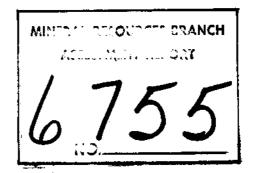
78-#172-#6755

1977 PROGRAMME OF GEOLOGICAL MAPPING AND SURFACE SAMPLING ON THE RAM AND MAY TUNGSTEN PROSPECT AT THE TURNAGAIN RIVER, B.C.

CLAIMS:

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RAM 15 TO 20 MAY 1, 3, 5, 7, & 10, LIARD MINING DIVISION NTS 104 I - 9 **E** LATITUDE 58° 42' N LONGITUDE 128° 06' W UNION CARBIDE CANADA LIMITED. REPORT PREPARED: T. LIVERTON, APRIL, 1978



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MAPS APPENDED

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Location Map at 1:50,000 scale and geology and claim coverage at 1:10,000 - Sheet 1

| Geology at 1: 1,500 scale : S.W. | Sheet | 2 |
|-----------------------------------|-------|---|
| Geology at 1: 1,500 scale : N.W. | Sheet | 3 |
| Geology at 1: 1,500 scale : N.E. | Sheet | 4 |
| Geology at 1: 1,500 scale : S.E. | Sheet | 5 |
| Sampling of Skarns 1: 500 scale | Sheet | 6 |
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A. INTRODUCTION

i) Location and Access

The Ram and May Group of claims is on the North-West side of the Turnagain River Valley, opposite the confluence of the Cassiar River at latitude 58° 42' N, longitude 128° 06' W. The claim locations may be found on the 104 I/9E map sheet. This region is within the Liard Mining Division of B.C.

Topography is rugged and the claims cover elevations between about 1370 and 2100 metres above sea level. River level directly below the claims is at 760 metres. The Turnagain Valley has been glaciated during the last ice age and the two cirques forming much of the area covered by the claims are hanging valleys rising from around 1580 metres elevation, and at this level are above the timber line.

There is no ready access to the area and the only means of entry are by fixed wing aircraft to Blue Sheep Lake which is 15 kilometres North West of the claims thence helicopter from there to the claims or alternatively to travel up the Kechika and Turnagain Rivers from the Liard at Coat River by boat to a point directly below the claims (which is the highest point on the river navigable by riverboat) then by foot the remaining 3 kilometres (and 800 metres of climbing).

Aircraft departure would be from Watson Lake (95 miles, 150 kilometres to the North or from Dease Lake, 115 kilometres West-South-West.

ii) The Property

The Ram and May claims, together with the adjoining Eliza and Sheep claims were originally located by W. Kuhn over ten years ago when he was prospector for the El Paso subsidiary company Rip Van Mining Ltd. The prime target in this area was the tungsten mineralization found as scheelite in quartz veins, skarns and dolomite and the argentiferous galena veins found in the nearby granitic rocks.

The Ram, May, Eliza and Ram 101 groups were optioned to Union Carbide Canada Limited by W. Kuhn in 1977. Under terms of the option agreement the claims have been transferred to Union Carbide.

We are primarily interested in the tungsten potential of the property. Scheelite is found disseminated in skarns and in extensive joint systems within the overlying dolomites and potential exists for finding a large tonnage of medium-grade mineralization.

iii) Mapping

The 1977 work programme consisted of geological and topographic mapping to delineate the contacts of the granitic intrusives and the various carbonate and skarn units that are potential host rocks for the scheelite mineralization. To achieve this mapping control was established by laying out a small triangulation network of 24 stations and all subsequent work was carried out by traversing between these control points, primarily by theodolite tachymetry with limited compass, tape and clinometer surveys. Contours were prepared from the spot heights obtained and extended beyond the area surveyed using photogrammetric data. Scheelite occurrences were prospected by night examination with ultraviolet lamps and several localities were either directly chip sampled or better exposed by pitting and blasting. Assays were run on samples so obtained to dive an idea of the tenor of the mineralization.

An area of approximately 110 hectares was covered by the ground traversing; 70% of this being relevant to this report. Initial mapping was plotted at 1:500 scale which was later reduced to 1:1500 scale for this report.

iv) Claims Covered

Geological and topographic mapping covered the following claims, plus some of the vacant ground South of the May claims. Mapping to the North on the Ram 101, 102, 103 and 105 claims has previously been reported (assessment report by C.N. Forster, October 1977).

| <u>Clai</u> | im | Record Number | Expiry | Date | • |
|-------------|----|---------------|--------|-------|------|
| Ram | 15 | 27653 | August | lst, | 1981 |
| | 16 | 27654 | 1) | | 54 |
| | 17 | 27655 | tı | ¥3 | 1) |
| | 18 | 27656 | 11 | 11 | 12 |
| | 19 | 27657 | August | lst, | 1979 |
| | 20 | 27658 | ** | E) | |
| May | 1 | 71214 | May 27 | th, l | 979 |
| - | 3 | 71216 | 34 54 | | 92 |
| | 5 | 7 1218 | 11 11 | | 1) |
| | 7 | 71220 | IT 14 | | 21 |
| | 10 | 71223 | 17 H | | 1) |

Pitting and outcrop blasting was performed on the Ram 16 and 18 claims.

B. TOPOGRAPHIC AND GEOLOGICAL MAPPING

i) Methods

Geological mapping was first attempted using a photogrammetric map at a scale of one inch to five hundred feet (1:6000), with a similar scale enlargement of air-photos for reference. Because of problems of accurate positioning and the need for larger scale mapping the method was abandoned after a few days effort. It was decided to use tachymetry to carry out the mapping, with a limited amount of compass tape and clinometer traversing to fill in any detail omitted. To provide control for the mapping over the entire claim group a network of triangulation stations was laid out with a 10 second theodolite. The base line (chained with a steel band) is in the cirque at the Southern edge of the area mapped, where our base camp is located. Origin for co-ordinates and reduced levels is the East end of this base. The origin is designated 10,000 N and 10,000 E (feet) and assumed to be at an elevation of 5250 feet (1600 metres) above sea level. Reduced levels are therefore relative to this station, which is an approximation to the actual elevation. Relative elevation of the 24 control points was determined by indirect levelling, reciprocal measurements being used in all cases to minimize any effects of refraction. Whenever possible the stadia traverses were made between two or more of the triangulation stations.

