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COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

RECORDS 1957, No. 50

GEOPHYSICAL SURVEY AT
MT. LYELL
(CORRIDOR AND GLEN LYELL AREAS)
QUEENSTOWN, TASMANIA

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ABSTRACT

This record describes a geophysical survey made between November 1955, and March 1956, to locate mineralised zones in the Glen Lyell and Corridor areas of the Mt.Lyell Mining and Railway Company's leases near Queenstown, Tasmania.

Three geophysical methods, electromagnetic (Turam), self-potential and magnetic, were employed in each area and soil samples for geochemical analysis were collected over important indications. One diamond drill hole was electrically logged.

In the Glen Lyell area, five weak indications were recorded by the Turam method and self-potential anomalies were obtained over some of these. The magnetic method revealed no significant variations in the vertical intensity component.

The two most important indications occur en echelon in the central section of the grid and strike N 30° W; they are thought to be due to mineralisation. The larger, extending over 1,600 feet, coincides at its northern extremity with the Mt.Lyell Reserve Workings. The other, a broad, deep-seated indication, continues north beyond the limits of the geophysical grid along the western margin of an extensive overburden dump.

A third indication was revealed over the Glen Lyell No.2 Mine. These three indications warrant further investigation by diamond drilling and several locations for drill holes are suggested.

Near the western boundary of the area two weak indications occur en echelon. It is recommended that these be geologically examined.

Two groups of distinct anomalies were obtained in the Corridor area. These are separated by the Tharsis Outlier and barren schists in the central southern portion of the grid and gradually converge in the north-west to form one group which probably continues around Cape Horn.

One group comprises two indications which closely follow the conglomerate contact. The strongest indication extends 1,400 feet north-west from the Crown Lyell Open Cut, and is due to a narrow near-surface pyritic body which has been partly prospected by diamond drilling. Further testing at depth and through the full width to the conglomerate is recommended. The other indication is weaker and lies in a zone of disseminated pyrite.

The south-western section of the Corridor area contains a group of strong Turam and self-potential anomalies which form Indication Zone A (the Footprint Anomaly of a previous geophysical survey). This zone has been investigated by several diamond drill holes which revealed mainly pyrite and only minor quantities of copper. One anomaly at the north-western extremity of Indication Zone A had not previously been located by geophysical means. This anomaly is due to a regular, lenticular, near-vertical body about two hundred feet wide which extends over 600 feet and tails off into weak mineralisation. Although this body has apparently been intersected by D.D.H. 81, which shows 0.1 per cent copper over the relevant core section, a cross-cut in the nearby Western Tharsis workings terminated just short of the main anomaly in sulphides carrying 1.0 per cent copper; for this reason a further study of the northern extremity of this anomaly is recommended.

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1. INTRODUCTION

In March, 1955, an application was received by the Bureau of Mineral Resources from the Mt.Lyell Mining and Railway Co.Ltd. for a geophysical survey to be made, to assist in the company's proposed exploratory drilling programme. The application was supported by the Tasmanian Mines Department, and J. Horvath, a Senior Geophysicist of the Bureau, visited the mine to discuss with the company the problems involved. During these discussions, five areas were selected for survey, namely Glen Lyell, Corridor, East Darwin, Jukes and Comstock.

The field work was commenced in November, 1955, and by the end of the field season (March, 1956) the surveys of the Corridor and Glen Lyell areas had been completed. A preliminary report on the survey of the Corridor area (Rowston, 1956) was submitted to the company, through the Tasmanian Mines Department, in September, 1956. The present report describes the surveys in the Corridor and Glen Lyell areas. During the 1956/57 field season, two of the remaining areas, East Darwin and Comstock, were surveyed and, at the Company's request, another area, Great Lyell, was included in the programme in place of the Jukes area. The 1956/57 surveys are described in a separate report (Rowston 1958).

The survey party consisted of D.L. Rowston (party leader) and L.V. Skattebol, geophysicists, and three university students as field assistants. The Department of the Interior, Canberra, provided a surveyor and chainman for the pegging and levelling of the geophysical traverses.

The Mt.Lyell mining field is located near Queenstown, in the highly dissected mountains of the West Coast Ranges of Tasmania (Plate 1). The leases surveyed are about 2 miles east of Queenstown and extend in a northerly direction over a distance of about 2½ miles along a saddle linking Mt.Lyell and Mt.Owen. Strahan, 26 miles to the south-east, on Macquarie Harbour, is the nearest seaport, and is also on the railway line joining Queenstown with Zeehan and Burnie. Access to the field from the east is via the Lyell Highway, over the Central Highlands; the distance to Hobart is 158 miles.

The area shows the rugged west coast topography, but the vicinity of the mine is unique in that it is almost devoid of vegetation - the result of smelter fumes. Erosion is very rapid as a result of the heavy rainfall (100 inches annually) and the lack of vegetation.

The Mt.Lyell field was discovered in 1883 with the finding of a gold lode in the quartz-hematite outcrop of the "Big Blow". On the depletion of the payable gold, interest turned to the copper prospects of the area and a period of vigorous exploration and development followed. During this boom period, numerous companies held leases on the field, but a subsequent slump eliminated most of these and the remaining groups amalgamated to form the present company.

Current mining on the field is carried out mainly as open-cut mining of the low-grade ores of the West Lyell ore body. The mine produces copper, and small quantities of gold and silver in its local smelter, and ships pyrite concentrates to be used in superphosphate manufacture by subsidiary companies.

2. GEOLOGY

The following account of the geology of the Mt.Lyell field is based mainly on an unpublished precis by M.L. Wade (1956), the Company's Chief Geologist, on reports by S.W. Carey (1953) of the University of Tasmania and J.M. Alexander (1953), Assistant Mining Superintendent for the Company, and on various publications of the Tasmanian Mines Department.

A. Regional Geology.

Consideration of Lower Palaeozoic tectonics and sedimentation is of prime importance in the economic geology of the West Coast of Tasmania.

After the Pre-Cambrian era, geosynclinal conditions prevailed over a wide area of Australia and, in Tasmania, developed peripheral sedimentary basins around an elevated Pre-Cambrian core called the Tyennan Block.

The Cambrian Dundas Group sediments, comprising several thousand feet of greywackes, siltstones, pyroclastics and lavas, were deposited in a narrow basin immediately flanking the Tyennan Block. Towards the close of the Cambrian the basin was arched to form the Porphyroid Anticlinorium, the elevated portions of which were subsequently eroded giving a coarse breccia-conglomerate (the Jukes Breccia). This movement, known as the Tyennan Orogeny, was accompanied by regional metasomatism with local development of granitic rocks in the area of Mt.Darwin.

The Tyennan Block was then uplifted and sedimentation continued with the Junee Group of sediments. These consist of interbedded coarse siliceous conglomerates and sandstones known as the Owen Conglomerates, which have a marked influence on the topography and ore deposition in the area.

The Owen Conglomerates range from coarse-grained to fine-grained beds and the upper series transgressed beyond the limits of the old sedimentary basin. The Gordon River Limestones, deposited as a continuation of this transgressive phase, conclude the local occurrence of the Junee Group.

Sedimentation continued during the Silurian and Devonian with the formation of the Eldon Group shales and sandstones. A period of violent tectonic activity, metasomatism and sulphide mineralisation, known as the Tabberabberan Orogeny, interrupted sedimentation in the Mid-Devonian and continued until the Mid-Carboniferous. During this phase, most of the important structures were formed and all the major ore bodies were emplaced.

The orogeny was succeeded by peneplanation and glaciation and then by sedimentation during the Permian, when transgressive seas spread over the area. Extensive dolerite intrusions took place in the Jurassic, forming thick sills and dykes in the horizontal Permo-Trias sediments. Block faulting resulted in marginal marine sediments in the early Tertiary until the area was once more uplifted by faulting, and the sequence was completed by restricted late Pleistocene glaciation.

B. Local Geology.

The Queenstown area has been mapped in detail by M.L. Wade and M. Solomon of the Geological Department of Mt.Lyell Mining and Railway Co.Ltd., and portion of a map compiled by them is reproduced as Plate 1 of this report.

The predominant formation in the Mt.Lyell area is the West Coast Range (Owen) Conglomerates of Ordovician age, which are about 2,000 feet thick. They represent a shoreline facies and have been sub-divided by Loftus Hills into the Upper, Middle and Lower Series. The fine-grained shales, sandstones and conglomerates of the Upper Series grade to the coarse sand-stones and lenticular conglomerates of the Middle and Lower Series which overlie the Jukes Breccia.

In the Linda Valley to the east, the conglomerates are overlain by limestones and clays of the Gordon River Group. Much of the valley is covered by glacial debris.

Abutting the conglomerates and forming the foot-hills of the West Coast Ranges are the Lyell Schists which vary from finely-laminated sericitic schists at the conglomerate contact to porphyry-type rocks in the west. Further west are exposures of the Eldon Group and restricted outcrops of Gordon River Limestone.

C. Structure and Ore Controls.

The principal structures were formed during the Tabberabberan Orogeny, when the area was subjected to compression from the south-west against the stable Tyennan Block. This west-side-north movement produced a shearing couple oriented north-south, from which five main structural elements developed. They are:-

(a) The north-trending Lyell Shear, a zone of steep dips and overturning, with marked schistosity. Carey (1953) states that the shear seems to be very deep, cropping out intermittently at the surface as a fracture.

(b) The north-west fold-faults and north-west schistosity.

(c) The west-north-west zone of faulting known as the Linda Disturbance.

(d) The north-north-east faults.

(e) The north-east tension faults.

The first three of the above have a pronounced influence on ore concentration. All the major ore bodies are confined to the line of the Lyell Shear and are localised at the intersection of this shear and the main north-west faults.

The other major ore control is a function of the competency of the strata forming the Owen Conglomerates.

