71-790

ANNUAL REPORT

ON

MOINA AREA - E.L. 8/65

1970 - 71

By : J.P. McKibbon

Drafting: R.G. Wilson

Copies To:

General Office (1)

Exploration Dept. (2)

Dept. of Mines (1)

Field Copy (1)

August, 1971

INDEX

838004

003

LIST OF FIGURES

* not recieved with this report.

004

1. INTRODUCTION

This report covers the work performed on E.L. 8/65 from April, 1970 to June, 1971.

Detailed geological, geochemical and drilling activities were carried out in the following areas (Map 1):

(i) Shepherd & Murphy Mine area.

(ii) Iris River - Ti-Tree Creek area.

(iii) Stormont Mine area.

(iv) Dolcoath Hill.

Reconnaissance geophysical work was conducted over aeromagnetic anomalies near Lorinna and Daisy Dell. Regional geological mapping over Cambrian volcanics was completed in the Quaile Falls - Five Mile Rise area. The exploration programs conducted were aimed at continuing the appraisal of areas of interest delineated by previous geophysical and geological investigations.

The bulk of the work was carried out by the writer, aided for portion of the time by a field assistant, between April, 1970 and January, 1971. From January to March, 1971 P. Holyland was based in the Moina area. Subsequently no geological personnel have been available for permanent stationing on E.L. 8/65.

A severe setback to activities occurred in August, 1970 when flooding in the Iris River completely destroyed the base camp. As a result two caravans were lost in Lake Gairdner, a third severely damaged and the fourth water damaged. A considerable number of plans and records were lost and damage to generators, pumps, sheds etc. resulted from the flooding.

Only a temporary, modest base camp has been established to replace the lost camp.

In May, 1971, the southern section of the 110 square mile licence area was relinquished, reducing the area of E.L. 8/65 to 63 square miles. A slight modification to the licence area co-ordinates was made by the Department of Mines. The current and former boundaries of E.L. 8/65 are plotted on Map 1.

Expenditure on E.L. 8/65 during 1970-71 totalled $59,415, bringing total expenditure to date on the Moina area to $134,377 (1965 - 1971). A budget of $43,300 has been proposed for expenditure in 1971-72.

Recommendations for future exploration activities in the Moina area are centred on testing the potential of the Dolcoath Granite and its environs (Shepherd & Murphy Mine to Ti-Tree Creek).

2. ACKNOWLEDGEMENTS

Messrs. K.O. Reid and L.A. Newnham were responsible for supervision of much of the work conducted on E.L. 8/65 during 1970-71.

Drafting was carried out competently by R.G. Wilson.

3. REGIONAL STUDIES

3.1 Re-Interpretation of Aeromagnetic Results

An aeromagnetic survey of the Moina licence area was conducted in 1966 by A.M.E.G. The interpretation work done by A.M.E.G. was considered to be insufficient and a second interpretation was undertaken by J. Webb (Austral Exploration Services, 1968). Webb's interpretation reduced the total magnetic intensity values to a series of 7 residual anomalies. All the residual anomalies (numbered A to F) were examined on the ground and confirmed. Details of the work conducted over each of these anomalies are included in the 1968-69, 1969-70 annual reports on E.L. 8/65.

Subsequently, C.G.G. indicated the possibility of distinguishing deep seated magnetic horizons beneath the extensive Tertiary basalt cover which had severely hindered all previous attempts at interpreting the aeromagnetic results.

A third interpretation was carried out in October, 1970 by C.G.G.'s Massy (France) Interpretation Department. The report on this interpretation criticised the way in which the aeromagnetics was flown. It was, however, possible to distinguish between anomalies related to the Tertiary basalt and anomalies related to bedrock.

A vast negative anomaly outlined the Dolcoath Granite batholith (?). Striking magnetic discontinuities coincide well with known faults in a number of areas.

To the north east of Lorinna a series of three N-S magnetic axes were distinguished as occurring close to the surface. C.G.G. considered that these were not associated with the Tertiary basalt but rather to magnetic contrasts in the underlying Cambrian rocks. A similar anomaly occurred north of Daisy Dell and was considered to be of comparable origin.

Reconnaissance ground magnetic checking of both these areas was undertaken and the anomalies were readily located on the ground. It became obvious that the magnetic axes correspond to magnetiferous basalt horizons within ordinary basalt. This is an unusual variety of basalt but the presence of magnetite was confirmed in thin section examination. No further work was undertaken on these anomalous areas.

3.2 Five Mile Rise - Quaile Falls Area

Cambrian rocks unconformably overlie Precambrian quartz-sericite schists and quartzites along the northern slopes of the Dove River Valley. The succession consists of a thick and variable sequence of sediments (greywackes with some cherts) and acid pyroclastic rocks.

Jennings (1963) defined the Lorinna Greywacke as "an assemblage of greywacke, chert, quartzite and volcanic rocks which underlies the Moina Sandstone on the Five Mile Rise and also outcrops in the Forth River about ½ mile north of Lorinna Bridge".

On the southern slopes of Five Mile Rise Cambrian rocks include granitised greywacke and porphyries with microgranodiorite. Granitisation of the Lorinna Greywacke by the Dove Granite has rendered the boundary between these units indistinct and apparently gradational.

An extensive area of outcropping Cambrian sediments and volcanics NE and E of Quaile Falls on Olivia Creek was not mapped by Jennings (1963). A reconnaissance regional mapping program was undertaken over these volcanics during 1970-71. (See Map 1).

Massive light grey Cambrian cherts and siltstones outcrop adjacent to Quaile Falls and in a quarry half a mile to the east.

Microscopic examination of these rocks by Central Mineralogical Services revealed bedding features and siliceous sponge spicules indicating a marine origin. This sedimentary unit is inferred to unconformably overlie Precambrian Dove Group schists and quartzites; although no exposure of this unconformity was observed. The sequence is thin and appears to lens out towards the east.

Overlying the chert-siltstone unit is a thick pile of quartz-feldspar porphyries. These rocks are acid pyroclastics typically containing rounded phenocrysts of quartz, plagioclase and volcanic fragments in a dominantly potash feldspar matrix. The rocks are described as rhyolitic tuffs due to the dominance of alkalis indicated by the potash content of the groundmass.

The distribution of this sequence of sediments and pyroclastics is shown on Map 2. Photogeological interpretation, coupled with regional mapping, suggests the presence of a major SE-NW trending fault offsetting the Cambrian rocks. Portion of the Dove River Valley appears to be localised along this fault zone.

Very minor amounts of disseminated pyrite was observed in the pyroclastics in widely distributed localities. Pyrrhotite was observed locally as very rare disseminated grains. No evidence of potentially mineralised environments were observed during regional mapping.

Subsequently the area of these rocks was relinquished as part of the 47 square mile reduction of the licence area.

4. SHEPHERD & MURPHY MINE AREA

4.1 Introduction

A considerable amount of reconnaissance exploration has previously been carried out in the Shepherd & Murphy Mine area by the Company. Details of previous investigations are contained in the 1969-70 Annual Report.

During 1970-71 a series of access roads were constructed to drill sites. Three diamond drill holes, totalling 2,826 ft., were completed during the year.

4.2 Access

A total of 3,300 ft. of traverse lines were cut and pegged to allow a detailed magnetometer coverage of the magnetic anomaly previously outlined on lines 9E, 10E.

Three diamond drill sites were prepared and access roads, totalling 4,000 ft., were constructed to these sites. In addition, a $\frac{1}{4}$ mile of roadway was constructed to allow access to the area after severe flooding destroyed a culvert on the main Moina Road.

4.3 Geological Mapping

Detailed plane table mapping of all new roads and exposures in in the mine area was plotted at 1 : 2400 scale (Map 3).

Tertiary basalt cover is present over much of the area. Diamond drilling and road exposures indicate a considerable component of tachylytic breccia within the basalt. Minor sedimentary horizons, associated with fragmental volcanic breccia and tuffs, were intersected in D.D.H. Moina 2.

Highly magnetiferous skarn (metasomatised basal section of Ordovician Gordon Limestone) with numerous albite veins outcrops in the mine area. The skarn overlies a series of "transition beds" - siltstones and calcareous sandstones which conformably overlie Moina Sandstone.

4.4 Magnetometry

Detailed ground magnetic readings wer taken at 50 ft. intervals on traverses 4250E, 4500E (9E), 4750E, 5000E (10E) and 5250E from 1000S to 2100S. The results accurately outlined the previously indicated magnetic anomaly on the NE side of the Bismuth Creek Fault.

The anomaly was shown to coincide with magnetiferous skarn in part only - it largely overlies Moina Sandstone surface outcrops.

4.5 Diamond Drilling

Three diamond drill holes, totalling 2,700 ft., were recommended (Newnham, 1970) to test the easterly and westerly extensions

of the known lodes in the Shepherd & Murphy Mine area.

Drilling of all three holes, totalling 2,826 ft., was carried out during 1970-71. Hole locations are shown on Map 3.