Contours for the base map were prepared by interpolation between spot heights derived from the stadia work. These were extended beyond the immediate vicinity of traverses using the photogrammetric map to provide form lines.(Contours based on the photogrammetric map are shown as dashed lines on the maps).

Geological data was plotted initially at a scale of 1:500 (metric) which was reduced to 1:1500 for reporting.

Claim boundaries are still only approximately known, however, since few of the corner posts were identified during traversing. The L.C.P. for Ram 19 and 20 was used as ore of the triangulation stations, so it is accurately positioned and the L.C.P.'s for the Ram 105 and 102 claims were identified after mapping was completed and positioned on the maps from topographic detail (so these are only approximate).

ii) Regional Geology

The claims are located between the Cassiar Batholith and a large quartz-monzonite stock to the West. The Turnagain Valley dissects the contact region of the batholith. Two further much smaller stocks, a few hundred metres across, are found on the May 5 and 7 claims and immediately to the North (on the Ram 103). Sediments forming the roof of the batholith are Lower Palaeozoic carbonates and schist, with an overlying massive dolomite unit which is most likely a thrust sheet of older (? Proterozoic) age.

Page 3.

iii) Detailed Geology - Stratigraphy

The stratigraphic succession is as follows:

- a) The lowest unit observable is a fine-grained quartz-rich schist or phyllite. The grainsize of the micas varies according, presumably, with local grade of metamorphism. This unit contains numerous calcareous horizons of one metre or less thickness. These appear mostly as fine-grained, green calc-silicate hornfels. Total thickness is probably well over 300 metres.
- b) The "skarns" are at the contact with the carbonate unit above. They occur as relatively coarse, dense garnet-pyroxene skarn interbedded with aphanitic calc-silicate hornfels and garnetbearing marble in varying quantities. Often, discontinuous highpyrrhotite lenses are found in the dense skarn.
- c) A carbonate unit is found above the skarns. It varies from about 30 metres to 360 metres thickness across the area mapped. Lithology varies according to the amount of dolomitisation from bedded, grey limestone to massive yellow dolomite. In unaltered sections a "wavy-banded limestone" or marl can be recognised apart from the grey "foetid" limestone. It is designated w.b. on the map.

Dolomitisation appears to generally follow certain horizons, but is locally quite transgressive. The enormous thickening of the carbonate unit over the 1½ kilometres of ground mapped is assumed to represent an old reef. There is evidence of some folding in the area, but it is not of sufficient magnitude to produce tectonic thickening of this order.

- d) Above the carbonate is a schist bed, seemingly devoid of calcareous horizons. It is over 90 metres thick.
- e) Vertically above these units is a massive yellow dolomite, at least 180 metres thick. It is most likely a thrust sheet of older, possibly Proterozoic (and stratigraphically belongs at the beginning of this sequence). Evidence for thrust faulting is sketchy, however, since the contact is not distinctly discordant with the carbonates below and there is no sign of mylonitisation or obvious shearing at the contact. There are however, some small scale folds in the units below which are not reflected in the upper dolomite content, so it is presumed to be faulted.

This dolomite unit differs from the (younger) carbonates in that it is almost entirely a massive pervasively jointed dolomite with only one large pod of limestone visible to the north of the map area. Bedding is only rarely recognisable in this unit.

iv) Metamorphism

Throughout the limestone - dolomite units there is evidence of widespread low-grade thermal metamorphism. Most of the carbonate bands within the schist are either partly converted to fine-grained pyroxene hornfels or show coarse porphyroblasts of garnet, often up to 8mm size. The "skarn" bands which carry the scheelite mineralization of the most interest vary from garnet-bearing marble to dense, garnet-diopside skarn with local sulphide concentrations. The units mapped as skarn around 11500N are the dense skarn and calc-silicate hornfels. Some of the limestone between the bands is converted to garnet-marble.

Adjacent to the large quartz-monzonite stock (around 12500N, 8250E) the dolomite is partially metamorphosed to a green pyroxene hornfels.

v) Small Intrusive Stocks and Associated Breccia Zones to the North-East

There are two small granitic stocks to the North-East; one around 16,500N, 13,500E on the May 5 and 7 claims and the other off the mapped area, around 18000N. This northernmost stock has not yet been mapped due to the verticality of this part of the world. Scheelite was found during prospecting the creeks below the contact zone and hence it probably will be mapped during the next season.

Hornfels and some skarn is developed around the West side of the stock on the May 5 claim in calcareous horizons within the lower schist, roughly 30 metres stratigraphically below the carbonates. The east side of the stock is one gigantic breccia zone, with blocks up to 50 metres across tilted at sharp angles to one another. Some granitic dykes have intruded between the blocks. Much of the breccia material is calc-silicate hornfels and garnetiferous marble with skarn bands and the region deserves further prospecting.

Mapping did not cover the whole of the breccia zone, which extends a further 200 metres or so to the south-east.

vi) Structure

The large-scale structure as defined by whole stratigraphic units appears to be of quite gentle, open, folding producing only a warping over the area mapped. It has been suggested that perhaps the schist units above and below the limestone (dolomite unit) are the same unit repeated by isoclinal folding, but no evidence to suggest a fold hinge in the appropriate region has been seen.

Small scale folds (on the scale of 50 metres) are evident particularly around 13,500 N, 10,300 E. They are not ubiquitous however and are insufficiently oppressed to produce any tectonic thickening of the stratigraphy units. Lack of marker horizons prevents detailed structural mapping within the thicker part of the carbonate unit, or for any distance in the schists below.

vii) Mineralization

Two separate types of scheelite mineralizations are found on these claims. The skarns at the base of the limestone - dolomite unit carry the obvious reasonable-grade mineralization, at around 1.65% WO_3 over a 1.8 metre section, an average of 0.5% WO_3 over 6.0 metres. The dolomites near the contact of the western stock are partly altered to calc-silicate hornfels and show close-spaced jointing carrying coarse scheelite crystals in the quartz fillings.