D. Economic Geology.

Widespread metasomatic activity occurred during the orogeny, involving albitisation, chloritisation and silicification, accompanied along the Lyell Shear by sulphide mineralisation.

From recent studies of the complex sericitic and chloritic Lyell Schists, Wade (1956) considers that they are a product of metasomatism of the Dundas Group rocks and sections of the siliceous Owen Conglomerates. Earlier investigators (Nye and Blake, 1938 and Conolly, 1947) believe they are derived from sheared intrusive porphyries of Devonian age, while Carey (1953) considers that they originated by selective metamorphism of Cambrian conglomerates, greywacke tuffs, basic lavas and slates.

The copper and iron mineralisation at Mt.Lyell is confined to these schists, which, except where they follow the conglomerate contact, are elongated generally about N 40° W, dip steeply to the south-west and are mineralised in long narrow zones along the schistosity. These zones, first recognised and mapped by Nye in 1934, are arranged en echelon, stepping progressively to the south.

Three main types of ore body are found in the zones; two of these, the bornite-chalcopyrite and massive pyrite bodies are on, or near, the conglomerate contact. Except at the Lyell Comstock, known bodies of these types are depleted and current mining is restricted to the third type, namely, the low-grade disseminated ores away from the contact.

The disseminated ores are predominantly pyritic, with minor chalcopyrite, and average less than one percent copper and about 10 percent iron. The gangue is mainly siliceous, chloritic, and sericitic schist with some barite and hematite nearer the contact. There is no apparent constant ratio between the copper and pyrite content.

Secondary copper minerals are known but these occur only in minor quantities. The secondary mineralisation in the original Big Blow reached only shallow depth and soon gave way to primary mineralisation. Gold and silver occur with the ore in very small quantities and are recovered in the treatment process. Chalcopyrite, as a replacement after pyrite, is the main copper mineral and, although usually finely disseminated, sometimes occurs in massive veins. Galena and sphalerite are present in the Comstock area.

3. PREVIOUS GEOPHYSICAL SURVEYS.

Geophysical investigations have previously been made at Mt.Lyell by the Company and by the Bureau of Mineral Resources.

Extensive surveys were carried out for the Company by E.L. Blazey and O.Douglas during the years 1934 to 1938. They surveyed a narrow area along the schist/conglomerate contact from the Glen Lyell to the Comstock, using the equipotential line method, and delineated thirty zones of higher electrical conductivity.

In 1948, L.A. Richardson of the Bureau reported on their results and following his review (Richardson, 1949a), equipotential, self-potential and gravity surveys were carried out by the Bureau in 1948 and 1949 in the Gormanston area and in 1949 in the Comstock area. The results of the 1948 surveys have been described in a preliminary report by Richardson (1949b) and those of the 1948 and 1949 surveys in a report by Webb (1958).

The Company subsequently drilled the most likely indications obtained during the surveys by Blazey and Douglas and by the Bureau. This drilling disclosed pyritic bodies with little copper in the holes drilled to test Blazey and Douglas' results, and clays containing copper in the Gormanston area.

The results of the earlier geophysical surveys are shown on Plate 2.

4. SELECTION AND APPLICABILITY OF METHODS.

The magnetic, electromagnetic and self-potential methods were used in the survey. Geochemical sampling was carried out over some of the major geophysical indications and one diamond drill hole (No.88) was electrically logged.

This section gives a brief description of each method used and the reasons for its use in this area.

A. Electromagnetic method.

Electromagnetic methods are employed to locate zones of good electrical conductivity which are usually related to the mineralisation of an area. Because of the complexity of most mining fields however, the interpretation of the results is rather difficult and depends to a large extent on the geological information available.

When an electromagnetic field is created over a homogeneous medium a normal primary field distribution is observed and may also be calculated. If subsurface zones of higher conductivity exist within the limits of the field, secondary fields are set up and combine with the primary field. These fields are usually displaced in phase and the resultant vector traces out a polarisation ellipse. By determining the components of this ellipse at the surface and subtracting the calculated primary field component, departures from a normal curve show the presence of subsurface conductors.

In the Turam method used at Mt.Lyell, the primary field is provided by a motor generator, and is applied to the ground by means of a long cable, earthed at each end. Measurements are made of the relation, in amplitude and phase, of the vertical fields induced in two horizontal coils, which are moved along traverses at a constant separation. Results are obtained as ratios of amplitudes and as phase differences. An anomaly due to a conducting body appears generally as a maximum in ratio and as a large negative value in phase difference. A topographical correction can be applied for the difference in elevation between the two coils, but the correction is appreciable only when there is a large difference in elevation and the coils are situated near the primary cable.

Information regarding the relative conductivity of individual indications may be obtained by plotting vector diagrams. The reduced ratio is plotted as ordinate and the phase difference as abscissa; when the observation points for a complete traverse are plotted closed curves occur in the anomalous sections. The slope of the axis of each indication is a measure of the relative conductivity; an increase in conductivity is indicated by increasing slope.

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B. Self-potential method.

The self-potential method is used to detect naturally occurring earth potentials and their distribution at the ground surface. Such potentials may be due to a variety of causes, but a characteristic negative centre is commonly associated with a sulphide body undergoing oxidation.

Measurements are usually made with a high-impedance valve voltmeter; contact with the ground is obtained by non-polarising electrodes. One electrode is kept stationary and readings are taken as the other electrode is moved to successive stations along a traverse. Two or more readings are taken at each station to minimise local surface effects and poor electrode contact.

C. Magnetic method.

Magnetic observations are made to determine local variations in the vertical component of the earth's magnetic field. Such variations can be caused by concentrations of magnetic minerals.

Magnetic minerals, mainly magnetite, are present in small quantities in the ore bodies at Mt.Lyell, particularly in those bodies along the conglomerate/schist contact. Susceptibility differences between the schist and pyritic zones away from the contact are small however, and magnetic minerals appear to be absent.

In localities where variations are expected to be small, frequent readings are taken at a base station to correct for the diurnal variation.

D. Geochemical method.

The U.S. Bureau of Mines has developed a satisfactory geochemical method for the determination of traces of certain metals such as copper, lead and zinc in soil. The method is quick, simple and sensitive; for the detection of copper, dithizone (an organic compound) is used as a colorimetric indicator. Briefly, the method entails the comparison of the dithizone solution from the soil sample with that from a standard copper solution of known strength. The results are usually given in parts per million and plotted as profiles with the copper content as ordinate.

E. Electric well-logging.

Electric logging is used to supplement the geological information obtained from diamond drill cores. It is particularly useful if core recovery is low, as it gives information on the characteristics and thickness of formations from which the core is missing.

The Widco single-electrode system employed at Mt.Lyell gives continuous and simultaneous records of resistivity and self-potential as the logging electrode is raised or lowered in the hole. The resistivity observed is the total of electrode contact, return path and formation resistivities. As the first of these components is almost constant and the second is negligible due to the large cross-sectional area, the variations recorded are due mainly to changes in formation resistivity in the immediate vicinity of the moving electrode.

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The self-potential measured is a combination of electro-filtration effects due to the movement of fluids in porous formations and electro-chemical potentials arising from differences in ion concentrations of solutions. The results are described in a later section.

5. FIELD WORK.

Field investigations were carried out by the Geophysical Section of the Bureau from 21st November, 1955 to 26th March, 1956. The party consisted of two geophysicists, D.L. Rowston (party leader) and L.V. Skattebol, and three university vacation students employed by the Bureau as field assistants. A surveyor, D.P. Cook, and a chainman from the Department of the Interior, Canberra, assisted by a company employee, surveyed and pegged the geophysical grids. The surveyor became ill in February, and was replaced by G.Schunke of the Department of the Interior. Some difficulty was experienced in obtaining suitable mine labour in March when two of the students returned to Melbourne.

J.Horvath, a Senior Geophysicist of the Bureau, visited the survey in an advisory capacity in December and February.

The severe topography and difficulty of access to the areas slowed the progress of the survey considerably. Both areas, Glen Lyell and Corridor, are covered with quartz scree and loose boulders, and the sharp schist outcrops were a continual hazard to the cables used in the electrical methods.

6. GLEN LYELL AREA.

A. Operations.

(i) General

The field work commenced in the Glen Lyell area with the pegging of traverses 200 feet apart, at right angles to the baseline, 1500W (Plate 4). The baseline has a true bearing of 9°30' and the co-ordinates of the geophysical grid in this area correspond to those of the Mt.Lyell mining grid.

The surveyed area extends from 6500S to 8900S and from 200W to 3000W. Observation points were pegged every 25 feet along the traverses. Wherever results made it advisable, additional traverses were surveyed mid-way between pegged traverses.

Turam, self-potential and magnetic methods were used in the area and some soil samples for geochemical analysis were collected over selected indications.

The results of the survey in the Glen Lyell Area are shown on Plates 4 to 7. Plate 4 shows the outline of the geophysical anomalies, and their relationship to the mineralised zones mapped by Nye (1934).

Numbers 51 to 55 have been allocated to the anomalous zones in the Glen Lyell area and these are suffixed 56 to denote the date of their discovery.

(ii) Electromagnetic Method.

Electromagnetic investigations were carried out using the Turam equipment; the primary field was established by means of a long straight insulated cable earthed at each end. The field intensity ratio and phase differences between the coils were measured at successive 25-foot intervals on traverses 6500S to 8900S.

Preliminary tests were made on traverses 6900S and 6700S to determine the best frequency (440 or 880 cycles per second) and coil spacing. The 880 cycles per second frequency and 100-foot coil spacing gave the more pronounced variations and these values were therefore adopted for the remainder of the survey.

As the traverses crossed the indications obliquely, three layouts of primary cable (along 1000W, 1800W and 2600W) were necessary to survey the area effectively. The Turam observations near the Lyell Highway were influenced by primary current concentrations in the cable fence along the road and readings were unobtainable at some points. After being corrected for the normal ratio and topographic effects, which were considerable near the primary cable, the ratio readings were plotted as profiles, one of which (7300S) is shown on Plate 6. Because the variations in the reduced ratios were small, no attempt was made to prepare a ratio contour map. The phase differences were also plotted as profiles and from these a map was drawn showing the phase difference contours (Plate 5).