4.5.1 D.D.H. Moina 1

Drilling of D.D.H. Moina 1 commenced on October 2nd, 1970 using a Mindrill F52C rig under contract from Associated Diamond Drillers Pty. Ltd. The hole collared in weathered, garnetiferous skarn and passed into a narrow transition zone to Moina Sandstone at 190 ft. Moina Sandstone was intersected from 190 to 475 ft. Minor quartz veins, containing only traces amounts of molybdenite and wolframite, occurred rarely through this zone.

During rod-pulling, the rod string snapped at a depth of 150 ft. All attempts to recover the lost rods were unsuccessful due to the broken, caving nature of the ground. Abandonment of the hole was necessary.

Subsequently D.D.H. Moina 1A was collared on the same site and re-drilled to 475 ft. at the expense of the contractors. The hole continued to a total depth of

871 ft., being completed on December 8th, 1970.

D.D.H. Moina 1A intersected bleached skarn and minor sandy siltstone from 0 to 188 ft. Typical siliceous quartzites of the Moina Sandstone were intersected from 188 to 770 ft., with only minor traces of wolframite, talc and epidote in thin quartz veins scattered occassionally in the core. From 770 to 871 ft. the hole passed through massive, mottled yellow and red granite containing minor amounts of finely disseminated molybdenite flakes.

Map 4 is a section of D.D.H. Moina 1A on traverse 8E. The presence of a granite body at vertical depth of approximately 700 ft. below ground surface is indicated.

4.5.2 <u>D.D.H. Moina 2</u>

D.D.H. Moina 2 (see Map 5) was sited on traverse 6E to test the westerly and depth extensions of No. 4, 6 lodes. Drilling commenced on December 21st, 1970.

The hole collared in coarse tachylytic tuff and breccia with minor basalt flows and a series of clay and mudstone horizons from 0 to 80 ft. Massive fine grained basalt

with fine amygdules throughout was intersected from 80 to 130 ft.

A zone of weathered clayey material from 130 - 140 ft. passed downwards into massive highly magnetiferous banded skarn, containing intense concentrations of fine magnetite veinlets. The skarn continued to 324 ft. From 324 to 1,018 ft., typical grey sandstones of the Moina Sandstone Formation were intersected. Minor thin (<1" to 6") quartz veins containing minor pyrite, molybdenite, muscovite, cassiterite and traces of chalcopyrite occur very rarely throughout this section.

Highly silicified quartzite with chlorite and muscovite throughout occurs from 1,018 to 1,087 ft. indicating increasing metamorphism and metasomatism in close proximity to the underlying granite body. From 1,087 to 1,100 ft. a phlogopite - muscovite - quartz rock represents the granitised and assimilated contact between Moina Sandstone and granite. Minor wolframite, cassiterite and molybdenite occur in this zone.

Drilling was terminated at 1,100 ft. without intersecting any significant mineralisation. No indications of lode channel extensions were observed.

016

4.5.3 D.D.H. Moina 3

D.D.H. Moina 3 was sited to test the coincident magnetic, EM and IP anomaly on the north-eastern side of the Bismuth Creek Fault. In addition it was intended that this hole test for possible repetitions of the known Shepherd & Murphy lodes across the fault zone.

Drilling commenced on March 1st, 1971, the hole being collared in typical Moina Sandstone. Considerable difficulty was encountered in drilling the zone from 250 to 305 ft. where the hole passed through extremely broken Moina Sandstone associated with the Bismuth Creek Fault zone. After considerable drilling difficulties the hole was advanced to 319 ft.

At that depth a number of steel objects were dropped down the hole - apparently by weekend visitors. This caused drilling to be completely impossible and as a result the hole was abandoned.

Subsequently D.D.H. Moina 3A (see Map 6) was collared on the same site and drilling commenced on April 28th, 1971. From 0 to 342 ft. the hole passed through Moina Sandstone, intersecting the Bismuth Creek Fault zone from 262 to 342 ft.

Massive magnetiferous skarn was intersected from 342 to 477 ft. The magnetiferous skarn graded into mottled brown and light green garnetiferous skarn which continued to 620 ft. A thin transition into Moina Sandstone occurred at 620 ft. with typical light grey quartz sandstone containuing to 854 ft.

No mineralisation was observed in the core, nor were lode channels of the Shepherd & Murphy type indicated. The EM, IP and magnetic anomalies recorded over this area are apparently related to the sharply folded and downfaulted block of magnetiferous skarn on the north-eastern side of the Bismuth Creek Fault.

4.6 Summary

Diamond drilling in the Shepherd & Murphy Mine area has not revealed any indication of significant lateral or depth extensions to any of the known lode systems.

The presence of a granite body at shallow depth below the mine area significantly downgrades the potential of the area, as it is not expected that the Sn-W-Bi lodes would persist deeper than the granite - Moina Sandstone contact.

In view of the limited lateral and depth potential of the known Shepherd & Murphy Mine lode systems, it is recommended that no further work be undertaken in the immediate mine area.

5. STORMONT AREA

5.1 Introduction

Bismuth mineralisation in the Stormont area occurs as finely disseminated bismuthinite and bismite in skarn (garnetiferous, "calc-silicate" rocks) derived from metasomatism of the basal portion of the Gordon Limestone. The garnetiferous skarn is underlain by highly magnetiferous skarn, which Cordwell (1961) regarded as being essentially unmineralised.

Previous exploration in this locality have been carried out by N.C.G.F.A. (Cordwell; 1961, Wilson; 1962). However the area was only examined in a reconnaissance manner. Accordingly a grid was cut over the area in 1970-71 to allow a more detailed assessment of the potential of the area.

5.2 Road Construction and Track Cutting

A short access road, approximately ½ mile long, was formed along the old Stormont pack-horse track to permit vehicle access to the Stormont Mine Open Cut.

A grid, consisting of 5 traverses and a baseline, was pegged over the Stormont area. A total footage of 11,000 ft. was cut, with traverse spacing of 250 ft.

020

5.3 Summary of Geology

Skarn outcrops in three areas north of Mt. Stormont (refer Map 7).

(i) Stormont Mine.

(ii) Stormont West.

(iii) Stormont East.

The skarn bodies are preserved as gently folded synclinal inliers, conformably overlying quartzites, sandstones and siltstones of the Moina Sandstone Formation.

The Stormont East, and Stormont Mine skarn bodies are essentially massive, garnetiferous "calc-silicate" rocks whilst the Stormont West body is a highly magnetiferous, chloritic skarn.

Tertiary basalt flows cover portions of the area and obscure a large section to the east of the grid area. On the southern portion of the grid highly silicified remnants of Tertiary gravel deposits (locally referred to as "greybilly") are preserved beneath basalt.

The area has been affected by a number of faults striking at 330°. It is probable that these structures have localised metasomatism and mineralisation to some extent.

Disseminated bismuth mineralisation, largely bismuthinite with minor bismite occurs in the garnetiferous "calc-silicate" skarn. Cordwell (1961) considered that the magnetiferous skarn is essentially unmineralised.

Workings at the Stormont Mine consist of a small open cut and a short drive. Enriched bismuth values were intersected in localised joint and fracture fillings.

A potential for disseminated bismuth mineralisation appeared to be present in the outlying skarn bodies.

5.4 Ground Magnetometry

Ground magnetometer surveying was carried out over the Stormont Grid to delineate the skarn bodies. Map 8 shows the contoured values of the vertical component of magnetic intensity.

Three anomalous zones correspond, in part at least, to outcrops of highly magnetiferous skarn. No anomalous response was obtained over the Stormont East or Stormont Mine skarn bodies, reflecting their essential silicate mineralogy as contrasted to the magnetiferous skarn outcropping at Stormont West.

The magnetic results indicate that the Stormont West skarn body is an elongate synclinal inlier of very limited tonnage potential.

5.5 Chip Sampling

A number of chip samples were taken from around the walls of the Stormont Mine open cut to gain an indication of the grade of disseminated bismuth mineralisation. Values of 0.3%, 0.06%, 0.37%, 0.09% and 0.02% Bi were obtained.

Six chip samples taken over the Stormont East skarn body adjacent to old prospect trenches revealed only trace bismuth contents in all cases.

5.6 Summary

Reconnaissance geological and geophysical work conducted over the Stormont area indicates three skarn bodies of limited outcrop and low tonnage.

The Stormont West body is a magnetite - garnet skarn of the type which Cordwell (1961) regarded as being unmineralised. A very limited tonnage is preserved in this body.

The Stormont Mine skarn has been worked in a small open cut and drive. The tonnage remaining appears very limited (approximately 250,000 tons) and does not warrant further work.

The Stormont East skarn body is a shallow synclinal outcrop of garnetiferous "calc-silicate" rocks. The tonnage represented by this body is insignificant and chip sampling reveals only trace bismuth values.

The low tonnage potential remaining in the Stormont area renders the area of low interest. No further work is recommended over the Stormont Grid.

6. IRIS RIVER - TI-TREE CREEK AREA

6.1 Introduction

To the west of Moina, an east-west synclinal basin preserves Gordon Limestone overlying Moina Sandstone. Metamorphism and metasomatism associated with the intrusion of the Dolcoath Granite, which presumably underlies this area at shallow depth, has altered the basal marls of the limestone to produce magnetiferous and garnetiferous skarn rocks.

