the claim group, plus detailed surveys on areas indicated as favorable by the reconnaissance results.

In the first stage, to detail the area of the known mineral occurrences, two base lines should be run, extending in a northwesterly direction from one side of the claim group to the other, and roughly parallel to the predominant strike. They should include between them, the upper showing at A-46 and the lower, long adit at A-162 and the nearby trenches at A-165.

In the area of the showings thus bracketed, grid lines run from one base line to the other, should be spaced at 200 foot intervals to cover the ground from about 1000 feet northwest of Harvey's old cabin, to 1800 feet southeast of it. Outside of these limits, a 400 foot reconnaissance spacing may be used on the balance of the property, but it should be supplemented by 200 foot spacings in areas where possible anomalies are indicated.

On this grid system, magnetic, soil sampling, geological and induced polarization surveys should be conducted. Closer, detail work should be carried out on areas where anomalous conditions are recorded.

In addition to the surface work, the underground workings should be cleared and rehabilitated and the walls cleaned, wherever this is

needed to facilitate geological mapping and more thorough sampling. The mapping and sampling should be oriented towards deriving more data on the mode of occurrence of mineralization and on the significant formational strikes and dips. Sampling should also include the muck piled in the long adit, to shed light on possible mineralized wall rocks which C. G. Harvey ignored.

On the basis of data derived from the underground mapping and sampling, strikes and dips of mineralized zones can be used to spot a few, test diamond drill holes. These holes are to probe down-dip on the mineralization and to give a cross-section of the wall rocks. They will also yield information on the variety of strikes and dips of mineralized zones to be expected in this area. The holes should be spotted to intersect the sulphide zones about 100 feet to 150 feet down-dip from the underground exposures.

The workings to be tested in the above manner, include those at A-41, A-20 and A-21, A-15, A-16 and A-17, and A-162. Each hole should extend below the target zone of mineralization, to give a good formational cross-section. Five holes, each about 250 feet deep, are therefore indicated.

The second phase of the exploration program, which could be conducted concurrently with phase one, provides for a reconnaissance survey over the balance of the claim group. This will involve extending the grid lines at 400 foot spacings, NE and SW to the boundaries of the property. An additional base line to the SW and two to the NE will probably be required to control the proper spacings of the grid lines.

These extended grid lines and additional base lines can then be used for geophysical mapping, magnetic observations, soil sampling and induced polarization survey. The latter should be applied on any apparently anomalous areas which have been revealed in the detail surveys

by geological mapping, soil sampling and magnetic observations.

Target areas defined during phase one and phase two of the work should be subjected to testing by extensive diamond drilling in a follow-up program. That is a separate program, however, for which cost estimates can not be made until data are available on the number, locations and extents of target areas.

Estimates are given below to cover the probable costs of the two-phase program now recommended:-

ESTIMATED EXPENDITURES

PHASE I

Grid line-cutting, 8 miles @ \$140/mi.....	\$ 1,120
Magnetometer survey, 8 miles @ \$50/mi.....	400
Soil Sampling survey, 8 miles @ \$50/mi.....	400
Analyses of soil sample.....	1,080
Allowance for detail fill-in of above.....	600
Induced polarization survey, 8 miles of grid.....	4,200
Allowance for detail fill-in.....	1,000
Geological mapping.....	1,000
Rehabilitation of workings.....	1,500
Diamond drilling, 5 holes.....	18,750
Core splitting.....	1,200
Assays.....	2,500
Bulldozing; roads, drill sites, trenches.....	2,000
Transportation.....	500
Engineering and supervision.....	<u>3,000</u>
	\$ 39,250
Contingencies.....	<u>3,750</u>
	\$ 43,000

PHASE II

Grid line cutting, 25 miles @ \$140/mi.....	\$ 3,500
Magnetometer survey, 25 miles @ \$50/mi.....	\$ 1,250
Soil sampling survey, 25 miles @ \$50/mi.....	\$ 1,250
Analysing soil samples.....	\$ 3,800
Allowance for detail fill-in of above.....	\$ 2,500
Induced polarization survey, assume 8 miles.....	\$ 4,200
Geological mapping.....	\$ 3,000
Bulldozing; trenches, roads, drill sites.....	\$ 4,000
Diamond drilling (allow 8 holes, 250 ft. deep).....	\$ 30,000
Core splitting.....	\$ 2,000
Assays.....	\$ 4,000
Transportation.....	\$ 1,000
Engineering and supervision.....	\$ 4,000
	\$ 64,500
Contingencies.....	\$ 6,500
	\$ 71,000
Phase I.....	\$ 43,000
Phase II.....	\$ 71,000
	\$ 114,000

To this total cost of field work, should be added the sums necessary for defraying legal, audit, administration and travel expenses.