The section from 12,000 N to 12,500 N and 8,000 to 8,500 E carries the higher grade material. Joint spacing is often around one metre or less and width of the joints are from 1 to 10 centimetres. The joint-filling quartz contains up to 25% WO₃ (estimated) as coarse scheelite crystals. One area was sampled, more because of good exposure rather than it necessarily being the better mineralized locality. Values of 0.1-0.2% WO₃ over 1 to 5 metres were typical of the results. These widths, however, do not represent the total extent of the mineralized zone. It is virtually impossible to judge the overall attitude of the zone as three or more joint sets carry the mineralization.

Some scheelite has also been noted disseminated in unaltered dolomite, particularly at 11,730N, 9,500E. One further occurrence may be notedat around 11,700N, 7,600E. Here quartz veins are common in the schist near to the quartz-monzonite contact. They carry scheelite in grades up to 10% WO₃ in widths up to 0.5 metre. Spacing is, however, rather erratic.

The five skarn and calc-silicate limestone horizons mapped in the region of 12,400 to 13,300 N and 10,400 to 11,400 E show sporadic disseminated scheelite. No sampling was attempted here, but further work, particularly prospecting to trace these horizons both east and west is warranted.

Lead - silver mineralization is seen as galena (presumably argentiferous) in pyrolusite veins near the contact of the batholith in the region of 11,000 N, 10,500 E. Width of the veins is under 0.5 metre. Some scheelite was found in these maganese veins once the rock was crushed and panned. They appear to be of little economic significance.

C. SAMPLING, PITTING AND BLASTING

The two enclosed sketches (numbers 6,7) show the location and results of averaging assays of chip samples from the rock faces and pits. Chip samples were broken from suitable edges on the face of cliffs and the pits; from half to one kilogramme being taken for each metre of sample length. These were sent to Bondar and Clegg for tungsten and molybdenum assay. (Traces of molybdenite and some molybdscheelite are found in the skarns). Pits were dug at two localities to better expose the lower skarn horizon. The first was at 11,840 N, 9,950 E. Here an area of approximately 4 metres by 5 metres was cleared into the side of the hill, resulting in a face of 3½ metres being exposed. The rock there is a calcsilicite hornfels with a sulphide-skarn band. It appears to have been disturbed by slumping but probably has not moved any distance. The loose material was sampled by W. Kuhn and he reported a result of 3.0% WO₂ over 7 feet (2.13 metres). A second pit was dug at 11470N, 9610E to uncover the skarn where talus partially obscured outcrop. Samples did not reach the very bottom of the skarn. A triangular cut into the hill of about 3 to 4 metres length exposed a $2\frac{1}{2}$ metre face.

Page 7.

Two other localities were drilled out and blasted after surface chip sampling to investigate the continuity of the mineralisation. These were at 11,830N, 9310E and 12,455N, 8235E.

At the first location it was found that mineralization was just at surface on joints and only one pod of about a cubic metre containing disseminated scheelite in the dolomite remained after blasting an eight metre length of rock face.

At the second locality two rows of vertical holes over a 7 metre length of rock face, to about l_2^1 metres depth were drilled and fired. Mineralization was found to be quite pervasive along two prominent joint sets.

D. CONCLUSIONS

Mineralization is widespread throughout the whole block of carbonates from 8000E to 9500E and 11,000 to 1,250 N. (Sheet Number 2, 3). Whilst a thickness of 6 metres of 0.5% WO₃ grade will not necessarily make a mine there is the possibility of an increase in grade of the skarn (hornfels horizons closer to the western stock where metamorphic grade might be higher, i.e. down dip).

For an assumed thickness of 9.5 metres for both horizons there is a potential for 3.5×10^6 tonnes of ore in these zones, using a conservative guess at the trend of the skarns. Average grades where sampled are around 0.5% WO₂ over the whole interval.

The joint zones in the dolomites could represent a further low grade target which should be tested by drilling.

Possible surface extensions of the skarns are obscured by talus in the cirque at around 12,750N, 9250E. These could carry ore-grade mineralization and represent a further target. Two other regions for further prospecting exist:

- a) Around the stock at 12750N, 7750E the carbonates must be close to the intrusive and may well have skarns developed. The entire region at the head of the cirque is obscured by scree and permanent snow. It deserves work, but will probably need subsurface investigation to find in-situ material.
- b) Around the small stock to the north (Sheet 4) there are hornfelses with scheelite on the west side and skarns in the breccia on the opposite side. Both areas need more prospecting.

RECOMMENDATIONS

i) Drilling

The property warrants drilling to test the skarns at depth and joint mineralization in the dolomites. A shallow hole or two are needed to test the skarn horizons below the cirque on the north branch of schist creek (east side of sheet 2).

Proposed holes are as follows:

- At 11890N, 8580E, either inclined north-westerly at 70^o or vertical. Depth would need to be around 1000 feet (300 metres) for a vertical hole. This would test the skarn at depth.
- 2. At 12000N, 8020E to test the mineralization in the dolomites and the skarn at the contact of the stock. Depth required would be around 1400 ft (430 metres) for a vertical hole. This hole would preferably be of large size say, H or N for the initial 50 to 100 metres to obtain a suitable sample of the jointed dolomites. Many drilling problems can be anticipated here due to the nature of the rock and lack of proximity to water. The nearest permanent water is at 13500N, 8500E, some 800 feet (240 metres) below the ridge.
- 3. A shallowhole, under 500 feet (150 metres) would test the various skarn bands under the cirque. It would need to be collared at around 12750N, 9250E and probably a vertical hole would suffice. At least water would not be a problem here.

ii) Prospecting

Prospecting is needed in the following locations:

- 1. Around 12,400N, 9250E to attempt to find the surface trace of the upper and lower skarns.
- 2. Around 12700N, 7750E to see if skarns are developed at the stock contact.
- 3. Around the small northern stocks as discussed in the conclusions

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COST STATEMENT

F.

Physical Work - Ram 16 and Ram 18

Pitting carried out from the 6th to 10th September by T. Liverton and W. Kuhn and on the 6th and 7th also by S.C. Fraser.

| Wages at \$66.60 per day (10) = | \$ 666.00 |
|--|------------|
| Helicopter 3.56 hrs. at \$180.= | 640.00 |
| Accommodation 10 man/days at \$30.00 = | 300.00 |
| | |
| | \$1,606.00 |

| Drilling and Blasting of Outcrops | |
|-----------------------------------|--------------|
| 11th, 12th September (2 man/days) | |
| Wages | \$ 133.00 |
| Helicopter (1.1 hours) | 200.00 |
| Accommodation at \$30.00 | 60.00 |
| Explosives | 150.00 |
| | |
| | \$ 543.00 |

Total Physical Work

\$2,149.00

Surveying, Geological Mapping and Sampling

Total time spent in the area was as follows:-

31st May to 30th June : L.A. Bell, S.C. Fraser and T. Liverton (Geologists), E. Rehtlane (Assistant), T. Campbell (Cook).