At the Shepherd & Murphy Mine and adjacent to Ti-Tree Creek highly magnetiferous skarn carries low grade bismuth and copper values. The skarn is associated with "tension-filling" lode deposits of tin, tungsten and bismuth at the Shepherd and Murphy Mine.

Extensive bismuth soil geochemical anomalies have been obtained over skarn near the Iris River and westwards to Ti-Tree Creek. Bismuth and copper mineralisation associated with highly magnetiferous skarn at Ti-Tree Creek may indicate a similar environment to that at the Shepherd & Murphy deposit.

6.2 Road Development and Track Cutting

Vehicle access to the Ti-Tree Creek area was lost when the Iris River Bridge was destroyed by flooding during August, 1970.

Subsequently two-thirds of a mile of new road was constructed as far as the Old Sawmill, north-west of Ti-Tree Creek. This road opened up much of the area of interest on the western bank of the Iris River.

Traverse lines 6W to 10W were recut and repegged from 4300S to 2500S. In addition four intermediate traverses were pegged between these traverses.

Traverses 5W, 6W, 7W were recut and repegged from 1800S to 500S.

6.3 Costeaning

Six bulldozed costeans were constructed to provide exposure of fresh rock in anomalous areas. A total of 2,350 ft. of costeaning was carried out on the following traverses:

4500W	(9W)	4200S to 3700S	500 ft.
4250W		4100S to 3500S	600 ft.
4000W	(8W)	4200S to 4050S	150 ft.
3250W		3600S to 3400S	200 ft.
2500W	(5W)	3900S to 3500S	400 ft.
2000W	(4W)	4000S to 3500S	500 ft.
			2,350 ft.

These costeans have provided valuable exposure of the contact between Moina Sandstone and the basal skarn. The costeans on traverses 3250W, 2500W and 2000W were cut to expose skarn bedrock in areas of anomalous copper and bismuth soil geochemistry. No visible sulphide mineralisation was observed but garnetiferous calc-silicate skarn similar to the Stormont Mine host rocks was exposed.

The costeaning carried out in the Ti-Tree Creek area (traverses 4500W, 4250W, 4000W : refer Map 9) exposed heavily mineralised highly magnetiferous skarn containing disseminated pyrite and chalcopyrite. Bismuthinite was observed in places. A bright yellow "clayey" material may represent oxidation products (bismite or bismutite ?) of bismuth zones.

6.4 Geological Mapping

The reconnaissance geological mapping of Foster (1969) was checked over the entire grid from traverses 4W to 10W and plotted at a scale of 1 : 2400.

Exposures provided by costeaning enabled a more detailed geological map of the anomalous area on traverses 8W tp 10W adjacent to Ti-Tree Creek to be completed (see Map 9).

Between traverses 8W and 10W, a zone of highly magnetiferous skarn overlies Moina Sandstone. The skarn represents the metasomatised basal marls of the Gordon Limestone. The contact with the Moina Sandstone appears to be a normal sedimentary transition - from typical Moina Sandstone orthoquartzites, through a narrow transition sequence of sandstones and siltstones into highly magnetiferous skarn.

Two types of skarn are distinguished adjacent to Ti-Tree Creek:

(i) Magnetiferous, chloritised skarn.

(ii) Massive garnet-epidote "calc-silicate" skarn.

Both types are identical to skarn rocks outcropping at Stormont and the Shepherd and Murphy Mine. The magnetiferous variety carries disseminated pyrite, chalcopyrite and minor amounts of bismuth in this area. No visible mineralisation is present in the garnetiferous skarn.

6.5 Soil Sampling

A program of detailed soil sampling at 50 ft. intervals was carried out to confirm and accurately delineate the areas of anomalous Cu, Bi soil geochemistry obtained by Foster (1969) in this area. Values obtained closely agreed with previous results and only recontouring of results was necessary.

6.6 Chip Sampling

In view of the mineralisation exposed in costeans a program of detailed chip sampling of all exposed skarn was carried out in the area adjacent to Ti-Tree Creek. All exposures were chip sampled in 5 foot runs and samples assayed for Cu, Zn, Bi content. Selected samples were analysed for gold and silver. A total of 167 samples were analysed.

Several zones of highly magnetiferous skarn showed strong correlation with high bismuth values. Significant sample intersections were obtained on magnetiferous skarn and included:

(i) 35 ft. of 4800 ppm (0.48%) Bi
(ii) 35 ft. of 4600 ppm (0.46%) Bi
(iii) 35 ft. of 2150 ppm (0.21%) Bi
(iv) 30 ft. of 2000 ppm (0.20%) Bi
(v) 30 ft. of 3300 ppm (0.33%) Bi
(vi) 20 ft. of 3100 ppm (0.31%) Bi

Copper content is highly variable up to 0.5% Cu with a background value of about 300 ppm Cu. Trace amounts of gold and silver are present in some samples.

The results of the chip sampling indicate the presence of highly interesting bismuth concentrations in the magnetiferous skarn.

Further, the nature of the mineralisation and skarn metasomatism suggests that the Ti-Tree Creek anomaly is similar to the environment at the Shepherd & Murphy Mine and the Stormont area. Further testing is warranted to establish the nature and extent of the bismuth mineralisation and to evaluate the potential for lode deposits underlying the area (as is the situation at the Shepherd & Murphy Mine).

7. DOLCOATH HILL GRID

7.1 Introduction

A granite batholith of Devonian age intrudes Cambrian volcanics and Moina Sandstone adjacent to the Forth River near Dolcoath Hill. This granite body, called the Dolcoath Granite, is regarded as the source for all the tin, tungsten, molybdenum, bismuth and lead mineralisation in the Moina area.

A number of small workings were developed on quartz veins containing cassiterite, molybdenite, wolframite, minor bismuthinite and beryl around the northern margin of the Dolcoath Granite.

A program of reconnaissance geological mapping, geochemical soil sampling and gridding was carried out during 1970-71. The work was aimed at evaluating the potential for disseminated Sn - W - Bi - Mo deposits on the mineralised northern margin of the granite outcropping on Dolcoath Hill.

7.2 Orientation Geochemistry

A total of 15 soil samples were taken in a north-south traverse across the outcropping granite body on the eastern bank of the Forth River.

A further series of five samples was taken above the Premier Mine adit to determine the geochemical response over known wolframite-molybdenite mineralisation. All samples were analysed for Sn, WO_4, Mo, Bi, Ta, Nb.

The results of the survey indicated strong WO_4 and Mo response over the Premier Mine with only weak Sn and Bi response.

The 15 samples taken across the granite showed significant response from WO_4, Bi, Mo towards the northern margin of the granite body. In all cases Ta and Nb values were very low and these elements consequently could not be considered as pathfinders.

7.3 Track Cutting

Based on the results of orientation geochemistry and geological mapping, a grid was pegged on Dolcoath Hill, on the western bank of the Forth River.

The grid (see Map 10) consisted of a 4000 ft. baseline and nine traverse lines totalling 22,000 ft. The grid was mapped in a reconnaissance manner.

032

7.4 Soil Sampling

Soil samples were taken at 100 ft. intervals over the entire grid.

The samples consisted essentially of decomposed granite - clayey matrix with numerous rounded quartz grains. Extensive exfoliation surfaces of outcropping granite caused some difficulty in obtaining samples.

All soil samples were analysed for Sn, WO_4, Bi and Mo. The results are plotted on Maps 10 - 13.

Significantly anomalous Sn, WO_4, Bi and Mo values occur in a broad, partially defined area on traverses 0, 1E, 2E and 3E. The anomalous zones are only partially coincident.

The topography of this area is steeply to moderately north sloping. The progressive distribution of Bi, Sn, WO_4 and Mo zones northwards closely follows the theoretical distribution predicted from mobility values of these elements. Mo has relatively high mobility, WO_4 moderately, Sn and Bi low mobility in most geochemical environments.

The Squib Mine is situated within the anomalous zone (located at 0/00 on the grid) and may have caused some contamination on line 0

033

north of the baseline. No possibility of contamination exists elsewhere on the grid.

The Squib orebody was a small tin bearing greisen deposit with wolframite, minor bismuthinite and molybdenite. Numerous small pits, trenches and shafts are also located within the anomalous area. Vein deposits of wolframite and molybdenite occur at Black's Workings and Povey and Johnston's Mine.

Encouragement is received from the fact that the area of anomalous geochemistry occurs at a high-level in the intrusive batholith. Any concentration of economic consequence would be expected to occur at a high level and late stage in the granite intrusion. It is anticipated that any disseminated mineralisation would be located close to the granite - Moina Sandstone contact, high in the batholith.

A program of further geochemical sampling is recommended for the 1971-72 year (refer 9.2.2)

8. OLIVER'S HILL AREA

Geological mapping by the Tasmanian Department of Mines during May, 1969 revealed zones of ferromanganese cappings over one mile long on the northern slopes of Oliver's Hill. Subsequent geochemical soil sampling showed a broad zone of anomalous lead concentrations (up to 1700 ppm) with associated, weak copper and zinc anomalies.