(iii) Self-potential Method.

The instruments used for the self-potential measurements were an electronic type Cambridge pH millivoltmeter and a self-potential meter made in the Bureau's workshop. Observations were made every 25 feet along traverses 6700S to 8900s and because of the poor soil cover, two readings were taken at each station to minimise errors due to local surface effects and poor contacts.

All S.P. readings were taken with one base station (1000W/7500S) as a reference point. The application of the method was hindered by spurious potentials from the electric train used to haul ore underground and by communication difficulties in the more sharply dissected areas. The fluctuating potentials from the train were as much as $\pm$ 150 millivolts and self-potential operations were finally restricted to the one day a week on which the train did not run.

The self-potential profiles (Plate 7) show the value in millivolts at each observation point relative to the value at the base station (1000W/7500S).

(iv) Magnetic Method.

Observations of the vertical magnetic intensity were made using Watts Vertical Variometers Nos.69107 and 69139. Readings were taken on traverses 6700S to 7300S and on traverse 7700S. There were no significant variations in the profiles, due to the small difference in magnetic susceptibility between the mineralised and non-mineralised schists, and the method was discontinued. A typical profile (7300S) is shown on Plate 6.

(v) Geochemical Method.

Soil samples were taken along traverses mainly over zones of high electrical conductivity and were subsequently tested for copper content in the laboratory. Difficulty was experienced in obtaining good samples because of the poor soil cover and talus from the steep mountain slopes.

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(vi) Electric Well logging.

No drill holes were accessible for logging in the Glen Lyell and Corridor areas and the only logging carried out was in D.D.H. 88, situated on a bench of West Lyell Open Cut. Self-potential and resistivity logs from the bottom of the casing (800 feet) to 1,210 feet are shown on Plate 3, together with the geological core log.

The section logged is in mineralised schist only and no comparison can be made with non-mineralised schist. There is good correlation between the geological and electric logs, but the method cannot discriminate between the conductivity due to copper sulphides and that due to iron sulphides. Generally, an increase in resistivity occurs, with a complementary fall in the negative self-potential, where the sulphide percentage decreases, but there are some exceptions to this.

The electric log, being a continuous record, gives a more detailed picture than the assay values, which are only averages over 5 or 10 feet of core. The variations recorded on the electric log in any section of constant pyrite content are due to variations in the actual composition of the strata, caused by shaly bands, concentrations of sulphides, etc., and also to variations in texture of the sulphides, e.g., fine-grained or large crystals or disseminated pyrite within an insulating matrix. Such details are not disclosed by assaying over large sections.

It should be noted, however, that in several places correlation between the electric and geological logs is impossible.

B. Interpretation of Results.

The electromagnetic (Turam) method proved to be the most successful in the Glen Lyell area, and five weak anomalies were located. Anomalies were obtained over some of these by the self-potential method.

The Turam anomalies in the Glen Lyell area (Plate 5) are characterised by moderate phase differences, and, on most traverses, by negligible ratio variations, indicating that they are due to comparatively weak conductors. In the case of a very good conductor such as a massive sulphide body, a large ratio maximum is usually associated with a phase difference minimum.

The five main anomalies, 51/56 to 55/56, are described below under their individual numbers.

Anomaly 51/56.

Anomaly 51/56 (Plate 5) is the most prominent and continuous feature of the electromagnetic contours and appears on all phase profiles from 7300S to 8900S. It commences on traverse 7300S between 1950W and 2300W as a broad, weak indication, strikes S30°E, narrows on traverse 8100S, and widens again until it reaches traverse 8500S. The configuration at the southern end of the indication between 8500S and 8900S, where the anomaly crosses the Lyell Highway, is doubtful because of the influence of steel cable along the highway. The continuation south beyond 8900S could not be traced by geophysical means because of the precipitous nature of the terrain. To the east, the results show apparently barren schists, which continue to the eastern limit of the surveyed area.

Anomaly 51/56 coincides with a broad self-potential indication observed on traverses 7300S and 7500S. The Turam results indicate a splitting of the conducting zones towards the north and this interpretation is supported by the two minima on each of the self-potential profiles along 7300S and 7500S.

In the southern part of Anomaly 51/56, self-potential indications occur on traverses 8500S, 8700S and 8900S. On traverse 8500S, the self-potential indication centred at 1000W is situated 200 to 300 feet east of the electromagnetic indication.

The Mt.Lyell Reserve adit, which penetrates the western limb at the northern end of the anomaly, reveals pyrite mineralization with a little fahl ore (0.1 to 2.6 per cent copper) and veins and disseminations of pyrite can be seen at the surface in the schist outcrops. It is considered that Anomaly 51/56 shown by the Turam contours is due to a wide body of relatively weak mineralization.

Anomaly 52/56.

North of Anomaly 51/56, the Turam contours reveal the southern end of a broad, regular, weakly conducting zone striking north-west. The anomaly widens towards the north-west and the phase difference reaches a maximum at about 1750W on traverse 6700S. The intensity ratios are relatively featureless.

Interference from the high-tension power line precluded observations on traverse 6500S, and surveying was impracticable farther north because of the extensive overburden dump. The anomaly might persist along the western edge of the dump, in which case the axis would intersect 6100S at about 2000W. The phase contours appear to indicate a south-pitching structure, en echelon with the structure associated with Anomaly 51/56.

Self-potential indications in this locality have an indefinite trend along the eastern edge of the Turam anomaly but, as they are erratic and small generally, no reliable information can be gained from them.

Anomaly 53/56.

Anomaly 53/56 constitutes the only significant indication along Philosophers Ridge and is equally well-defined by both the Turam and self-potential methods. The indication appears on traverse 7000S at 800W, trends north beyond traverse 6700S and probably links with equipotential zone 24 which is now under the overburden dump. The old Glen Lyell No.2 workings are situated within this anomaly and disclose weak pyritic mineralisation with about 0.2 percent copper. Judging from the electromagnetic indications the sulphide body is rather limited in extent in strike and depth and appears to have a southerly pitch.

Anomaly 54/56 and Anomaly 55/56.

These minor indications occur in a poorly-defined zone along the western part of the geophysical grid. This zone strikes N30°W and has no definite outline except where represented by Anomalies 54/56 and 55/56 which have the en echelon arrangement common in the Mt.Lyell field. Anomaly 54/56 is centred on 6700S at 2930W and Anomaly 55/56 on 7700S at 2800W. There are no corresponding anomalies in the self-potential profiles. Anomaly 54/56 persists to the north-west, but further geophysical work in this direction was prevented by the presence of a power transmission line and also by the rugged topography.

C. Conclusions and Recommendations.

The geophysical survey, in particular the electromagnetic method, located several anomalies within the schists of the Glen Lyell area. Although the indications obtained were weak, their characteristic relatively low conductivity is in accordance with the known occurrence of pyrite disseminated in a quartzose schist gangue, accompanied by generally low copper values ranging mostly between zero and one percent. Five main indications, Anomalies 51/56 to 55/56, are shown on Plate 4; the most important, 51/56, coincides with an area of mineralisation partly disclosed in the Mt.Lyell Reserve adit.

Anomalies 51/56 and 52/56 are in the central section of the grid and have the en echelon arrangement common to the ore bodies in the area. Anomaly 52/56 has not, as yet, been tested by diamond drilling to ascertain whether or not it is due to mineralisation but the results suggest a deepseated sulphide body which pitches to the south. A similar body which conforms with the local schistosity is indicated by Anomaly 51/56.

Anomaly 53/56 is the only one located on Philosophers' Ridge and appears to be due to a narrow conducting body with near-vertical dip and southerly pitch.

It is recommended that Anomalies 51/56, 52/56 and 53/56 be further investigated by diamond drilling. Five drill holes are recommended, sited as shown on Plate 4. The drill sites have been selected on geophysical considerations only and could be changed to suit local conditions.

Because of the inaccessibility of the area, alternative sites are shown on both the hanging wall and footwall of 51/56 and 53/56. Plate 8 shows the idealised drill hole sections.

A preliminary surface geological examination of Anomalies 54/56 and 55/56 should be made to determine whether or not they may be due to mineralisation. The most pronounced indication is on traverse 7700S, and D.D.H.6 is suggested to test Anomaly 55/56 if the results of the geological examination show that testing is warranted.

The following table gives the co-ordinates, direction and depression of the recommended diamond drill holes, the suffix "A" denoting the more inaccessible site.

D.D.H. No.	Anomaly	Co-ordinates	Azimuth	Depression	Approx. Depth (ft.)
1	51/56	7925S/2450W	60°	40°	1200
1A	"	7350S/1375W	240°	60°	1400
2	"	8400S/1725W	60°	50°	1000
3	"	8300S/2200W	55°	45°	1400
3A	"	7675S/1250W	235°	60°	1200
4	53/56	6900S/1400W	90°	45°	900
4A	"	6900S/400W	270°	50°	1000
5	52/56	6950S/2225W	55°	55°	1100
6	55/56	7800S/3075W		45°	800

7. CORRIDOR AREA.

A. Operations.

(i) General

At the completion of operations in the Glen Lyell area a survey was commenced in the Corridor area, between the Tharsis Outlier and Cape Horn, the western extremity of Mt.Lyell.

The baseline of the geophysical grid in the Corridor area is on a true bearing of 324° 30' and its intersection with traverse 16 has co-ordinates 00/2000W on the Mt.Lyell mine grid. The geophysical traverses, numbered from 12 to 36 proceeding north-west, are 200 feet apart except where intermediate traverses 23, 25 and 29 were inserted. Peg numbering commenced at 500 in the south-west and continues at 25-foot intervals to beyond 3500 in the north-east, where the steep conglomerate cliffs limited the surveying. The grid and topography of the Corridor area are shown on Plate 9.