The suggested allocation of funds set forth above, is not meant to be rigid. As work progresses, it may be found desirable to shift emphasis from one procedure to another and change the relative expenditures. The program should be kept flexible to permit this. This property has an unusual number of interesting showings and presents the possibility of being developed into a profitable large tonnage producer. It deserves a thorough investigation.

The work should be under the direction of a competent geologist or engineer.

Respectfully submitted,

Sherwin F. Kelly

Sherwin F. Kelly, P. Eng.,
Geologist and Geophysicist

Box 277
Merritt, B. C.
November 30, 1970



CERTIFICATE OF QUALIFICATIONS

I, Sherwin F. Kelly, P. Eng., residing at the Adelphi Hotel, in Merritt, B. C. certify that:-

I am a Registered Professional Engineer in the Province of British Columbia.

I graduated from the University of Kansas in 1917, receiving the degree of B. Sc. in Mining Engineering.

I followed post-graduate work in geology and mineralogy at the Sorbonne, the Ecole des Mines and the Museum d'Histoire Naturelle in Paris, and at the University of Kansas and the University of Toronto. I also taught those subjects at the University of Kansas and at the University of Toronto.

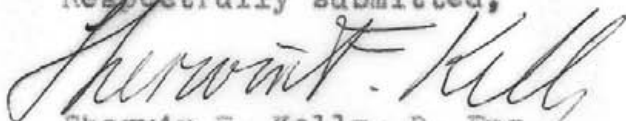
Since 1921, I have practised as a geologist and geophysicist in France, North Africa, Canada, the United States, Mexico, Cuba, Central America and South America.

The accompanying report is based on a five-day inspection of the Drift claims, September 11 to 15, 1970, and reference material found in numerous reports and maps. These included: the Annual Reports of the B. C. Minister of Mines for 1917, 1918, 1919, 1921, 1922, 1925, 1927, 1928, 1929, 1940, and the Summary Report, 1924 Part A, of the Geological Survey of Canada, with accompanying map, "Driftwood Creek Sheet, (West Half)"; plus geological maps of the GSC, "Houston," map 671A, 1942, "Smithers - Fort St. James," map 971A 1949, and "Geological Compilation Map of the Smithers, Hazelton and Terrace Areas," 69-1, 1969.

I also received a great deal of valuable information, as well as assistance, from Mr. Lloyd Hodgson.

I hereby certify that I have no interest in the claims herein reported on, nor in the company owning them, nor have I been promised any such interest.