Work conducted in this area by Mt. Lyell is adequately detailed by Dandy (1970). In summary this work consisted of geological mapping, soil sampling, magnetometry and a detailed gradient array IP coverage (conducted by C.G.G.).

A total of 8 IP anomalies were outlined. Anomaly A1 coincided with a "gossan" zone and an SP anomaly was detected on traverse 16W. Two diamond drill holes were recommended by C.G.G. to test this anomaly. Logging operations conducted on Oliver's Hill during the winter of 1970 severely damaged the access road, rendering it completely impassable. In order to regain access to the area approximately ¾ mile of new road was constructed.

Two diamond drill sites and a small water storage dam were constructed to enable the diamond drilling program to begin.

Drilling of D.D.H. Oliver's Hill 1 commenced on June 25th, 1971 and had advanced 100 ft. in Moina Sandstone at the end of the 1970-71 year. Drilling is continuing.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

This Company has been involved in mineral exploration activities on E.L. 8/65 since 1965. To date three diamond drill holes (total footage 2,826 ft.) have been completed to test the potential of the Shepherd & Murphy Mine area.

The following summary of results obtained to date may be stated:

1. The major potential for economic mineral deposits on E.L. 8/65 is associated with the Dolcoath Granite and its contact metasomatic aureole.

2. Drilling to test extensions of known lodes at the Shepherd & Murphy Mine has significantly downgraded the potential of this area and no further work is recommended.

3. No significant tonnage of mineralised skarn exists in the Stormont area.

4. An anomalous area adjacent to Ti-Tree Creek represents a favourable environment for disseminated bismuth deposits of the Stormont skarn type and may be associated with Shepherd & Murphy type lode systems at depth. Further testing of this area is strongly recommended.

5. A zone of interesting soil geochemical anomalies is present in a favourable environment on Dolcoath Hill and warrants further investigation.

6. Drilling is currently in progress to test "gossan" outcrops with coincident IP and resistivity anomalies on Oliver's Hill.

9.2 Recommendations

The following recommendations for further exploration activities on E.L. 8/65 are made with a view to completing reconnaissance activities in the area by the end of 1971-72. It is envisaged that a decision to either significantly reduce or relinquish the licence area or to undertake detailed evaluation studies should be made at that date.

Further work is recommended in the following areas:

9.2.1 Oliver's Hill

Drilling of two diamond drill holes at Oliver's Hill should be completed by early September, 1971. Unless significant intersection of mineralisation are encountered, no further drilling should be undertaken until a complete re-appraisal of all geological, geophysical and drilling information on this area is made.

The drilling results are expected to enable a critical

assessment of the source of the ferromanganese "gossan" outcrops. If such an assessment is unfavourable no further drilling should be carried out at this locality.

9.2.2 Dolcoath Hill

Further detailed soil sampling and rock chip sampling is required to accurately outline geochemical anomalies between traverses 00 and 3E.

It is recommended that three additional intermediate traverses 0.5E, 1.5E and 2.5E be pegged between traverses 0, 1E, 2E and 3E. These additional traverses should be pegged from 500S to 1000N and sampled at 100 ft. intervals.

In addition a program of rock chip sampling should be carried out on granite outcrops in the area of anomalous geochemical response. As only scattered outcrops of granite are present, all available outcrops should be sampled and the sample localities "tied-in" to the grid system by tape and compass survey.

A program of percussion drilling could be required to evaluate the area if the additional sampling confirms the encouraging results already obtained.

9.2.3 Iris River - Ti-Tree Creek

1. In order to evaluate the mineralised skarn adjacent to Ti-Tree Creek it is considered that at least two drill holes will be required. Drilling is recommended at the following sites:

Hole No.	Co-ordinate	Bearing	Dip	Length
1	4250W/3700S	230°	-40°	350 ft.
2	4000W/3900S	230°	-40°	350 ft.
3	4450W/3450S	230°	-40°	350 ft.

Hole Nos. 1, 2 should be drilled with B sized rods. These holes would test the grade and width of bismuth mineralisation in the skarn and evaluate the potential for lode-type deposits beneath the skarn.

If encouragement is received in the initial two holes, hole No. 3 could be drilled to prospect the concealed NW extension of the skarn body.

It is recommended that a small, easily maneouverable trailer mounted rig be used for this drilling.

2. All roadworks, costeans and grid lines in the Iris River - Ti-Tree Creek area need to be surveyed and plotted. It is recommended that this survey pick-up be undertaken in November, 1971. At the same time all available exposures could be plotted by a geologist working with the survey team.

The precise survey information and geological data is required to accurately predict "depth to skarn" beneath unaltered Gordon Limestone. A more accurate geological structural appraisal is necessary before further drilling activities can be planned.

It is envisaged that approximately 2 - 3 weeks would be needed to obtain precise survey and geological information on the Iris River - Ti-Tree Creek grid.

Further exploratory work may be planned when the survey pick-up and drilling results are available.

10. REFERENCES

A.M.E.G. Pty. Ltd.; 1966 : Aeromagnetic Survey, Staverton Area, North Central Tasmania. Unpublished report to Mt. Lyell Mining & Railway Co. Ltd.

C.G.G.; 1970 : Geophysical Survey at Moina E.L. 8/65. Unpublished report to Mt. Lyell Mining & Railway Co. Ltd.

Dandy, B.C.; 1970 : Annual Report 1969-70 on Moina Area E.L. 8/65. Mt. Lyell Mining & Railway Co. Ltd. Report.

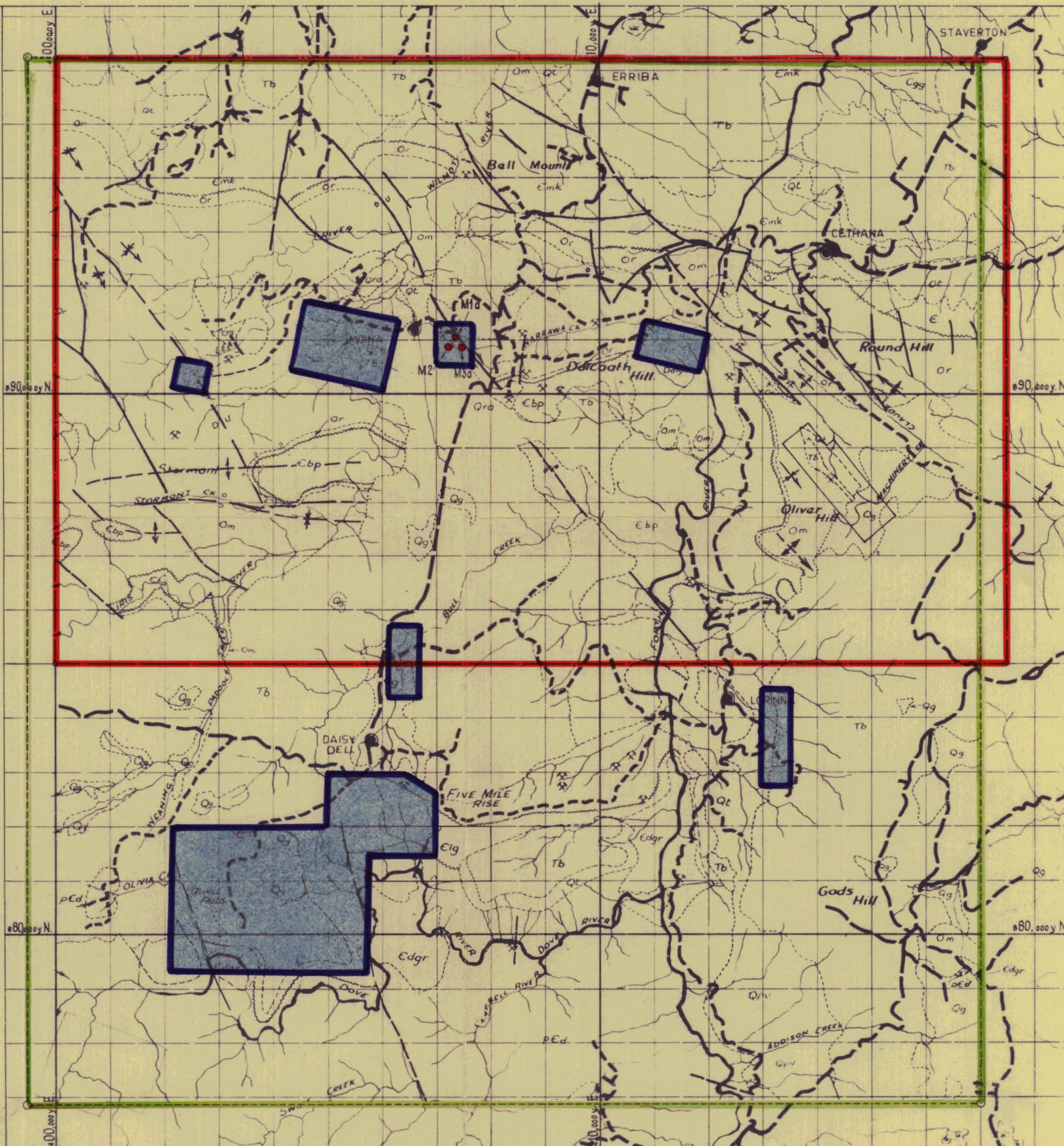
Foster, M.F.; 1969 : Progress Report on Activities in E.L. 8/65 (Moina Area) to March, 1969. Mt. Lyell Mining & Railway Co. Ltd. Report.