31st July to 24th August: T. Liverton and E. Rehtlane 27th August to 7th September: T. Liverton and S.C. Fraser 8th September to 16th September : T. Liverton and W. Kuhn

Proportion of this time spent on the relevant claims is: 125 days (Geologists) and 50 days (Assistant).

Costs are estimated as follows:

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| <u>Wages at</u> : 125 days X \$66.00 50 days X \$40.00 | \$ 8,250.00 2,000.00 |
|---|-------------------------|
| Accommodation: 175 days @ \$30.00 = | 5,250.00 |
| Fixed Wing Aircraft to Blue Sheep Lake: 10 trips with Otter at \$340.00) 2 trips with Beaver at \$270.00) 3 trips with Cessna at \$210.00) 2 trips with Cessna at \$220.00) | 5,010.00 |
| Helicopter: 4.74 hours with Bell 206B) at \$350.00 and 29.0) hours with Bell B.I. at \$180.00) | 6,879.00 |
| Assays: Rock, for W, Mo. 25 at \$5.00 | 125.00 |
| Report Preparation: | 300.00 |
| TOTAL | \$27,814.00 |

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G. STATEMENT OF QUALIFICATIONS OF AUTHOR

Timothy Liverton: Graduated from University of Sydney with B.Sc. degree in Geology and Geophysics in 1964.

Experience in Australia

1965 employed by R. Hare and Associates (consultants) to work on tin, tungsten and copper mines and prospects in Queensland and W.A. Work included surface and underground surveying and mapping, supervision of diamond drilling and regional mapping.

1966 and 1967 employed by the Electrolytic Zinc Company of A'Asia Ltd., to work on base metal exploration in N.S.W. and uranium prospects in S.A. Work involved detailed mapping, supervision of drilling, geochemical surveys and geophysics.

1968 to 1970 employed by Trans Australian Explorations to carry out regional mapping and prospecting over 2000 square miles of Queensland to explore for copper, molybdenum and tungsten. Also worked on nickel properties in N.A.

1971, 1972 employed by ANZ Exploration (Union Carbide) to carry out uranium exploration in the Northern Territory.