Turam and self-potential methods gave anomalies in this area, but the magnetic method gave no useful results. Soil samples were taken over several of the geophysical indications.

The anomalies in this area have the numbers of the earlier geophysical zones where they approximately coincide, but the suffix 56 has been added to denote the year of the Bureau's survey. New indications are designated from Anomaly 31/56 onwards. The name of the "Footprint" anomaly for Indication Zone A of earlier surveys has also been retained.

Plates 9 to 15 show the results of the survey in the Corridor area.

(ii) Electromagnetic Method.

In the Corridor area, the Turam equipment was operated with a primary layout similar to that used in the Glen Lyell area; a frequency of 880 cycles per second and a coil separation of 100 feet were used.

The north-eastern section of the grid was surveyed with the primary cable along baseline 2000; the results are shown on Plate 11, Sheet 1 as phase difference contours. Selected profiles are given on Plate 13, Sheets 1 to 5 and vector diagrams of one of the indications on Plate 14.

An attempt to survey the south-western section from this baseline was found to be impracticable because of the large phase displacements encountered over Indication A and the proximity of the cable to this conducting zone. The primary cable was therefore moved to 2,600.

Contours of the south-western section are presented on Plate 11, Sheet 2, and profiles on Plate 13, Sheets 1 to 5. Comparison of the results obtained with information from diamond drill hole sections disclosed that the use of a frequency of 880 cycles-per-second and a spacing of 100 feet between the coils accurately outlined the hanging wall of the zone.

(iii) Self-potential Method.

The self-potential observations were subject to the same time limitations as those in the Glen Lyell area and consequently some traverses are of limited extent only. Two parties operated when sufficient labour was available and the topography regular, but on many traverses it was necessary to employ five men in one party for efficient operation.

To minimise local surface effects, two readings were taken at each station on traverses 12 to 36. Some very high negative potentials, increasing with elevation, were observed on the steep slopes at the base of Mt.Lyell. The negative potentials were followed up to a value of -1200 millivolts at 4100 on traverse 24, i.e. well beyond the schist/conglomerate contact. The phenomenon was apparent only over barren outcrops in the immediate vicinity of Mt.Lyell. The potential gradient in this area varies with the slope along the individual traverses and has an approximate value of -230 millivolts per 100 feet increase in elevation.

Such potentials, apparently dependent upon the topography only, have been observed in mountainous localities elsewhere, but no satisfactory theory for their origin has been formulated.

The self-potential profiles on Plate 13, Sheets 1 to 5, show the decrease in potential approaching the base of Mt.Lyell, with the potentials of Anomaly 16/56 superimposed on this negative gradient. Displacement of the negative centres, due to topography, is not pronounced in the Corridor Area.

(iv) Geochemical.

Soil samples were collected over some of the geophysical indications in the area and analysed by the colorimetric method described earlier, to detect the presence of copper. Results were plotted as profiles and are shown on Plate 10 and on Plate 13, Sheets 2 to 5.

Little was expected from the use of this method because most of the surface soil has been eroded; furthermore, the copper minerals are exposed to heavy rainfall on barren ground in a steep terrain.

The assays for copper were undertaken mainly in the hope that they would be of some assistance in discerning those parts of the mineralised bodies containing copper. Although the electrical methods may determine concentrations of sulphides they cannot discriminate between pyrite and chalcopyrite. A method is needed therefore to distinguish between mineralisation containing pyrite only and that which also contains copper. As there is little possibility of doing this by any geophysical method, the geochemical method was used to give some guidance. The results obtained so far, however, are not sufficiently clear to be able to predict copper-rich mineralisation.

B. Interpretation of Results.

Several distinct indications were found in the Corridor Area by the electromagnetic and self-potential methods. Anomaly numbers previously mentioned are used in describing them.

The indications occur in two distinct groups which are separated by the Tharsis conglomerate outlier and barren schists in the south but gradually converge towards Cape Horn in the north-west.

Plate 10 shows the more pronounced geophysical indications, geochemical profiles and the boundaries of the mineralised zones as mapped by Nye (1934).

Except for the asymmetric S.P. indication with its axis trending from 2500 on traverse 12 to 2700 on traverse 14, which is considered to be due to the extension of the Tharsis orebody (Plate 12), the central area is devoid of anomalies between traverses 12 and 25.

The S.P. values tend to decrease towards the north-west until the indications are superimposed on a normal reading of about -100 millivolts. Study of the results and geological data suggests that the negative S.P. values are due to pyrite disseminated throughout the schists.

Similarly, the Turam ratio increases from 1.02 over the barren schists to about 1.07 in the north-west, indicating increasing general ground conductivity to the north-west.

The north-eastern group of indications, near the schist/conglomerate contact, is the most interesting as the ore bodies at Mt.Lyell tend to be richer in copper near this contact. These indications are represented by Anomalies 16/56 and 17/56. The other group, covering most of the south-western section of the geophysical grid, comprises Indication Zone A (Footprint anomaly) and Anomaly 31/56. A more detailed description of these indications follows.

Anomaly 16/56.

Anomaly 16/56 (Plates 10 and 11) follows the schist/conglomerate contact and extends as a continuous Turam indication from traverse 12 to traverse 30. The anomaly is attributed to a steeply-dipping, near-surface conducting body. The phase difference and ratio characteristics vary from traverse to traverse. Between traverses 14 and 18, the intensity ratio increases from the normal reading of about 1.10 to a maximum of 1.47 over the indication. This increase in conductivity is illustrated by the vector diagrams on Plate 14. Conductivity variations are indicated by a change in the slope of the vector axes; a vector diagram with a vertical axis corresponds to a very good conductor. The vector axes for traverses 14 and 16 are much steeper than those for traverses 20, 26 and 28, indicating that the conductivity decreases from traverse 18 towards the north-west. From traverse 28 westwards, no increase is observed above the general ground conductivity, which is higher than normal due to widespread disseminated pyrite.

Anomaly 16/56 was located by Blazey and Douglas but their indication was limited to the zone of relatively high conductivity between traverses 14 and 18. This zone was subsequently investigated by a shallow diamond drill hole (D.D.H. 406) which intersected ore carrying 1.1 percent copper over 150 feet. Another hole, D.D.H. 408 was directed horizontally in a north-easterly direction from the Crown Lyell Drive, and over its length of 360 feet averaged 0.9 per cent copper. The holes did not reach the conglomerate. The Turam indication 16/56 is fairly extensive and, although variations in the intensity of the anomaly point to variations in the mineralisation, the favourable geological position and the size of the indication make it one of the best prospects.

Most of the self-potentials originating from the sulphides in Anomaly 16/56 are masked by the steep topographical gradients described earlier, but the profiles along traverses 22 and 26 (Plate 13, Sheets 3 and 4) show negative centres.

The profiles of the geochemical analyses over this zone are shown on Plate 10. Traverse 24 has the most pronounced copper anomaly; this is about 50 feet north of the axis of the Turam indication. Irregular results with no significant variations occur on traverses 22 and 28.

Anomaly 17/56.

Turam Anomaly 17/56 is comparatively weak. The vector diagrams for traverses 26 and 28 (Plate 14) show only a small increase above the normal conductivity.

A broad S.P. indication was observed at the eastern end of the zone. West of the zone there is a group of weak S.P. indications which coincides approximately with Indication Zone B (Plate 12). In this area, erratic readings were obtained due to pyrite from numerous dumps and poor electrode contacts, particularly on traverse 28.

The geochemical profile of traverse 32 shows a gradual increase from 50 p.p.m. to 200 p.p.m., with an isolated maximum of 600 p.p.m. at 2450. The separation between the geochemical maximum and the axis of the Turam indication is readily explained by the migration of copper due to the steep terrain. Copper assays in the Anaconda Tunnel, however, show only about 0.1 per cent copper.

Anomaly 17/56 was incompletely investigated on traverse 25 by D.D.H. 407, which was drilled to 140 feet only and did not reach the main axis of the anomaly.

INDICATION ZONE A. (Footprint Anomaly)

Over almost the whole of the south-western section of the geophysical grid there are strong indications in a broad, irregular zone. The good conductor extends from south-east of traverse 12 to traverse 34, where it is considerably weaker (Plate 11, Sheet 2 and Plate 12).

The electromagnetic anomalies in this zone are characterised by very high phase differences; these prevail within the minus 15 degree contour shown on Plate 11, Sheet 2. The indication is expressed mainly in the phase differences, the ratio values being only slightly higher than normal. Such electrical characteristics may be due to a very wide zone of moderately high conductivity such as would be caused by disseminated sulphides.

Sections through drill holes D.D.H.78 to D.D.H. 81, and the nearest geophysical profiles are shown for comparison on Plate 13, Sheets 1 to 5. These diagrams show that, generally, the pyrite values correlate fairly well with the magnitude of the geophysical anomalies.

Plate 13, Sheet 1, showing the profiles along traverse 16 and the section along D.D.H. 79 shows that the magnitude of the electrical indications increases with the pyrite percentage in the drill hole.

The S.P. profile on Plate 13, Sheet 5, apart from the erratic readings due to local surface effects, indicates a broad zone of mineralization in agreement with the pyrite values of D.D.H. 81.

Also, the copper and pyrite assays in the old workings show good agreement with the geophysical results; the S.P. anomaly at 1000 on traverse 18 coincides with the high pyrite values in the Mt.Lyell Reserve adit.

The considerable amount of geological data provided by the diamond drill holes and by the old workings indicate that the geophysical anomalies originate from extensive pyrite mineralization.

Geochemical analyses were made in the Footprint anomaly zone on samples from traverses 20 and 26 only. The profile along traverse 20 shows mainly a low value of about 40 p.p.m., except for an increase to 200 p.p.m. at 1600. These low values are confirmed by D.D.H. 79, the core of which assayed less than 0.2 per cent copper.