Jennings, I.B.; 1963 : Explanatory Report - Geological Map Series - Middlesex. Department of Mines, Tasmania.

Newnham, L.A.; 1970 : Diamond Drilling Recommendation, Shepherd & Murphy Mine Area, E.L. 8/65. Mt. Lyell Mining & Railway Co. Ltd. Memorandum.

Reid, K.O.; 1967 : Progress Report on Activities in E.L. 8/65 (Moina Area) to June, 1967. Mt. Lyell Mining & Railway Co. Ltd. Report.

Webb, J.E.; 1968 : Interpretation of Airborne Magnetic Survey, Staverton Area, North Central Tasmania. Unpublished report to Mt. Lyell Mining & Railway Co. Ltd.



71-790

LEASE BOUNDARY
- CURRENT
- FORMER

AREAS WORKED 1970-71

M1 ● D. D. H. LOCATION & Nº.

838043

E. L. 8/65 MOINA AREA

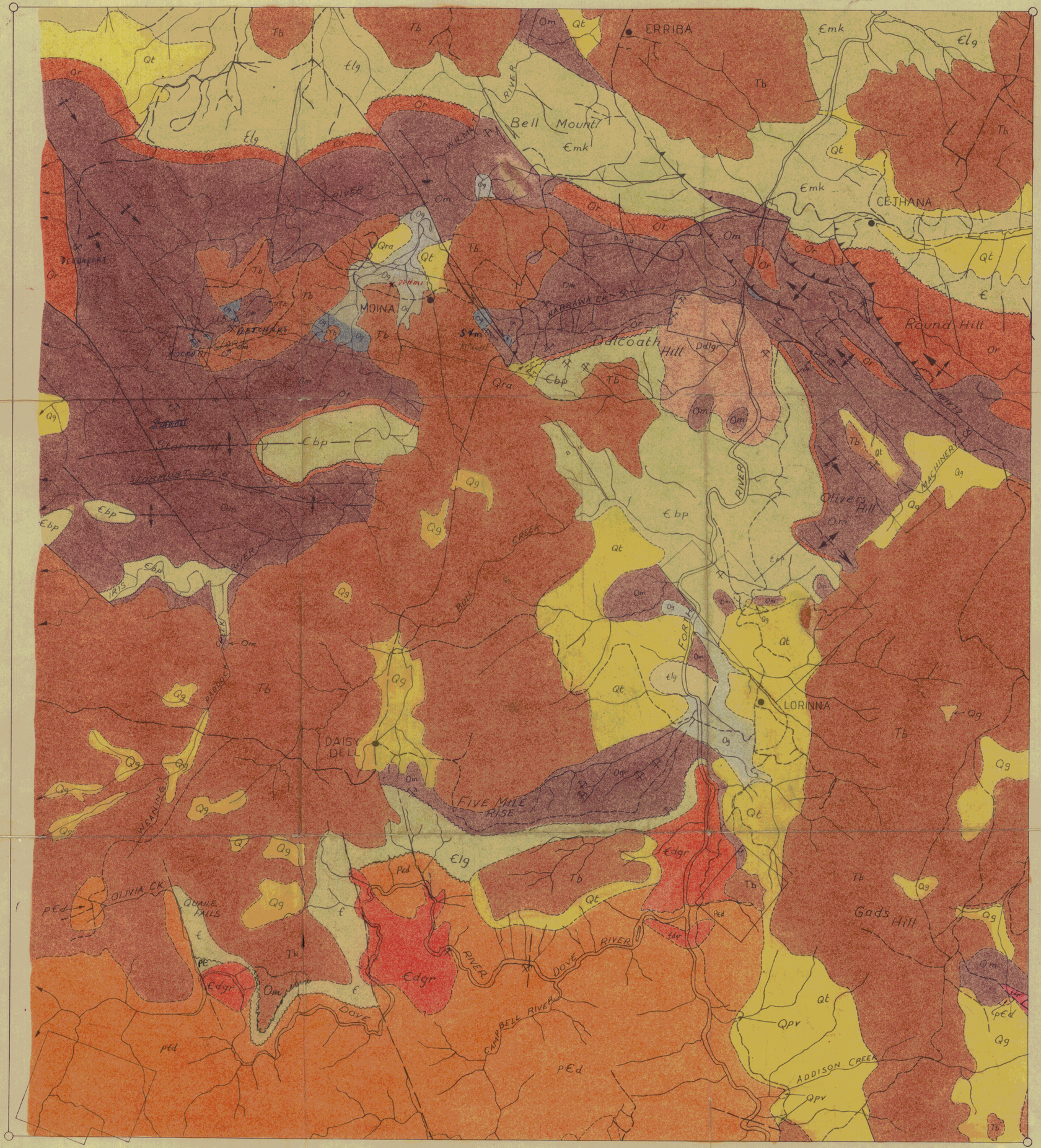
37/27

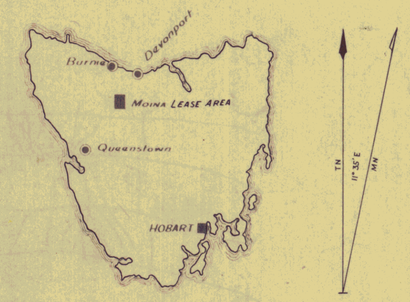
SCALE: 1" = 1 mile	DATE: June '71
CHECKED: K.O.R.	MAP 1

J.H.C.

5 cm

1035





LEGEND

CAINOZOIC — QUATERNARY — Q
- Qra — RECENT Alluvium
- Qt — Basalt talus and landslide debris
- Qr — Quartzite and conglomerate talus
- Qg — Marsh deposits and residual gravels
- Qpv — PLEISTOCENE Varved clays

TERTIARY — T
- Ts — Sands clays and conglomerate

PALAEOZOIC — ORDOVICIAN — O
- Og — Skarn (Metamorphosed limestone)
- Oq — Gordon Limestone
- Om — Moina Sandstone including Caroline Ck. Beds
- Or — Roland Conglomerate

CAMBRIAN — Є
- Ebp — Bull Creek Formation
- Elg — Lorinna Greywacke
- Emk — Minnow Keratophyre

PRECAMBRIAN — pЄ
- pЄd — Dove group

IGNEOUS ROCKS

TERTIARY — T
- Tb — Basalt

DEVONIAN — D
- Ddlgr — Dolcoath granite

CAMBRIAN — Є
- Edgr — Dove granite

Є? — Єs — Serpentinite

Established boundary — position approximate
Inferred probable or indefinite boundary
Unconformity
Thrust fault (teeth on upper plate)
Wrench Fault
Fault with direction of movement