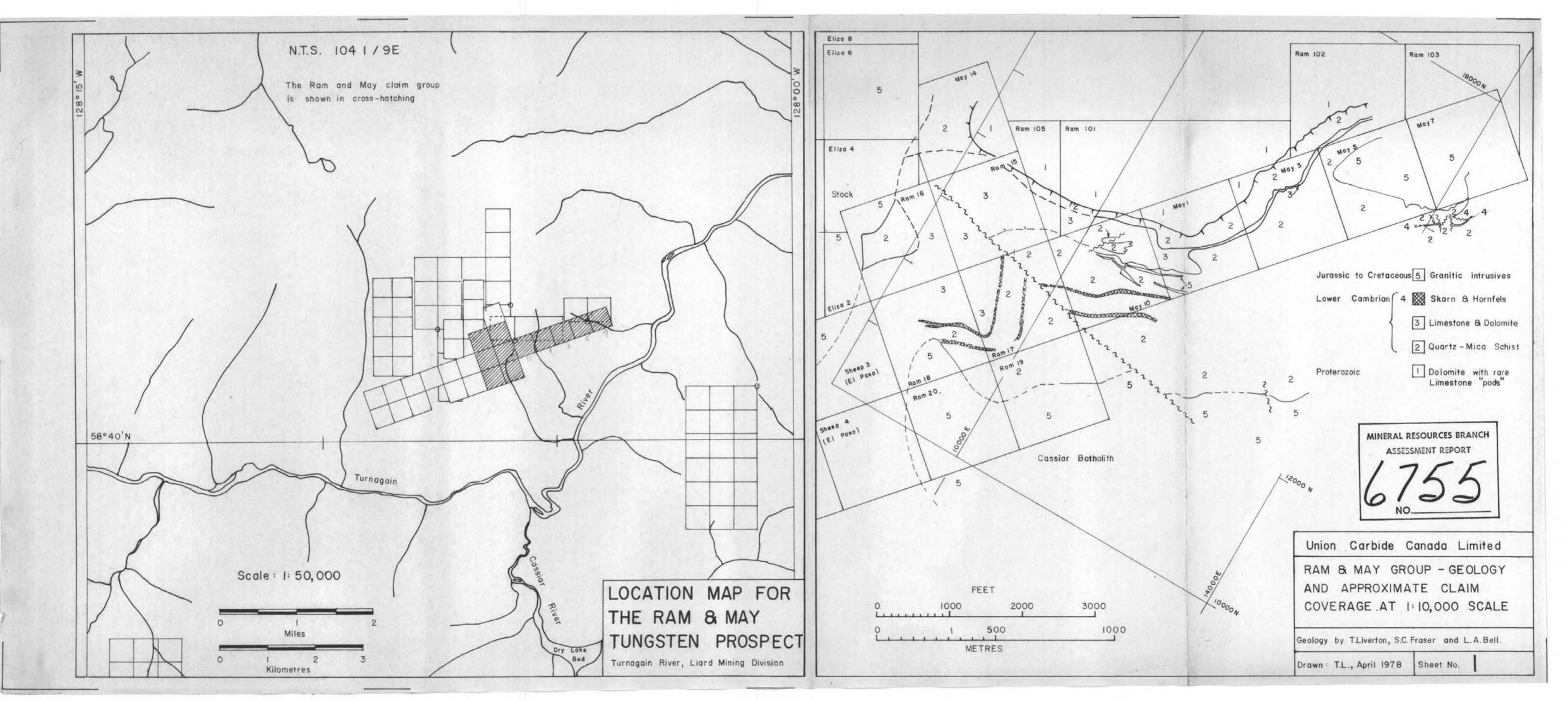
Experience in Canada and Abroad

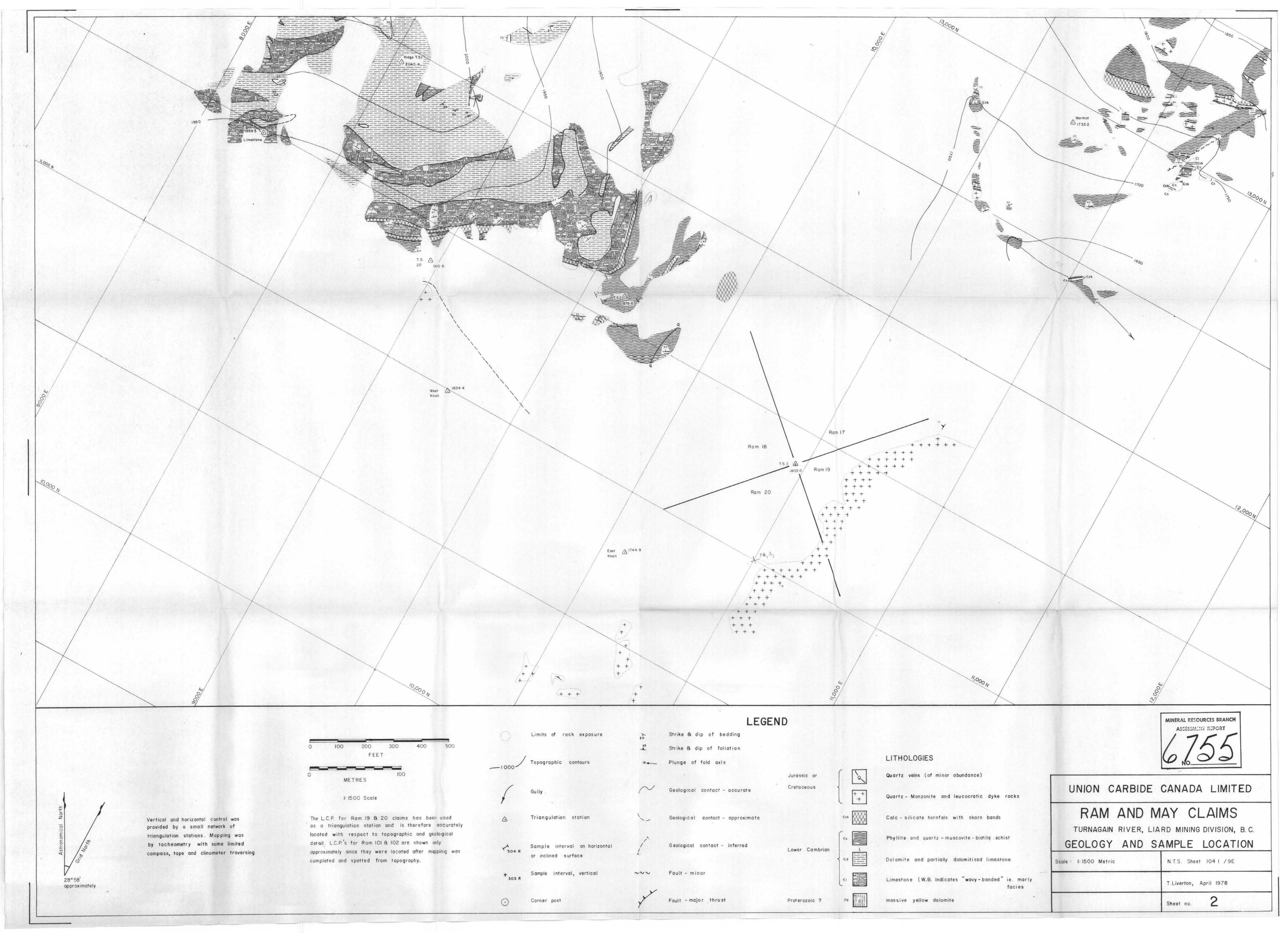
1973 I was working as a civil engineer in England.

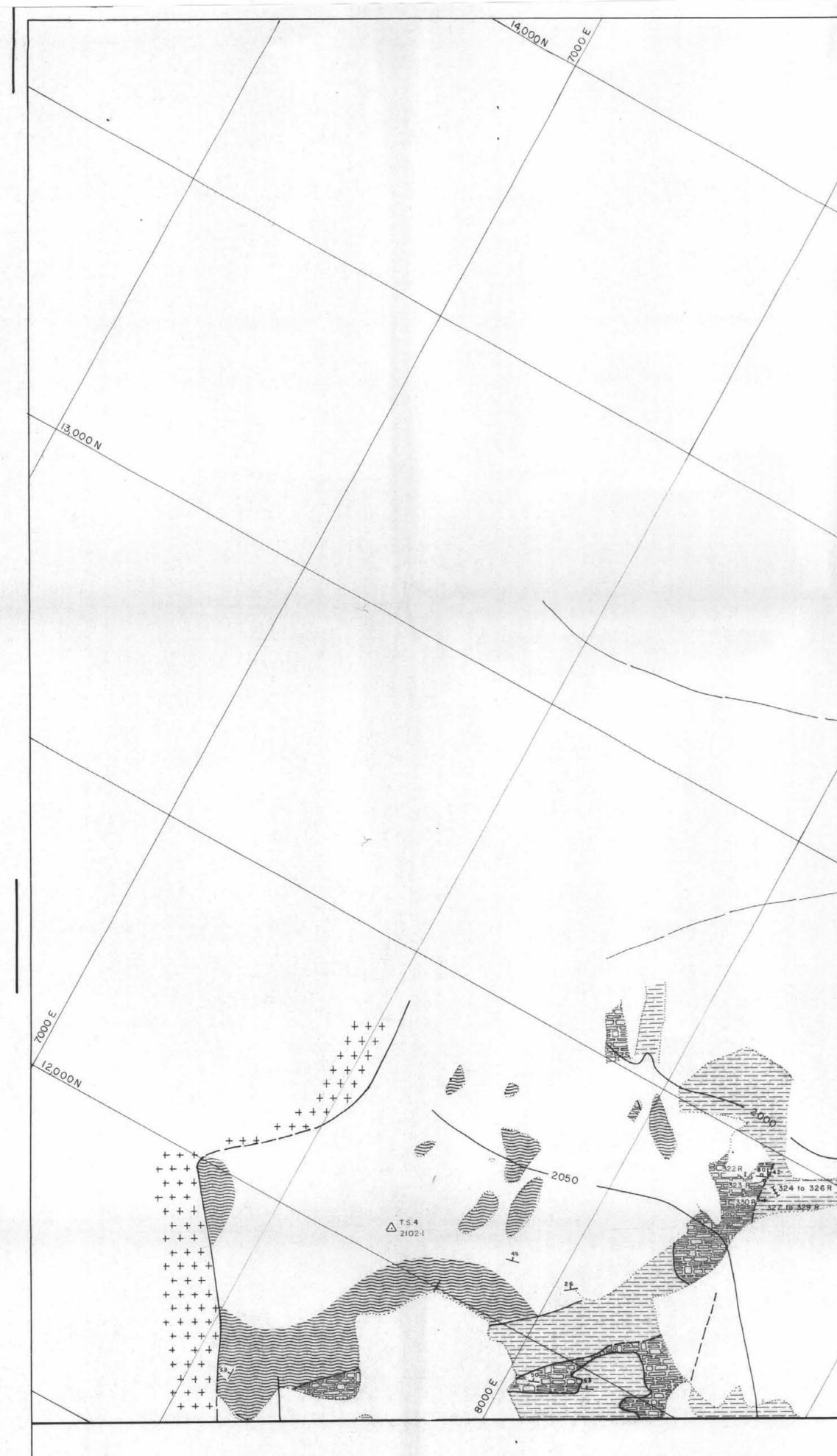
1974 to present: employed by Union Carbide Canada Ltd., to work on Yukon and Northern B.C. tungsten exploration during the summers. During the winter I was in Greenland carrying out geological reconnaissance for quartz; in Amazonia, Brazil prospecting for manganese; at the Pine Creek tungsten mine in California and working on Tungsten exploration in Norway and development work in Portugal.