The values along traverse 26 (Plate 13, Sheet 4) are much more variable, with overall higher copper assays; the northern part of the Footprint anomaly should be of more economic interest than the central part. A significant increase in metal values is also noticeable over Zone 31/56 at about 2100.

The Footprint anomaly was located by the equipotential line method but was shown only as an outline with no detail within its boundaries. The most distorted potential distribution occurred between traverses 16 and 24, and coincides with the strongest Turam and S.P. indications.

Anomaly 31/56.

Anomaly 31/56 forms the toe of the Footprint anomaly and is located between 1800 and 2000 on traverses 26 to 34, where it tails off into a weak indication which possibly continues

a/

around Cape Horn. Anomaly 31/56 was notfound by the earlier geophysical surveys.

Both the Turam and S.P. methods gave strong indications over the zone and show good agreement in position (Plate 10). The Turam anomaly, in common with the indications in the Footprint anomaly, is apparent mainly in the phase differences, thus suggesting a weakly conductive body.

The Turam and S.P. contours indicate a regular, lenticular body with almost vertical dip and north-westerly strike. The margins of Anomaly 31/56 are not as well delineated by the S.P. results, which show weak widespread "lows" to the north-east and south-west. At the south-eastern end of this zone the S.P. anomaly continues as a narrow indication to 1700 on traverse 20 and coincides with a sudden rise in the pyrite values in the North Lyell Consols No.5 adit at 1775 on traverse 22.

Turam indication A and Anomaly 31/56 have been tested in part by the old Western Tharsis workings which show copper to 1.0 per cent in the northern cross-cut. The cross-cut, however, did not reach the zone of the main indication.

D.D.H. 81 (Plate 13, Sheet 5) was put down near traverse 28 as a result of the surveys by Blazey and Douglas. Core assays are given as 0.1 per cent copper and 15 per cent pyrite over a section from 990 to 1220 feet, followed by 5 feet containing 1.2 per cent copper. Assuming that the steep south-westerly dip of the schists continues at depth, the copper values from 1220 to 1225 may represent the hanging wall of the mineralized zone suggested by Anomaly 31/56.

The soil samples of traverse 26 show a maximum of 300 p.p.m. copper between 1900 and 2100. On traverses 28 and 30, values of 200 and 150 p.p.m. respectively are found down-hill from the indication.

C. Conclusions and Recommendations.

The geophysical indications obtained by the electromagnetic and self-potential surveys over the Corridor Area are due to sulphide mineralisation.

The indications fall within the boundaries of mineralization mapped by Nye in 1934 and coincide largely with the results of the earlier equipotential surveys, but are more detailed.

The indications occur in two distinct groups which are separated by the Tharsis Outlier and the apparently barren schist in the south-central area, and gradually converge in the north-west.

The Turam results in Anomaly 16/56 indicate a high conductivity and it is considered that this anomaly has good prospects, especially in the area between traverses 14 and 18. D.D.Hs 406 and 408 investigated Anomaly 16/56 at the surface and underground from the Crown Lyell Mine drive and disclosed low-grade copper, but neither hole penetrated as far as the schist/conglomerate contact. It is recommended that further testing of this zone be carried out by deeper drilling, especially between traverses 14 and 18.

The geochemical results show a pronounced maximum on traverse 24 and, although the Turam indication there is relatively weak, this section also warrants investigation, because copper appears to concentrate at the extremities of the mineralised bodies.

Anomaly 17/56, although very weak and prospected by the shallow D.D.H. 407, should be drilled to intersect the axis at 2875 on traverse 27. This would require only a shallow hole as the source of the anomaly is near the surface. Subsequent drilling would be based on the results of the first hole.

The Turam indication on traverse 32 at 2675 has been tested by the Anaconda Tunnel, but would bear further study, especially if the Tunnel is accessible.

The above recommendations have been given in order of importance and the locations of the recommended holes are shown on Plate 10. Plate 15 shows the sections through the recommended drill holes in the Corridor area. The other group of indications forms the broad, strongly mineralized Footprint Anomaly or Indication Zone A, with Anomaly 31/56 in the north-west. The indications are strong between traverses 12 and 26, and continue north-west to a zone of general mineralization with Anomaly 31/56 as a lenticular, more mineralized zone within it.

D.D.Hs. Nos. 78 to 81 tested the Footprint anomaly and D.D.H. 81, in addition, probably intersected Anomaly 31/56, assaying less than 0.1 per cent copper in this section. However, the Western Tharsis workings show 1.0 per cent copper on the fringe of the body, and further investigation may be warranted. The following is a list of the relevant data for the suggested diamond drill holes. An alternative (D.D.H.5) has been given for D.D.H.4 and is the more accessible site.

D.D.H. No.	Anomaly	Co-ordinates	Azimuth	Depression	Approx.Depth (ft.)
1	16/56	16/2800	45°	45°	900
2	"	24/3000	45°	40°	600
3	17/56	2475N/2650	5°	40°	500
4	31/56	28/1200	45°	40°	1000
5	"	31/1200	45°	45°	1000

North-west from traverse 36, the area is covered by scrubby vegetation which would require considerable clearing if the geophysical survey were to be extended in this direction. Clearing and surveying should be done prior to the commencement of geophysical work in the area between Corridor and Comstock and an easier means of access would facilitate operations.

8. ACKNOWLEDGEMENTS

The author wishes to acknowledge the co-operation given by the Company during the survey and in particular the information and help provided by the Chief Geologist, M.L. Wade, and Assistant Geologist, M. Solomon.

The efficient work, under trying conditions, by the surveyors from the Department of Interior, Canberra, D.P. Cook and G. Schunke, was greatly appreciated.

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24

PLATE 1.
LEGEND
SEDIMENTARY ROCKS
LOCALITY MAP
LEGEND
GEOLOGICAL BOUNDARIES
FAULTS
BEDDING
METAMORPHIC ROCKS
IGNEOUS ROCKS
GEOPHYSICAL SURVEY AT MT. LYELL,
QUEENSTOWN, TASMANIA
GEOLOGICAL MAP
AFTER MT LYELL M&R CO LTD, QUEENSTOWN AREA GEOLOGICAL MAP
G26-31

GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA

GEOPHYSICAL GRIDS AND PREVIOUS GEOPHYSICAL RESULTS

GEOLOGY AFTER MOUNT LYELL M & R CO. LTD. PLAN No GE 10

NOTE: Geophysical Anomaly Zones 1-30, A-C Blazey and Douglas (1934-36)
Gormanston Geophysical Anomalies B.M.R. (1946-48) see Dwg. No. G 26-3

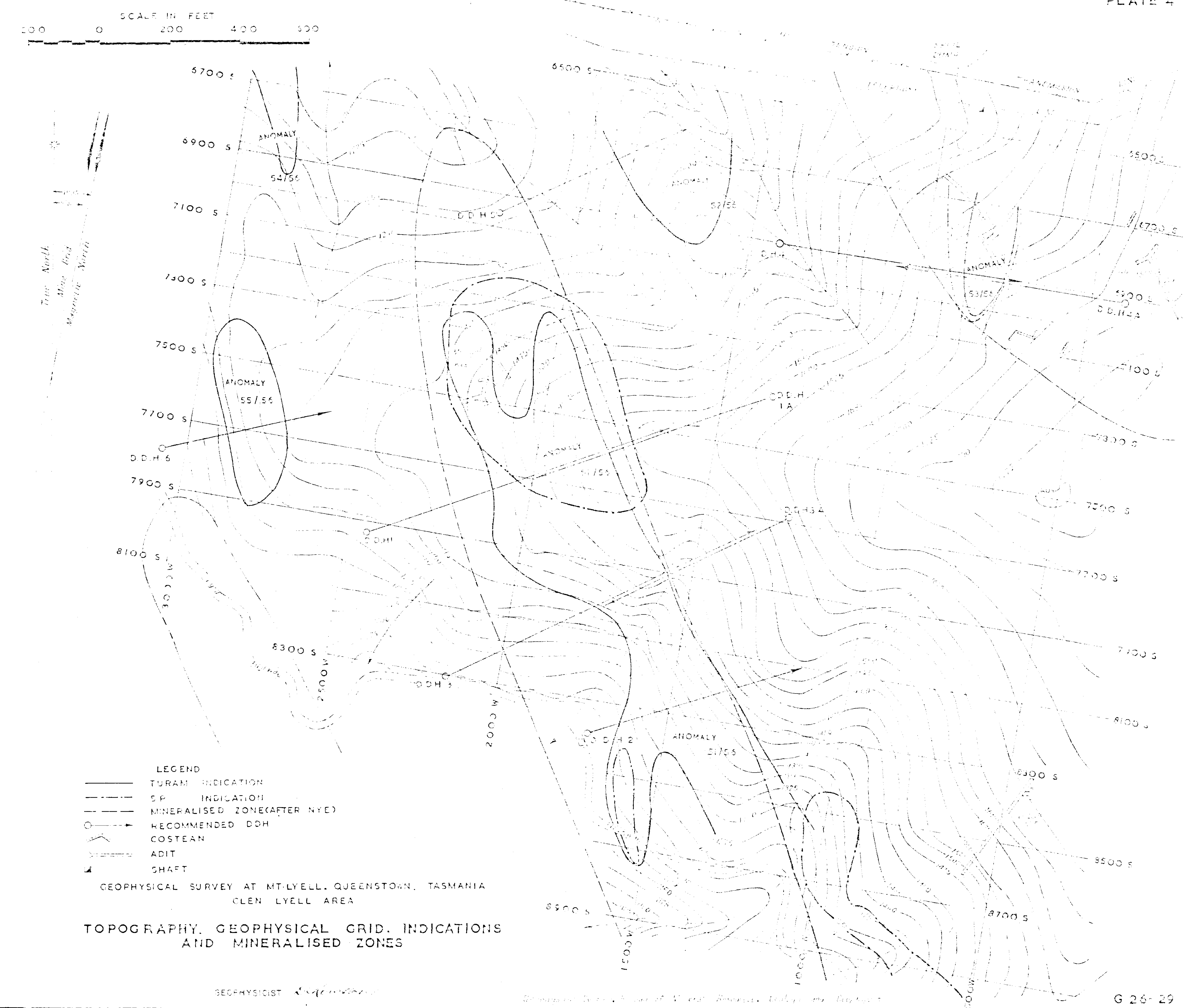
GEOPHYSICIST

G 26 - 22

GEOPHYSICAL SURVEY AT MT LYELL,
QUEENSTOWN TASMANIA.