Mine or prospect

Principal roads
Vehicular tracks
River or creek
Swamp or marsh

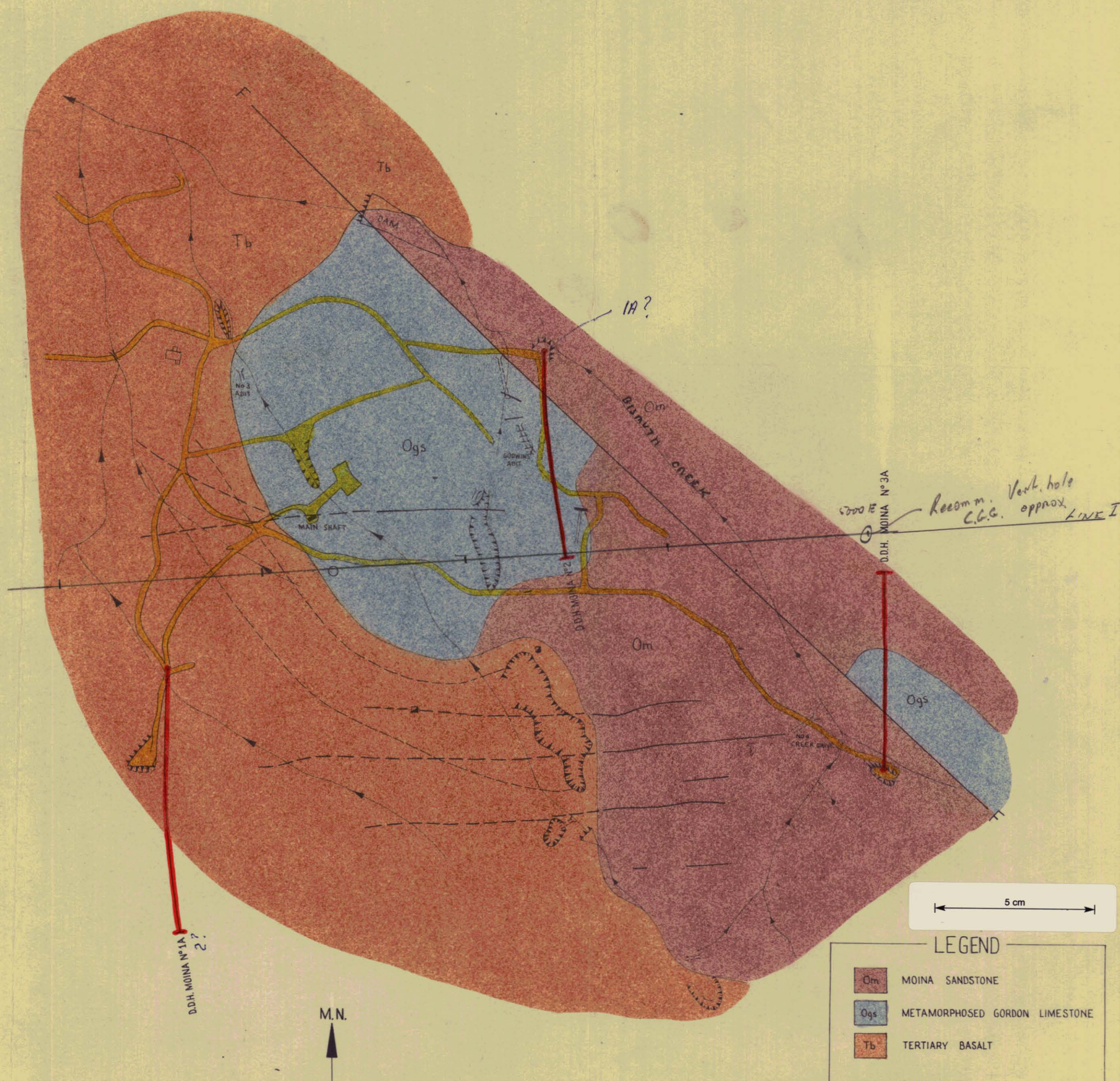
Anticlinal Axis
Synclinal Axis
Anticlinal Axis (position approximate)
Synclinal Axis (position approximate)

838044

5 cm

71-790

THE MOUNT LYELL M. & R. COY. LTD. GEOLOGICAL DEPARTMENT	DRAWN BY. R.G.W.
	TRACED BY. R.G.W.
	CHECKED BY. J.P.McK.
MOINA E.L. 8/65	DATE. 13 - 8 - '71
REGIONAL GEOLOGY	SCALE. 2" = 1 mile 1 : 31,680
Fourth 282216. R. GRANFIELD	MAP 2 37/27