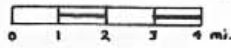
Respectfully submitted,



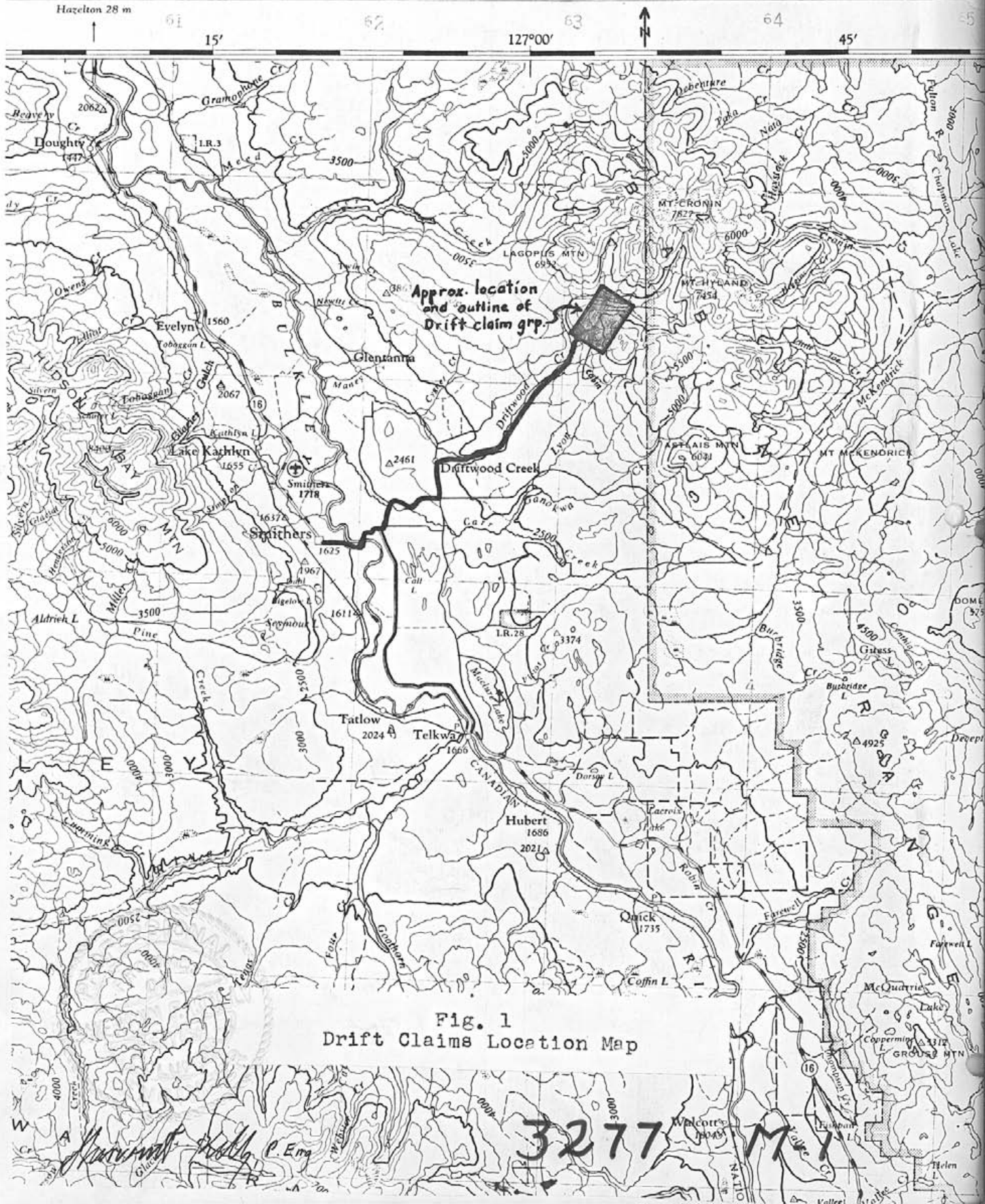
Sherwin F. Kelly, P. Eng.,
Geophysicist and Geologist