WELL LOGGING RECORD OF D.D.H. 88

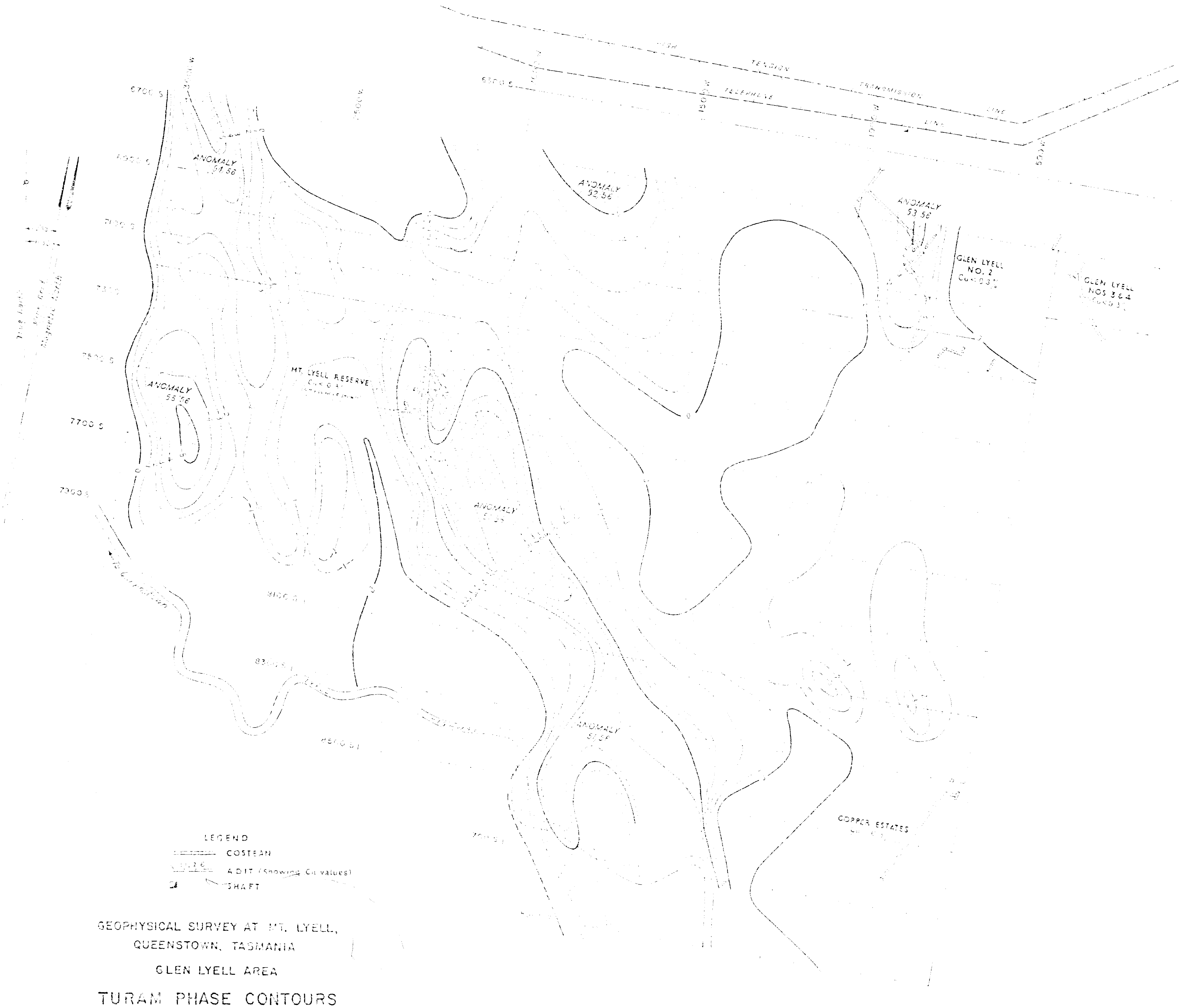
GEOPHYSICIST



GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA
GLEN LYELL AREA

TOPOGRAPHY, GEOPHYSICAL GRID, INDICATIONS AND MINERALISED ZONES

GEOPHYSICIST



GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA

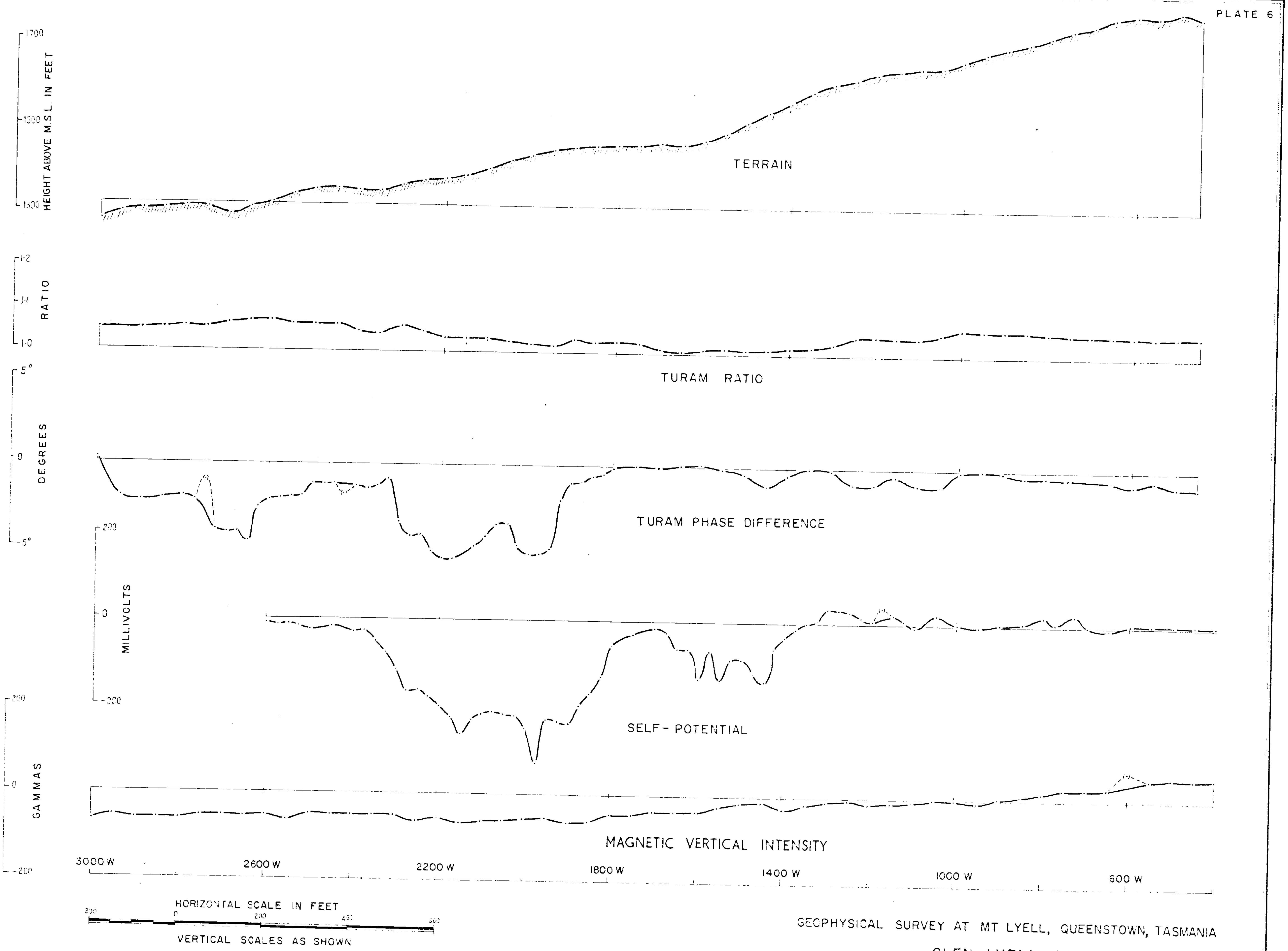
GLEN LYELL AREA

TURAM PHASE CONTOURS

CO-ORDINATES ON MT. LYELL GRID

CONTOUR INTERVAL 1°

G25-30



GEOPHYSICAL SURVEY AT MT LYELL, QUEENSTOWN, TASMANIA