71-790

THE MOUNT LYELL M. & R. COY. LTD.
GEOLOGICAL DEPARTMENT

£38045

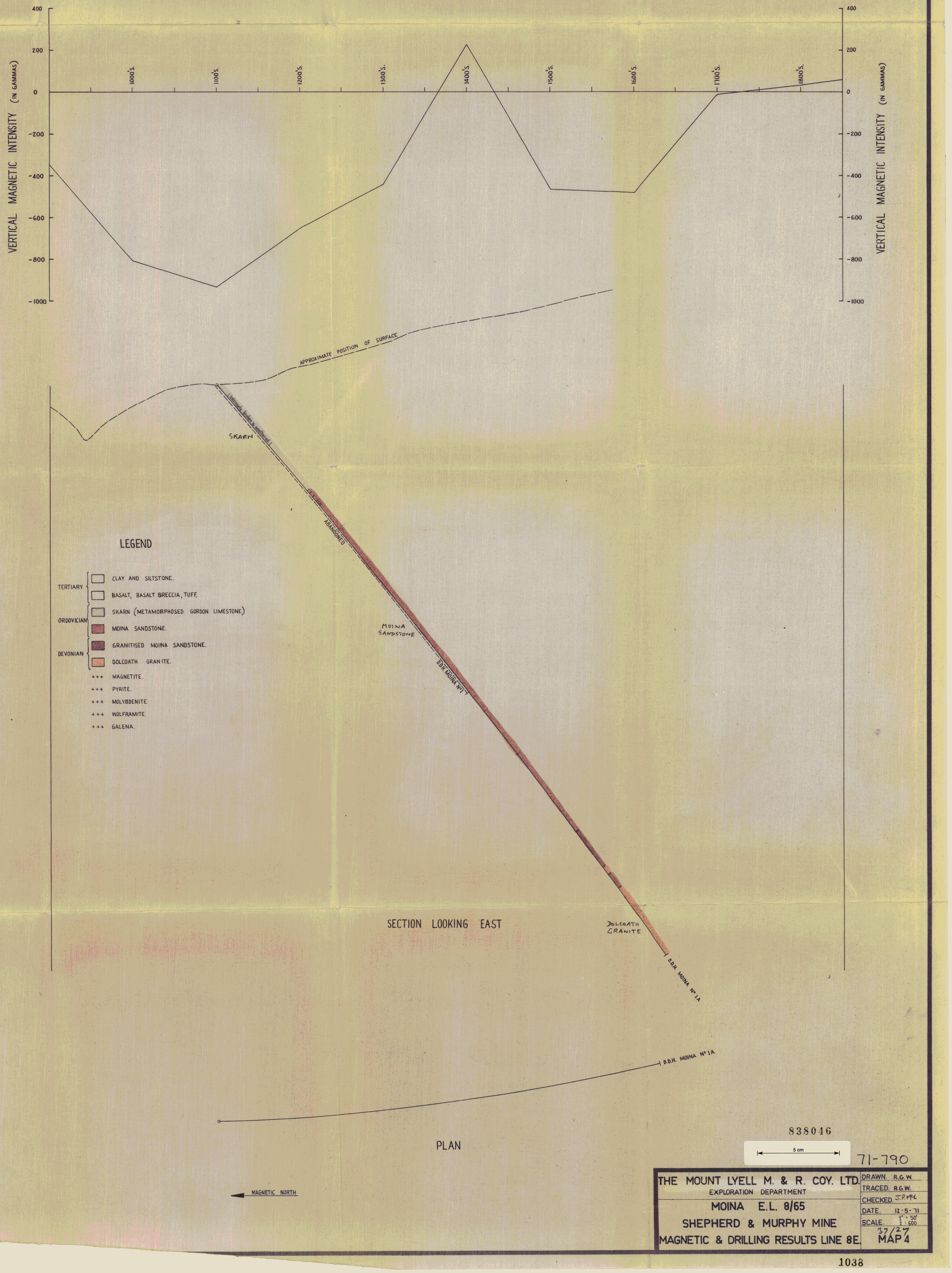
SHEPHERD & MURPHY MINE AREA

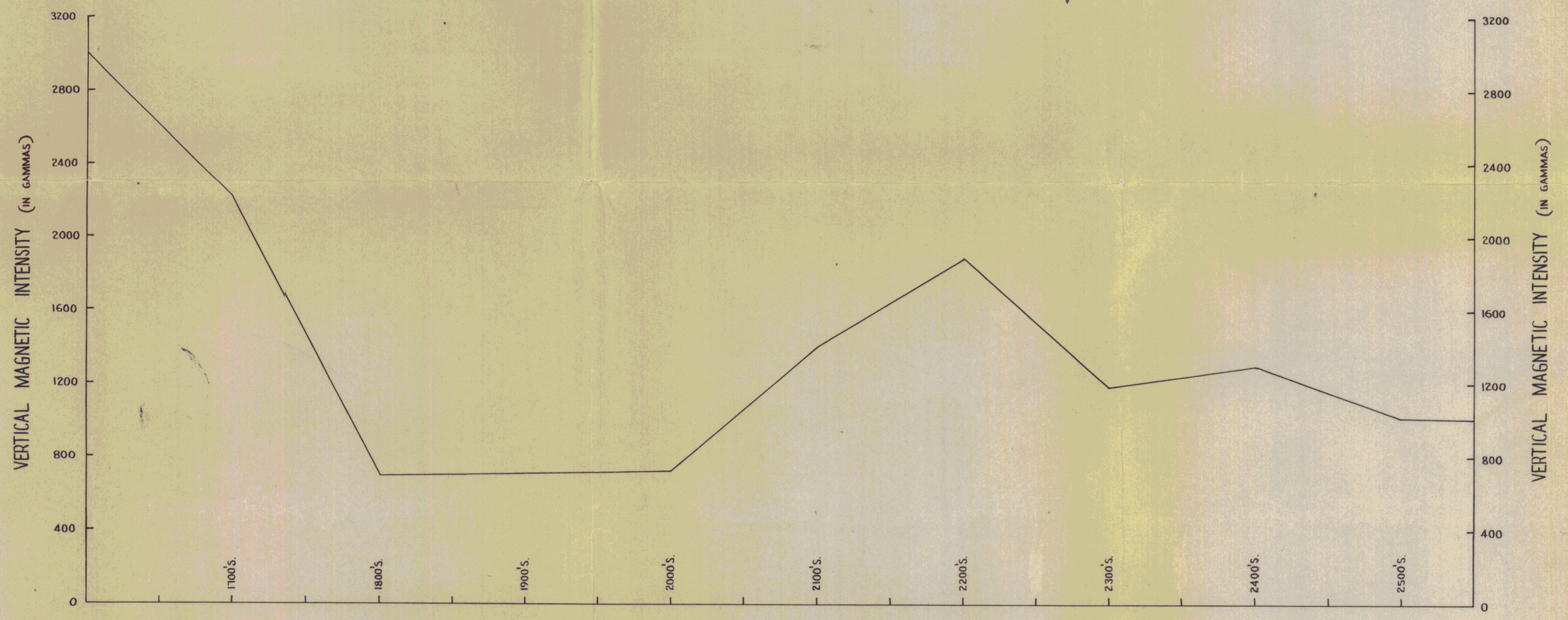
GEOLOGICAL MAP

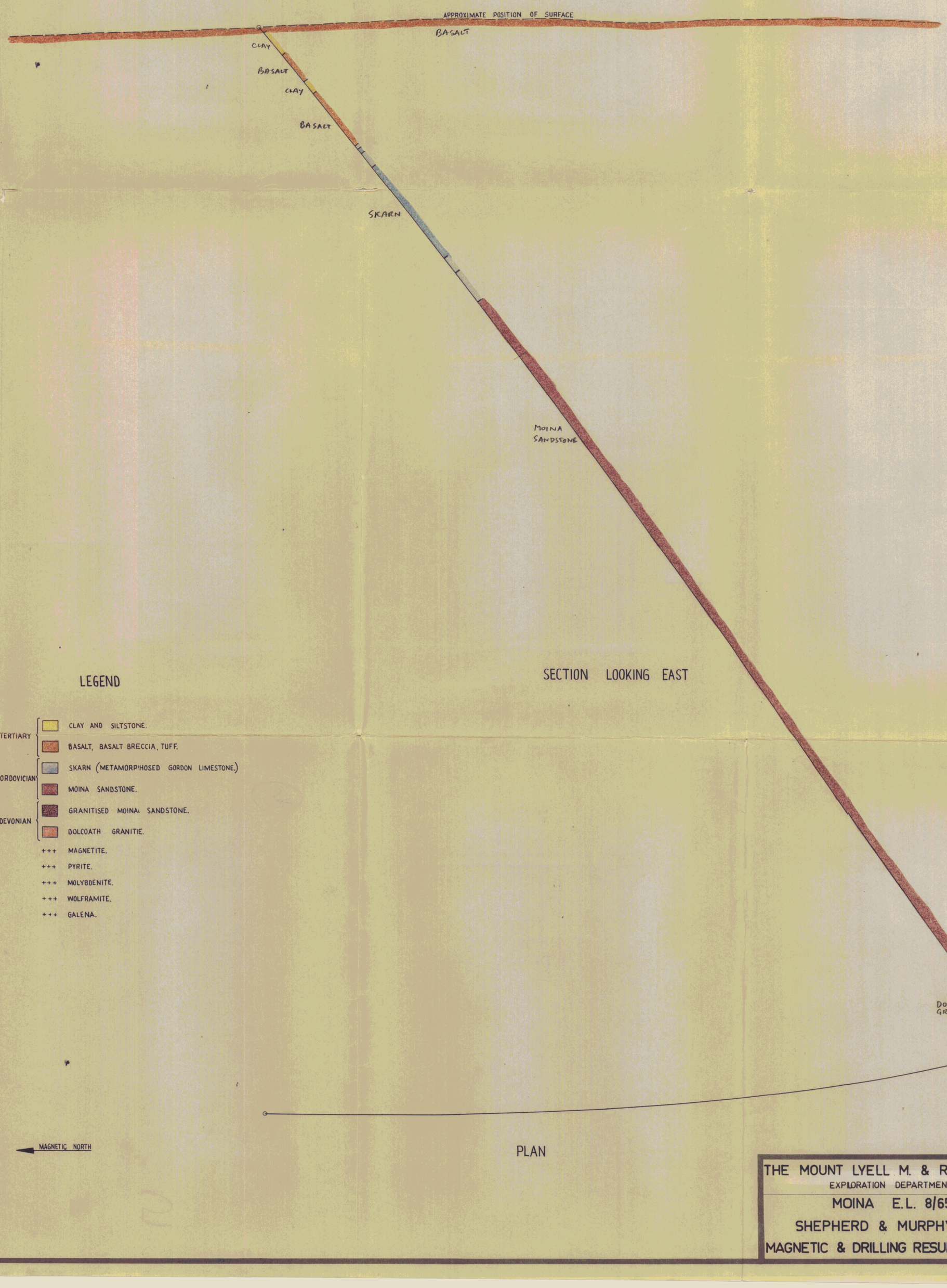
MAP 3 37/27

DRAWN	J.P.McK.
TRACED	R.G.W.
CHECKED	J.P.McK.
DATE	16:8:71
SCALE	1" = 200' 1 : 2400

1037 71-790


400
200
0
-200
-400
-600
-800
-1000
VERTICAL MAGNETIC INTENSITY (IN GAMMAS)
1000'S.
1100'S.
1200'S.
1300'S.
1400'S.
1500'S.
1600'S.
1700'S.
1800'S.
APPROXIMATE POSITION OF SURFACE
Intensely broken & weathered
SKARN
ABANDONED
MOINA SANDSTONE
D.D.H. MOINA No 1A
DOLCOATH GRANITE
LEGEND
TERTIARY
CLAY AND SILTSTONE.
BASALT, BASALT BRECCIA, TUFF.
ORDOVICIAN
SKARN (METAMORPHOSED GORDON LIMESTONE.)
MOINA SANDSTONE.
DEVONIAN
GRANITISED MOINA SANDSTONE.
DOLCOATH GRANITE.
+++ MAGNETITE.
+++ PYRITE.
+++ MOLYBDENITE.
+++ WOLFRAMITE.
+++ GALENA.
SECTION LOOKING EAST
PLAN
MAGNETIC NORTH
838046
5 cm
71-790
THE MOUNT LYELL M. & R. COY. LTD.
EXPLORATION DEPARTMENT
MOINA E.L. 8/65
SHEPHERD & MURPHY MINE
MAGNETIC & DRILLING RESULTS LINE 8E.
DRAWN. R.G.W.
TRACED. R.G.W.
CHECKED. J.P.McL
DATE. 12-5-71
SCALE. 1" = 50' 1 : 600
37/27
MAP 4
1038





SECTION LOOKING EAST

LEGEND

- TERTIARY
  - CLAY AND SILTSTONE.
  - BASALT, BASALT BRECCIA, TUFF.
- ORDOVICIAN
  - SKARN (METAMORPHOSED GORDON LIMESTONE.)
  - MOINA SANDSTONE.
- DEVONIAN
  - GRANITISED MOINA SANDSTONE.
  - DOLCOATH GRANITIE.
- +++ MAGNETITE.
- +++ PYRITE.
- +++ MOLYBDENITE.
- +++ WOLFRAMITE.
- +++ GALENA.

MAGNETIC NORTH

PLAN

838047

5 cm

71-790

THE MOUNT LYELL M. & R. COY. LTD. EXPLORATION DEPARTMENT	DRAWN. R.G.W.
	TRACED. R.G.W.
MOINA E.L. 8/65	CHECKED. J. P.McK
SHEPHERD & MURPHY MINE	DATE. 12-5-71
MAGNETIC & DRILLING RESULTS LINE 6E.	SCALE. 1" = 50' 1 : 600
	37/27 MAP 5

1033

4040 12040 5540

VERTICAL MAGNETIC INTENSITY (IN GAMMAS)

1200 1000 800 600 400 200 0 200 400

2700'N. 2600'N. 2500'N. 2400'N 2300'N. 2200'N. 2100'N. 2000'N.

VERTICAL MAGNETIC INTENSITY (IN GAMMAS)

1200 1000 800 600 400 200 0 -200 -400

APPROXIMATE POSITION OF SURFACE

SKARN

BISMUTH CREEK

ROAD

MOINA SANDSTONE

ABANDONED

SKARN

D.D.H. MOINA N°3

SKARN

MAGNETITE

SKARN

D.D.H. MOINA N°3A

MOINA SANDSTONE

SECTION LOOKING EAST

D.D.H. MOINA N°3A

PLAN

MAGNETIC NORTH

LEGEND

ORDOVICIAN
- SKARN (METAMORPHOSED GORDON LIMESTONE)
- MOINA SANDSTONE

- MAGNETITE
- PYRITE
- MOLYBDENITE
- WOLFRAMITE
- GALENA

838048

5 cm

71-790

THE MOUNT LYELL M. & R. COY. LTD.
EXPLORATION DEPARTMENT

MOINA E.L. 8/65
SHEPHERD & MURPHY MINE
MAGNETIC & DRILLING RESULTS LINE 10E.