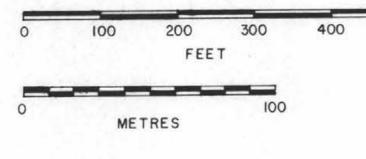
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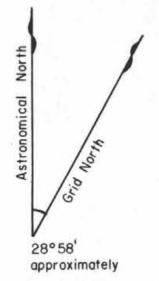








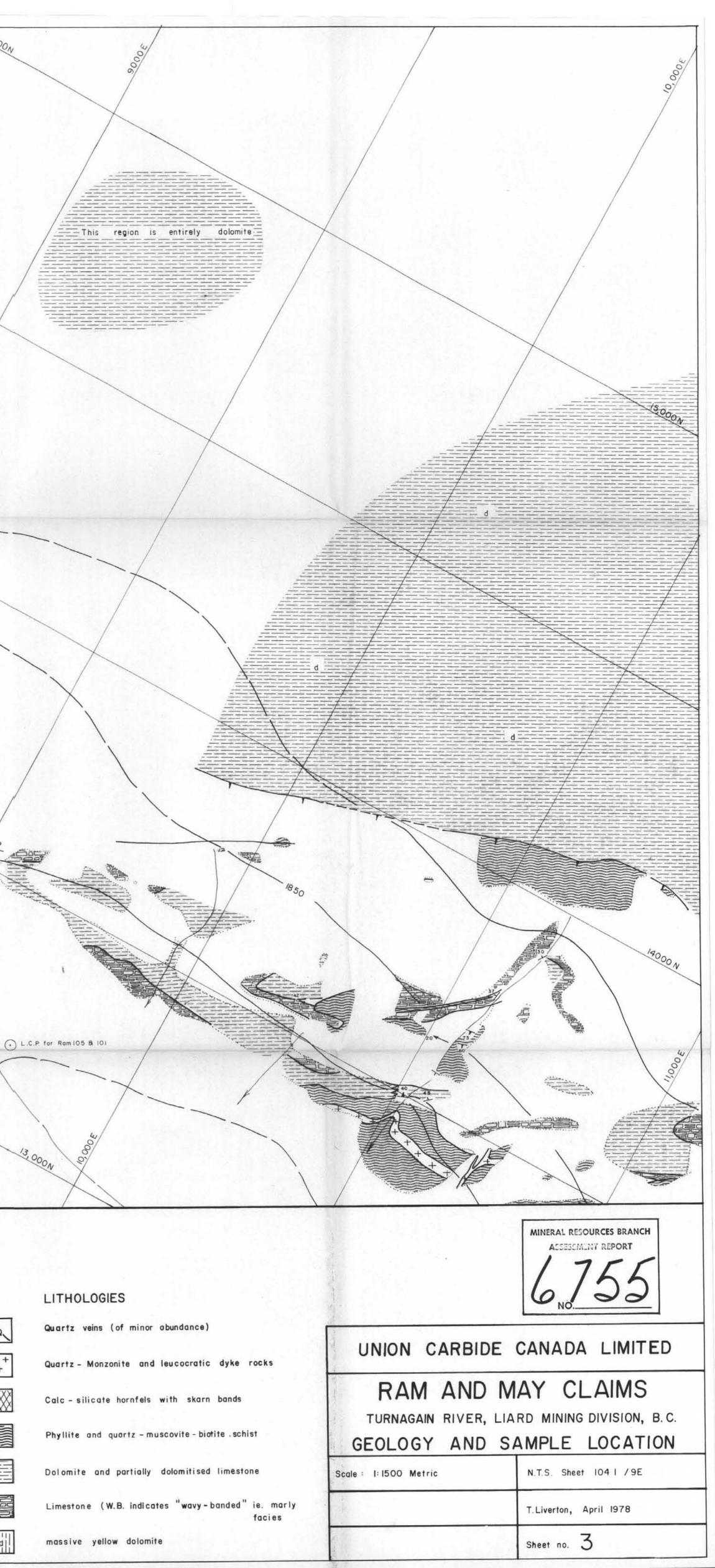
The L.C.P. for Ram 19 & 20 claims has been used as a triangulation station and is therefore accuralocated with respect to topographic and geological detail. L.C.P.'s for Ram 101 & 102 are shown only approximately since they were located after mapping w completed and spotted from topography.