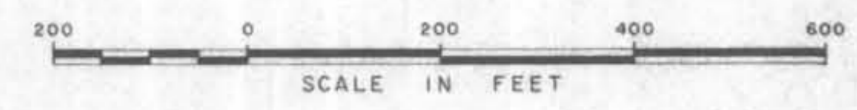
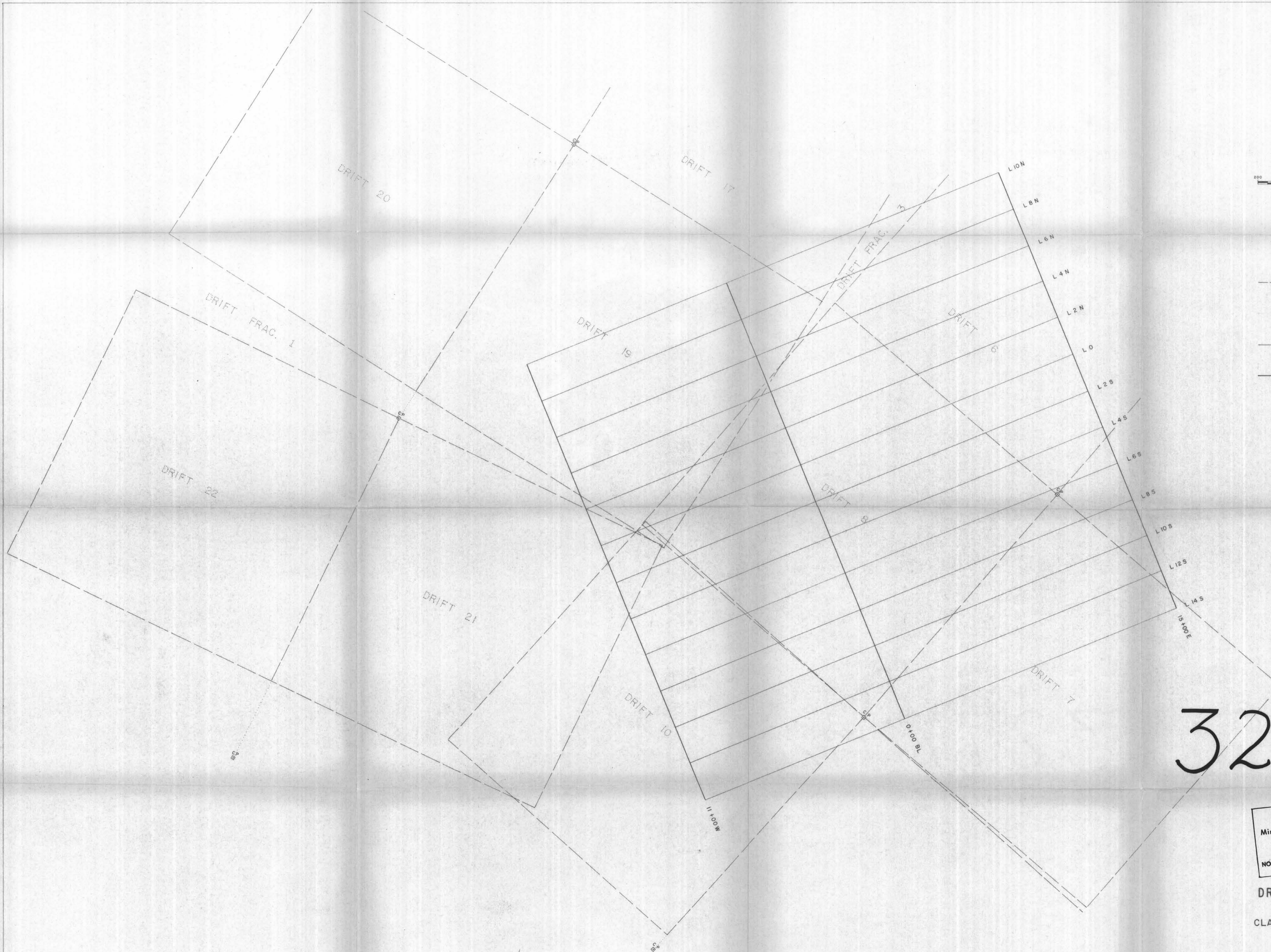
Box 277
Merritt, B. C.
November 30, 1970

Scale: 1:250,000
One inch to 4 mi. (approx.)



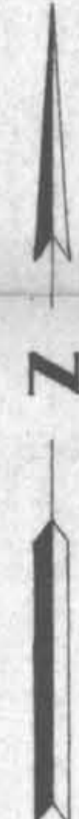
CANADA DEPARTMENT OF MINES AND TECHNICAL SURVEYS





LEGEND

- CLAIM LINE & CLAIM POST
- CLAIM NUMBER
- CUT GRID LINE
- CUT BASE LINE OR TIE LINE



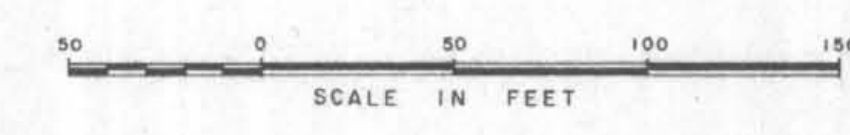
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ASSESSMENT REPORT
NO. 3277 MAP #2

DRIFTWOOD MINES LTD.
DRIFT CLAIMS
CLAIM & GRID LOCATION MAP
OMINECA M.D., B.C.