DRAWN. R.G.W.
TRACED. R.G.W.
CHECKED. J.P.McK
DATE. 2-7-71
SCALE. 1" = 50' 1 : 600

MAP 6

1040

LINE 22 W.

LINE 21W.

4,500 S.

CLIFF

15°

Om

LEA RIVER

5000 S.

WATER FALL

Skarn

TRENCHES

CREEK

Qtz

5500 S.

OPEN CUT

Tb

BASE LINE 5800 S

FAULT ?

Tgb

6,000 S.

ROAD

Sk

6500 S.

11,250 W.

11,000 W.

10,750 W.

10,500 W.

10,250 W.

LEGEND

- Tb — TERTIARY BASALT.
- Tgb — TERTIARY GREYBILLY
- Sk — SKARN.
- Om — MOINA SANDSTONES
- Qtz — QUARTZ BODY.

5 cm

71-790

THE MOUNT LYELL M. & R. COY. LTD.

GEOLOGICAL DEPARTMENT

MOINA E.L. 8/65. 838049

STORMONT GRID

GEOLOGICAL MAP

MAP 7 37/27

DRAWN J.P.M^cK.

TRACED R.G.W.

CHECKED J.P.M^cK.

DATE 26-2-'71

SCALE 1" = 100' 1 : 1200

1041

LINE 22 W.

LINE 21W.

4,500 S.

+110

CLIFF

+100

+110

LEA RIVER

+30

5,000 S. +80

+120

300

+300

+225

+20

0

+300

+230

+200

-50

300

+425

WATER FALL

+110

+320

+330

-160

TRENCHES

+40

CREEK

+340

+290

+140

-400

5,500 S. -560

+360

+310

+140

-70.

+70

300

OPEN CUT

-85

+340

+310

-160

+365

300

+350

+240

+160

+60

-190

-790

-1150

+140 BASE LINE 5,800 S

0

+320

+220

-60

300

+1550

1000

300

+20

+220

+90

-20

+3350

6,000 S. +2500

-60

-100

300

5000

+80

+9000

-80

ROAD

+280

+140

+5900

-140

-820

300

+150

-10,000

-1050

-500

+440

+240

-1050

+25,000

1000

+630

-60

+5500

5000

+2150

+1300

300

+280

-740

+2200

300

1000

+21,500

+4150

+3400

-90

+220

5000

1000

+40

+310

300

+4600

+50

+440

-1250

-40

6,500 S. +280

11,250 W.

11,000 W.

10,750 W.

10,500 W.

10,250 W.

71-790

5 cm

THE MOUNT LYELL M. & R. COY. LTD.

GEOLOGICAL DEPARTMENT

838050

MOINA E.L. 8/65.

STORMONT GRID

MAGNETICS

MAP 8

1042

DRAWN	R.G.W.
TRACED	R.G.W.
CHECKED	J.P.M.K
DATE	5-8-'71
SCALE	1" = 100' 1 = 1200

71-790

LEGEND

- RIVER GRAVELS AND ALLUVIUM
- TERTIARY BASALT
- TERTIARY "GREY BILLY
- GARNETIFEROUS "CALC SILICATE" SKARN
- MAGNETIFEROUS, CHLORITISED SKARN
- "TRANSITION BEDS" – SILTSTONE AND SANDSTONE
- MOINA SANDSTONE

5 cm

838051

71-790

THE MOUNT LYELL M. & R. COY. LTD.
EXPLORATION DEPARTMENT

TI - TREE CREEK GRID
GEOLOGICAL MAP

37/27

DRAWN BY.	J.P.McK.
TRACED BY.	R.G.W.
CHECKED BY.	J.P.McK.
DATE.	18-8-'71
SCALE.	1" = 100' 1 : 1200

MAP 9

1043

1400'N

SANDSTONE

GRANITE

MOINA

DOLCOATH

SQUIB MINE

800'S.

LINE 0 | LINE 1 | LINE 2 | LINE 3 | LINE 4 | LINE 5 | LINE 6 | LINE 7 | LINE 8

LEGEND

150 – 200 p.p.m.

> 200 p.p.m.

200 p.p.m. CONTOUR

(THEORETICAL GRID)

MAGNETIC NORTH

5 cm

71-790

THE MOUNT LYELL M. & R. COY. LTD.

EXPLORATION DEPARTMENT

838052

DOLCOATH HILL GRID

GEOCHEMICAL SOIL SAMPLING RESULTS

BISMUTH MAP 10

DRAWN. R.G.W.

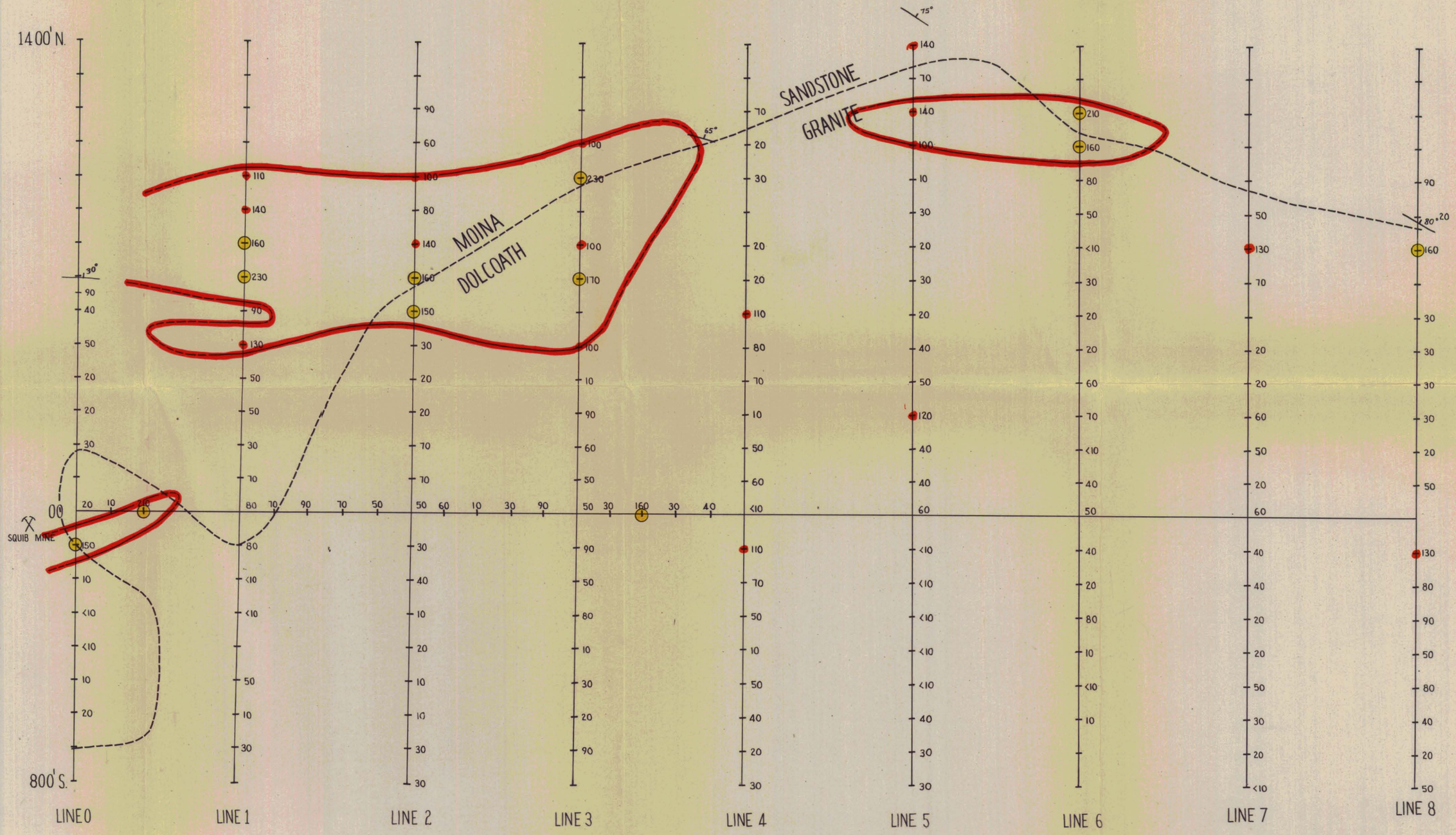
TRACED. R.G.W.

CHECKED. J.P.M°K

DATE. 17-8-71

SCALE. 1" = 200' 1 : 2400

1044



LEGEND

- 100 – 150 p.p.m.
- > 150 p.p.m.
- 100 p.p.m. CONTOUR

(THEORETICAL GRID)

MAGNETIC NORTH

838053

5 cm

71-790

THE MOUNT LYELL M. & R. COY. LTD.
EXPLORATION DEPARTMENT

DOLCOATH HILL GRID
GEOCHEMICAL SOIL SAMPLING RESULTS
MOLYBDENUM MAP 12
37/27

DRAWN.	R.G.W.
TRACED.	R.G.W.
CHECKED.	J.P.M.K
DATE.	17-8-'71
SCALE.	1" = 200' 1 : 2400