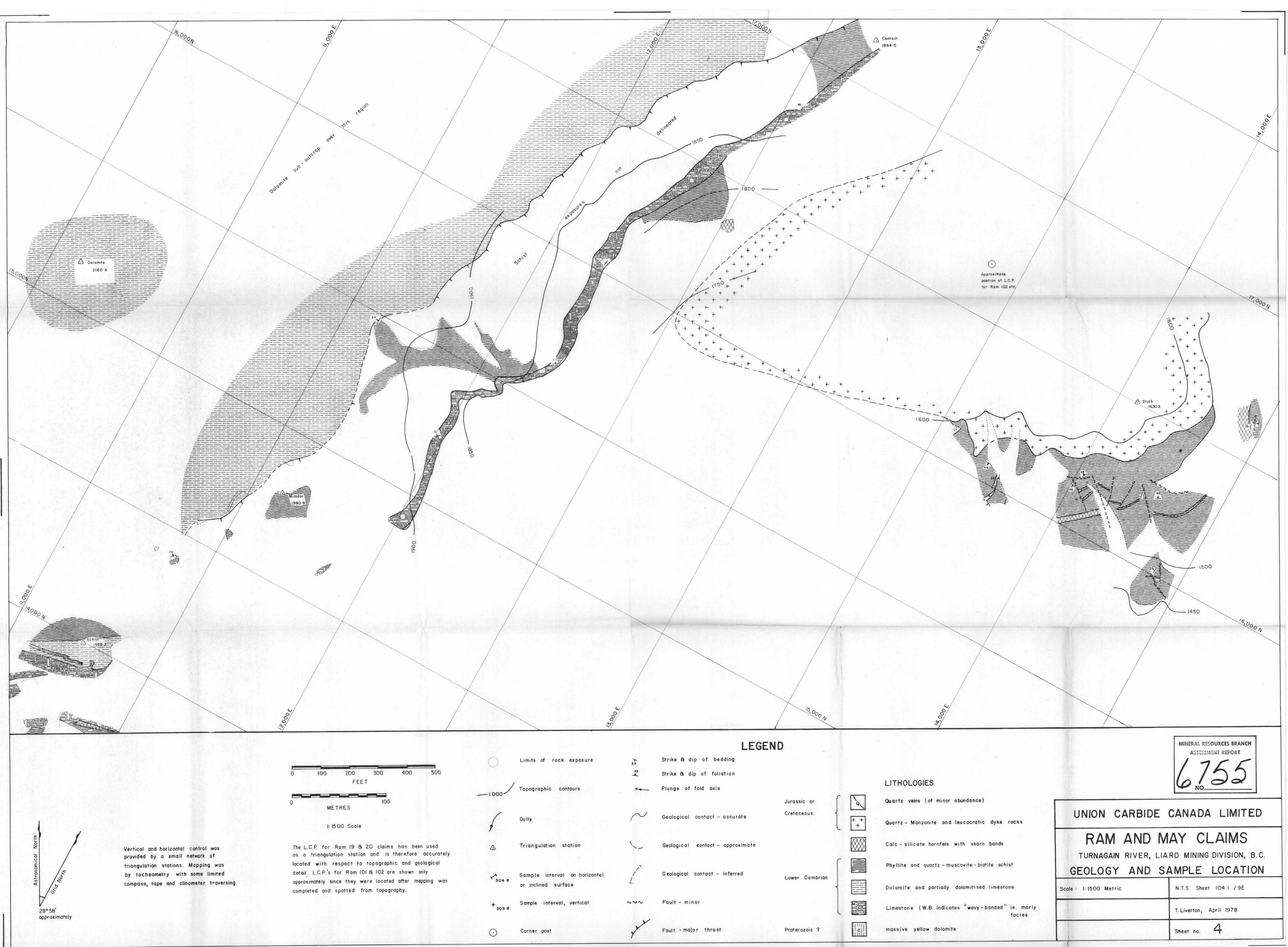


Vertical and horizontal control was provided by a small network of triangulation stations. Mapping was by tacheometry with some limited compass, tape and clinometer traversing.

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| 500 | | | 35 | Strike & dip of foliation | | |
| | 1000 | Topographic contours | 15-4 | Plunge of fold axis | | |
| | _1000- | | | | Jurassic or | 6 |
| | f | Gully | \sim | Geological contact – accurate | Cretaceous { | + + + |
| used ccurately | | Triangulation station | 5 | Geological contact-approximate | | |
| gical ing was | ✓304 R | Sample interval on horizontal or inclined surface | 1 | Geological contact – inferred | Lower Cambrian | |
| | + 303 R | Sample interval, vertical | ~~~ | Fault – minor | | |
| 1 | \odot | Corner post | The second secon | Fault - major thrust | Proterozoic ? | |