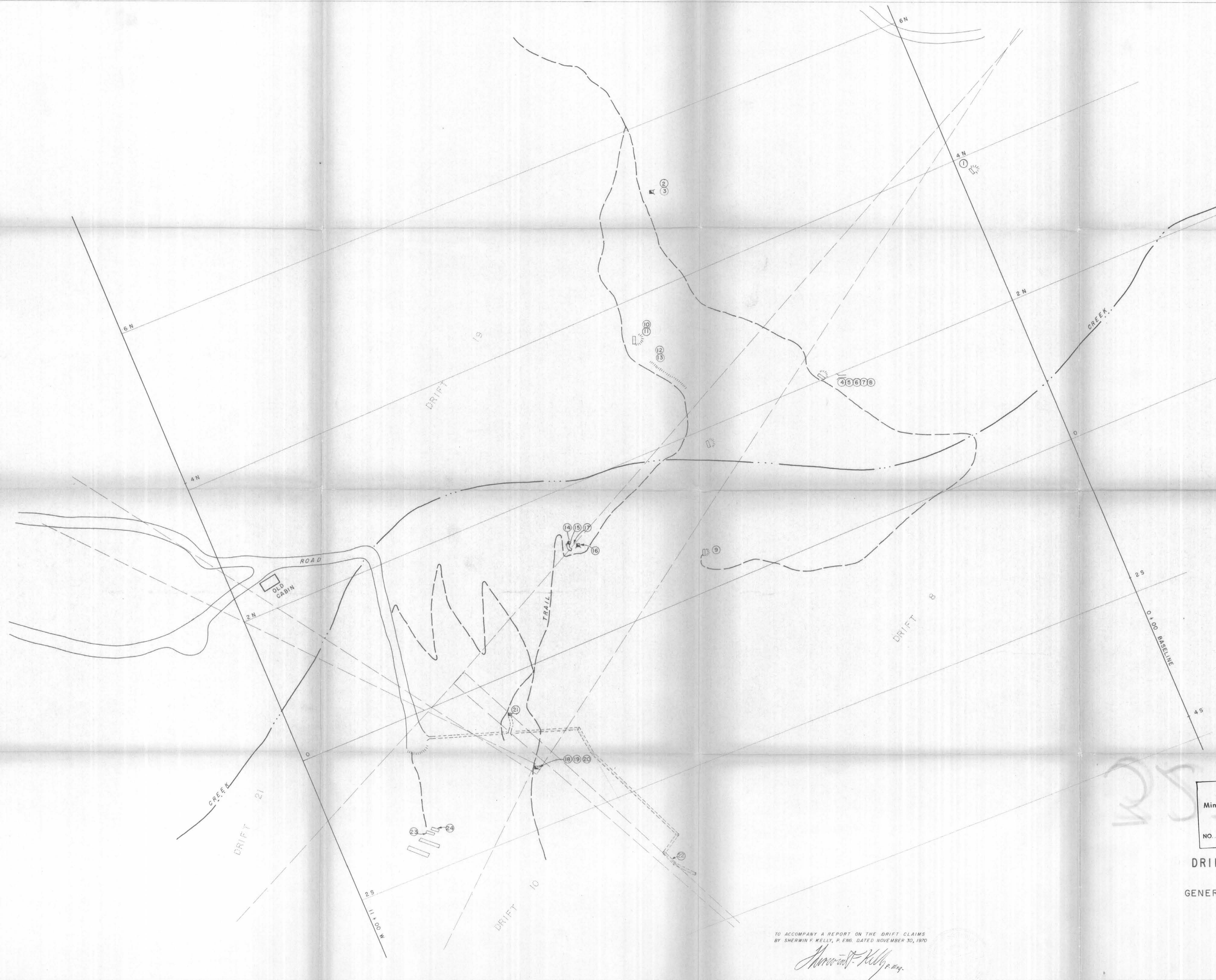
TO ACCOMPANY A REPORT ON THE DRIFT CLAIMS
BY SHERWIN F. KELLY, P. ENG. DATED NOVEMBER 30, 1970

Sherwin F. Kelly
P. Eng.



LEGEND

- CLAIM LINE
- 19 CLAIM NUMBER
- CUT GRID LINE
- CUT BASE LINE OR TIE LINE
- Y ADIT
- DRIFT
- SHAFT
- ▭ TRENCH
- ③ SAMPLE NUMBER



Department of
Mines and Petroleum Resources
ASSESSMENT REPORT
NO. 3277 MAP #3

DRIFTWOOD MINES LTD.
DRIFT CLAIMS
GENERAL PLAN & SHOWINGS
OMINECA M.D., B.C.

TO ACCOMPANY A REPORT ON THE DRIFT CLAIMS
BY SHERWIN F. KELLY, P. ENG. DATED NOVEMBER 30, 1970

Sherwin F. Kelly, P. Eng.