GLEN LYELL AREA

PROFILES ALONG TRAVERSE 7300 S

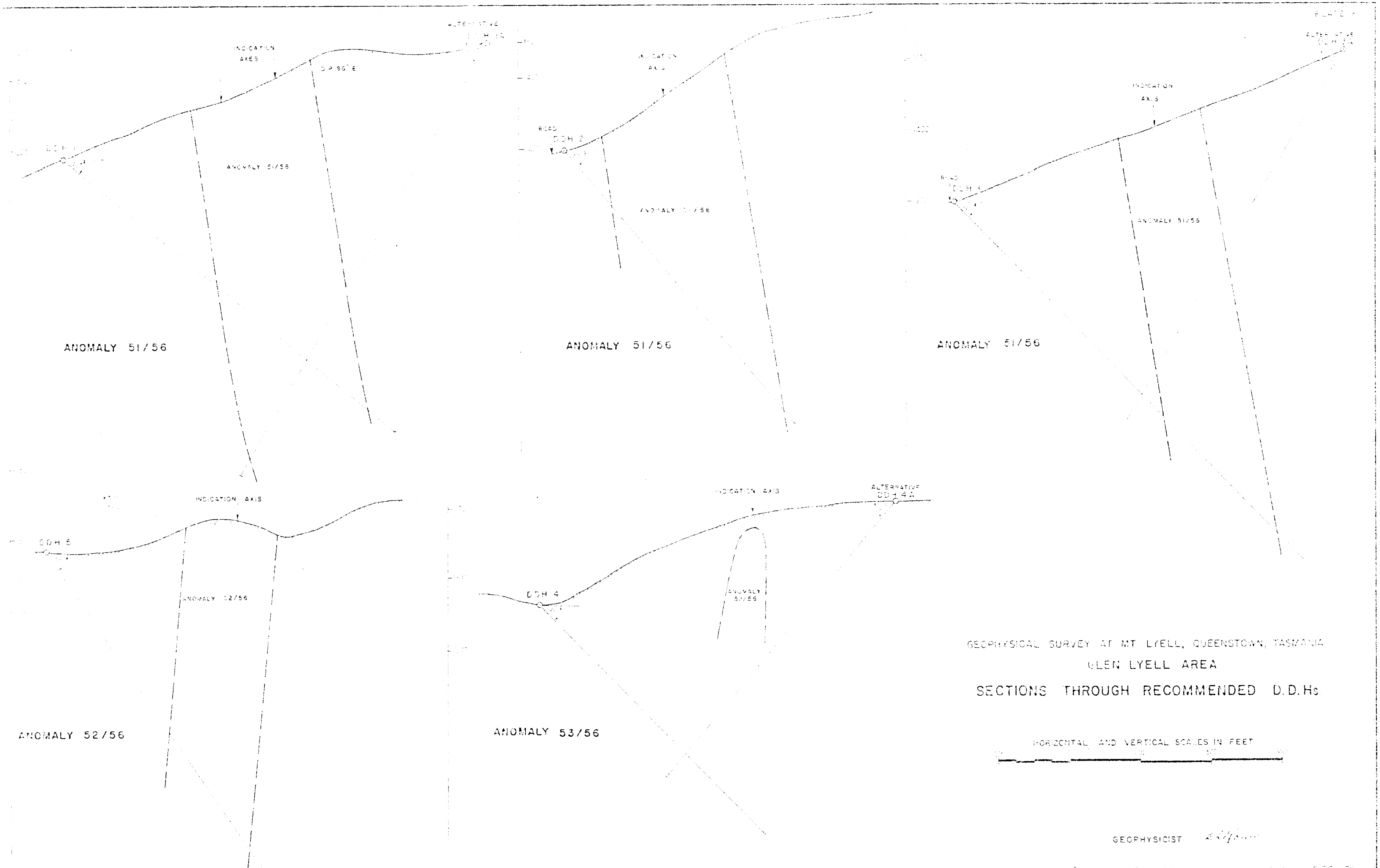
GEOPHYSICIST

GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA
GLEN LYELL AREA

SELF-POTENTIAL PROFILES

(SPACING BETWEEN PROFILES NOT TO SCALE)

G 26-37



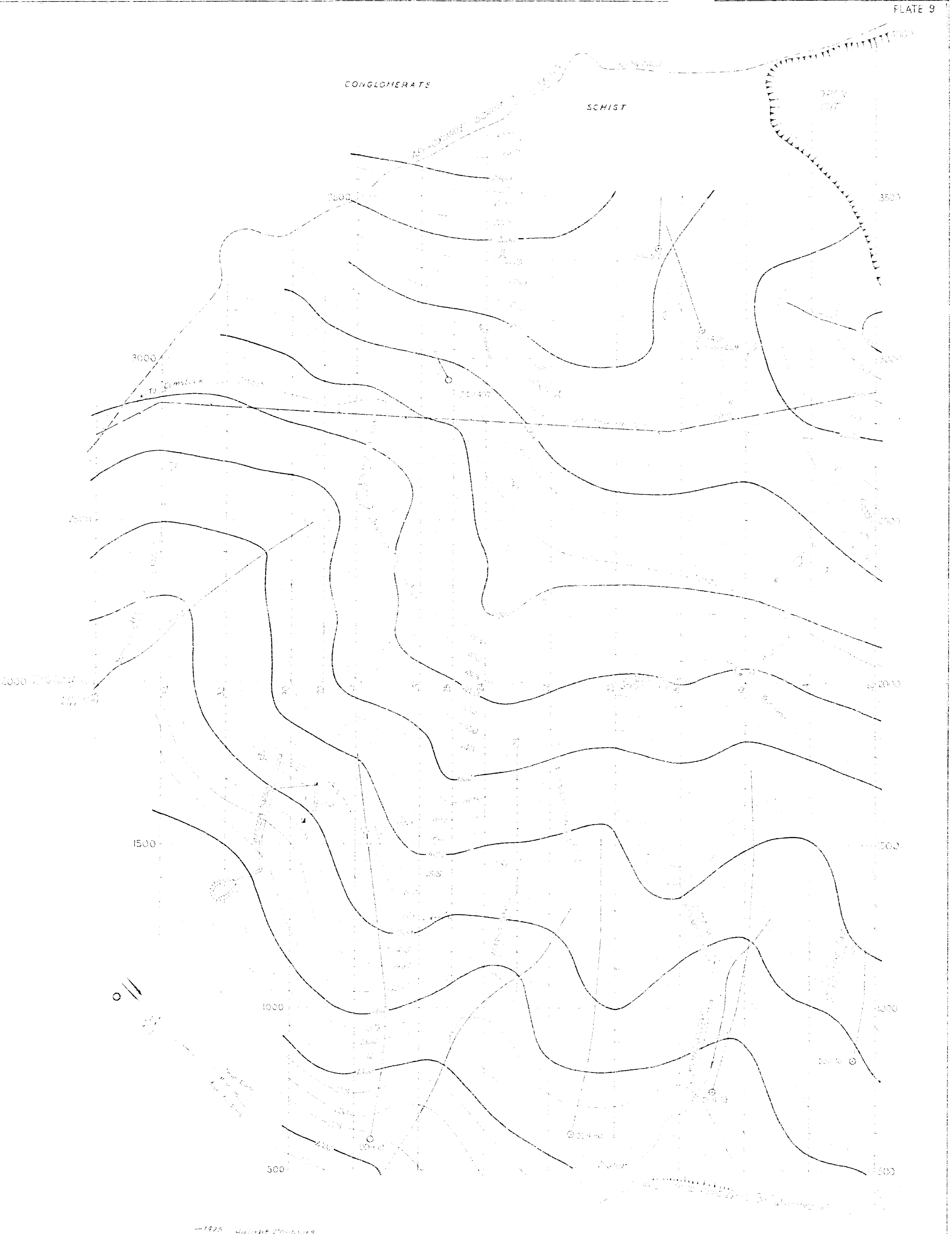
GEOPHYSICAL SURVEY AT MT LYELL, QUEENSTOWN, TASMANIA

GLEN LYELL AREA

SECTIONS THROUGH RECOMMENDED D.D.Hs

HORIZONTAL AND VERTICAL SCALES IN FEET

GEOPHYSICIST



GEOPHYSICAL SURVEY AT MT LYELL,
QUEENSTOWN, TASMANIA.