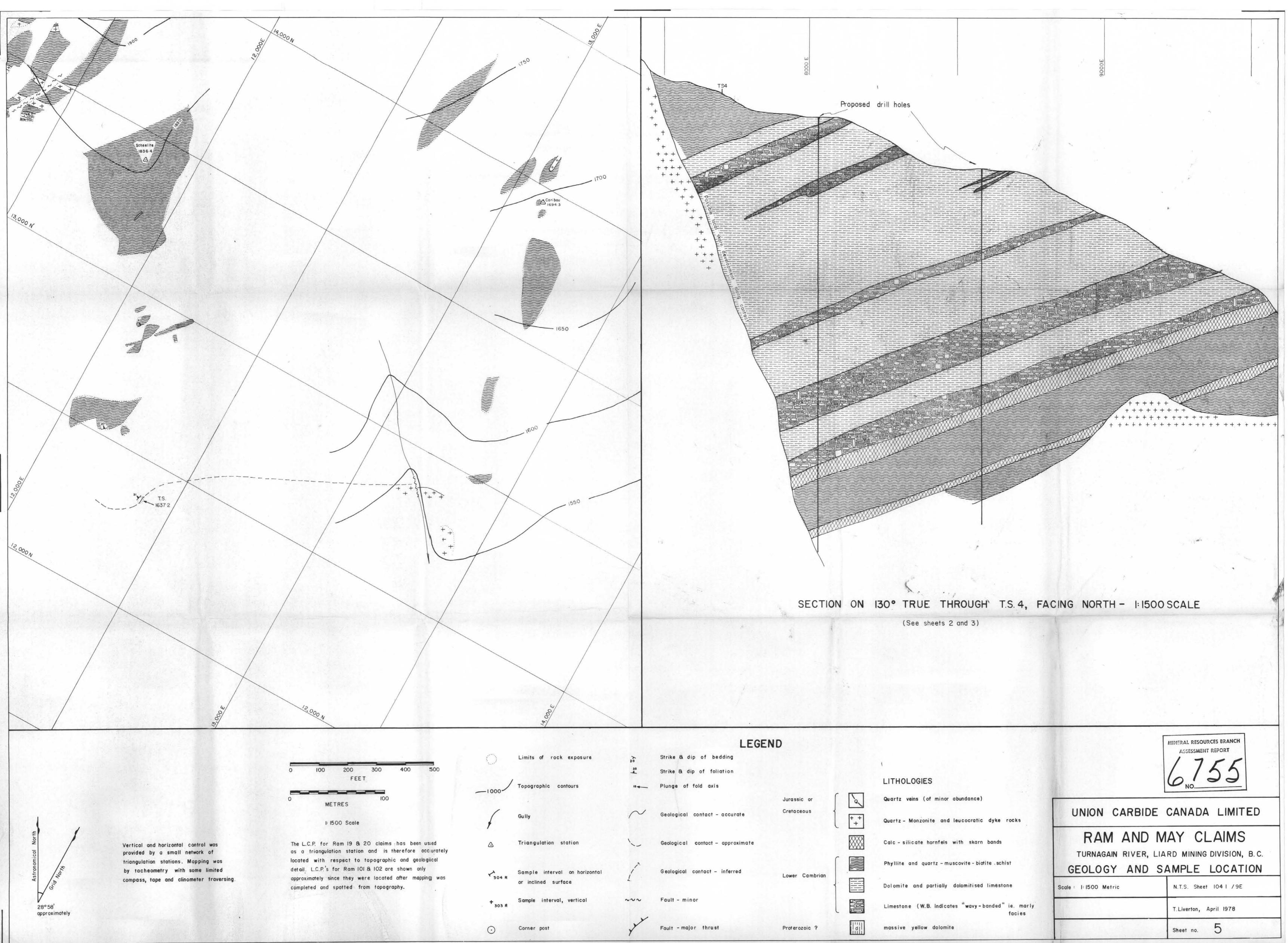


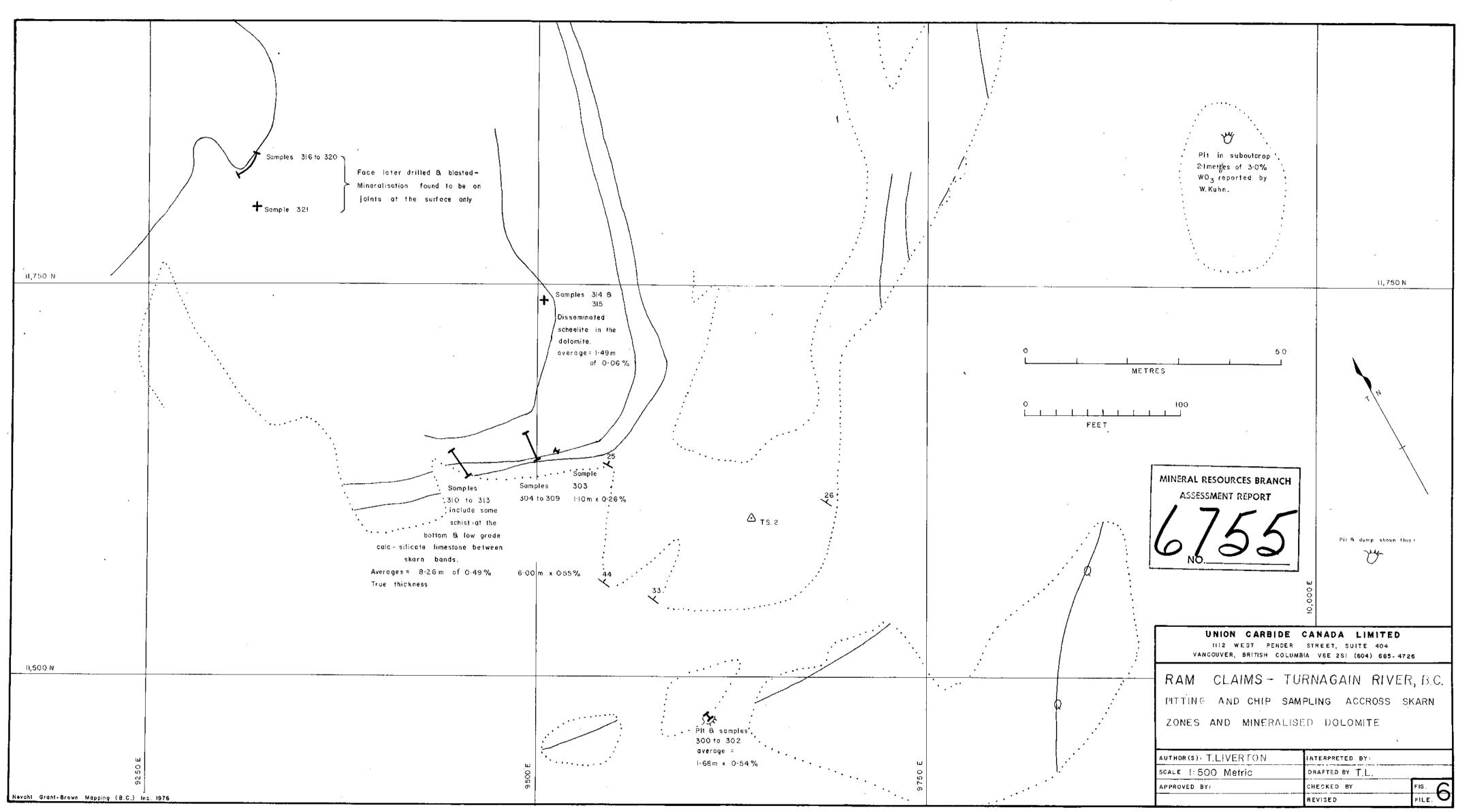


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