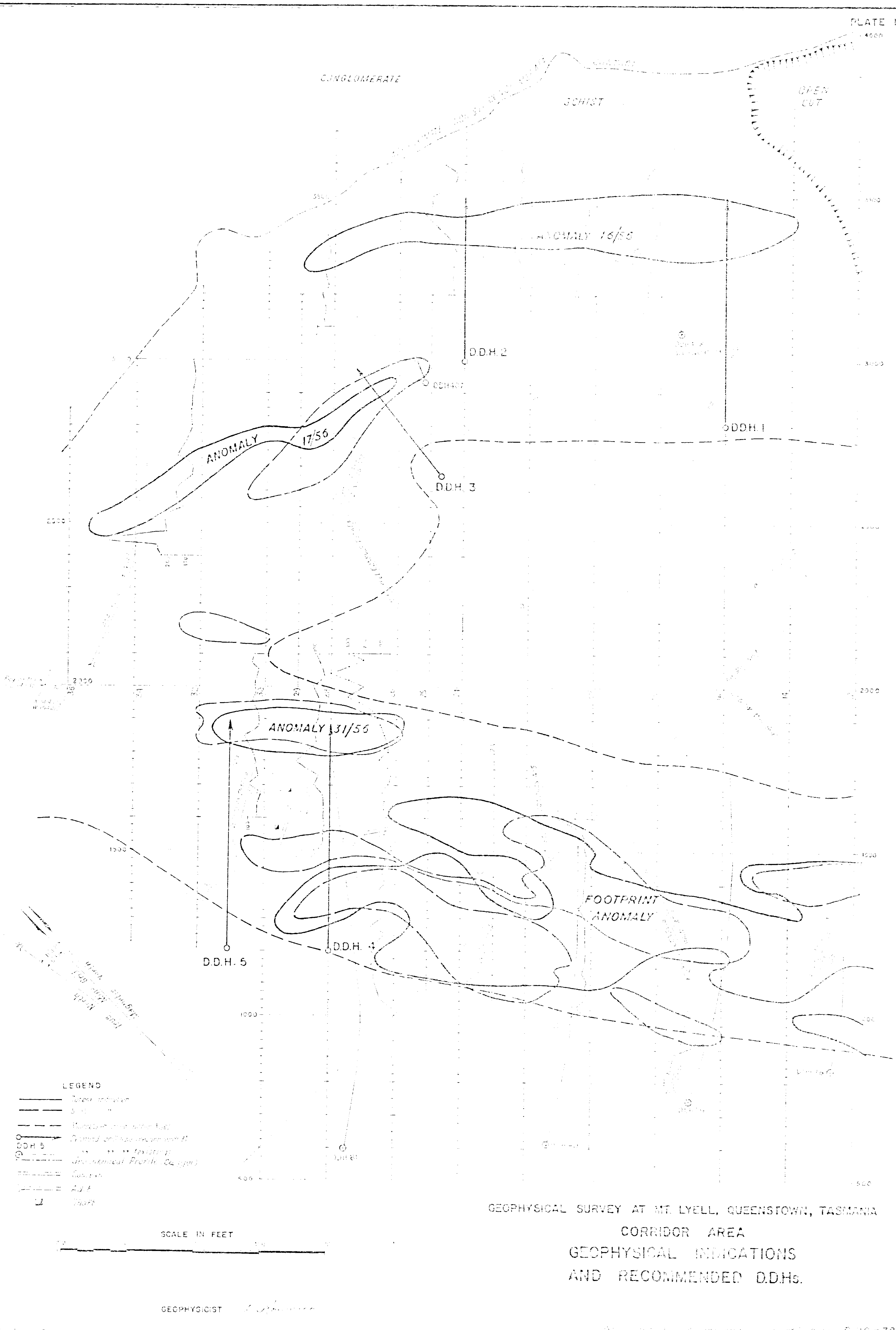
CORRIDOR AREA

TOPOGRAPHY, GEOPHYSICAL GRID AND MINE WORKINGS

SURVEYED BY G.S. SCHUNKE D.P. COOK.
DEPT OF THE INTERIOR,
CANBERRA.

GEOPHYSICIST

G25-23



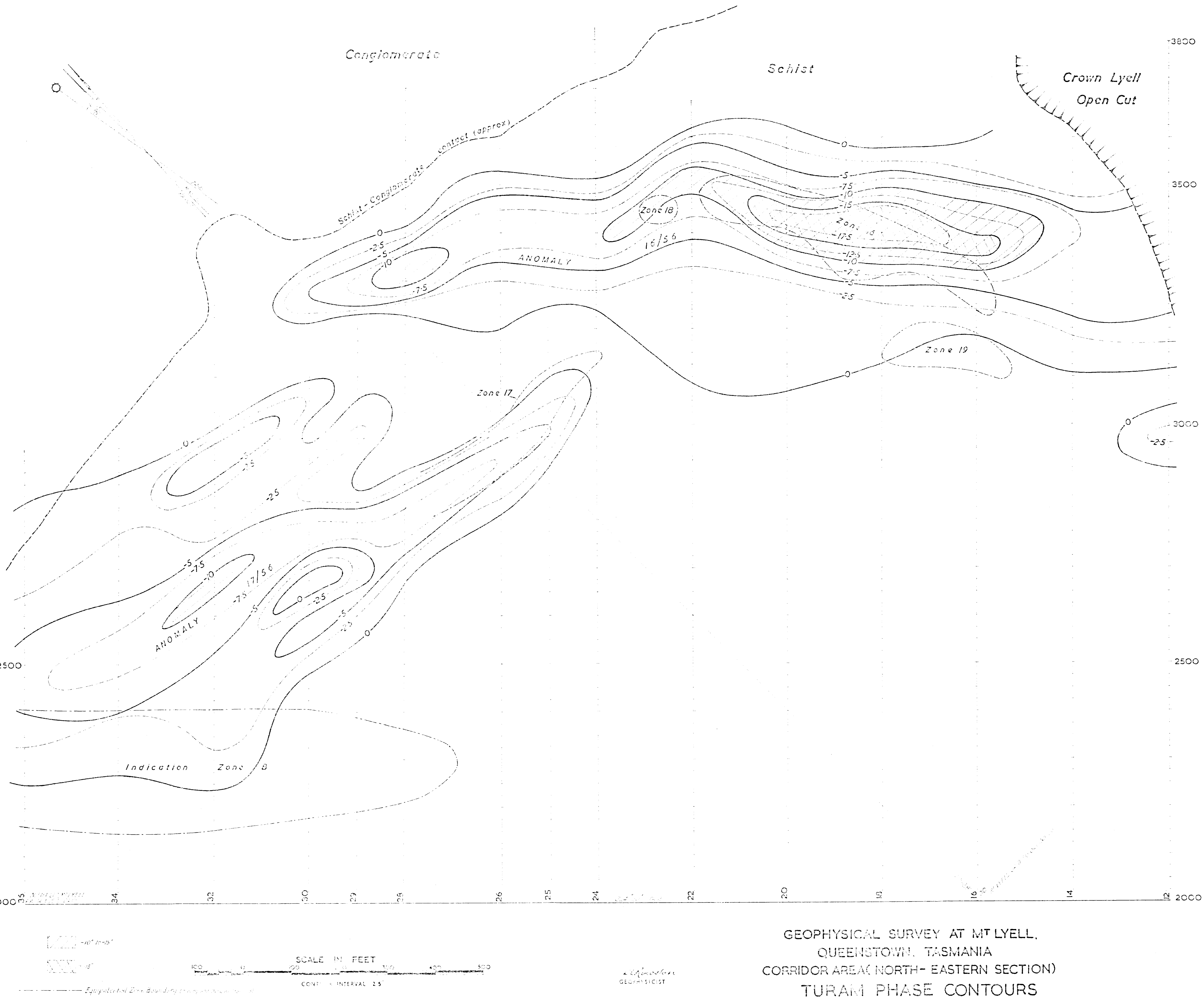
GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA

CORRIDOR AREA

GEOPHYSICAL INDICATIONS

AND RECOMMENDED D.D.Hs.

G 28-38



GEOPHYSICAL SURVEY AT MT LYELL,
QUEENSTOWN, TASMANIA
CORRIDOR AREA (NORTH- EASTERN SECTION)

TURAM PHASE CONTOURS

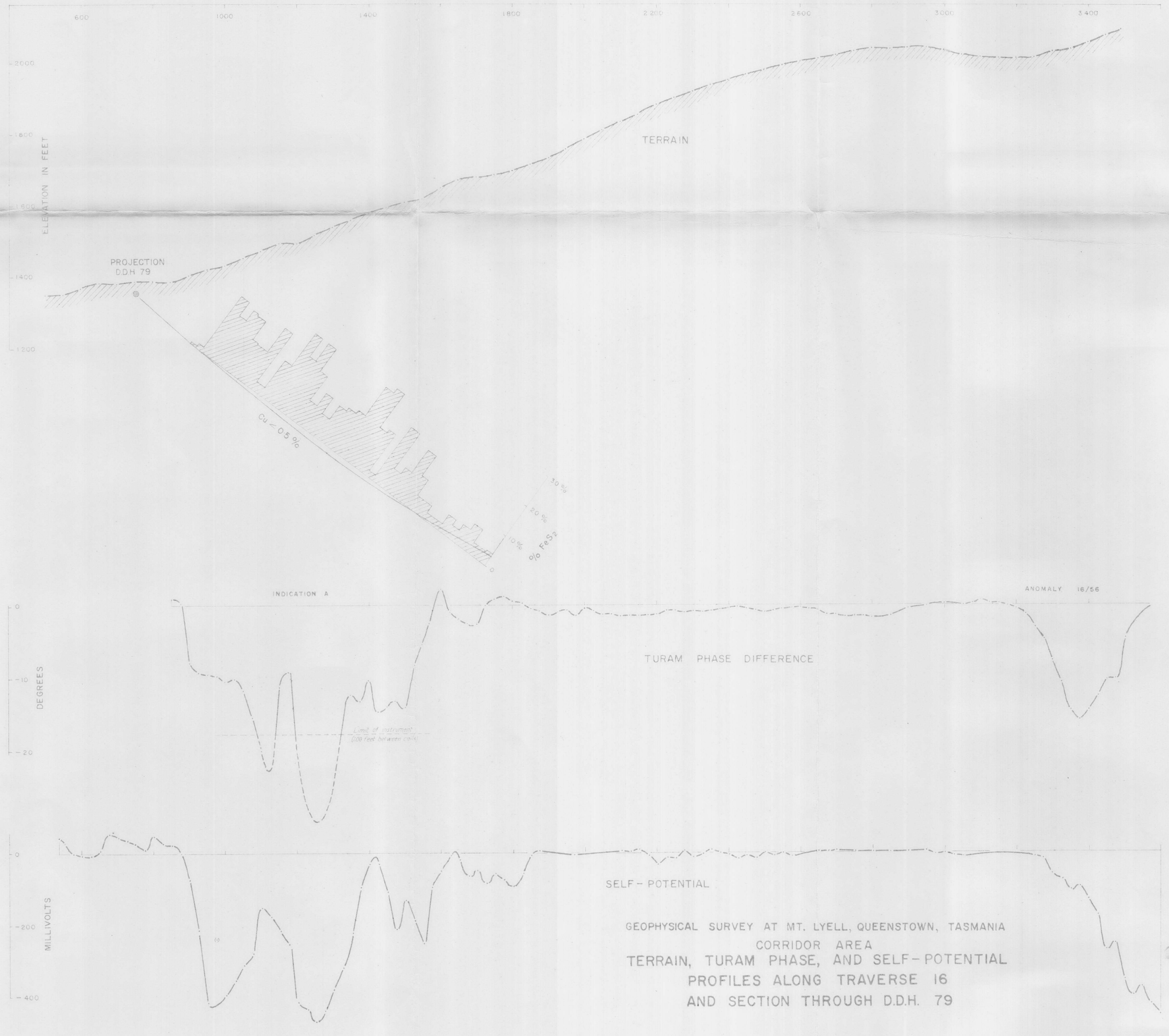
G26-25

PLATE 11
SHEET 2

GEOPHYSICAL SURVEY AT MT. LYELL.
QUEENSTOWN, TASMANIA
CORRIDOR AREA (SOUTH-WESTERN SECTION)

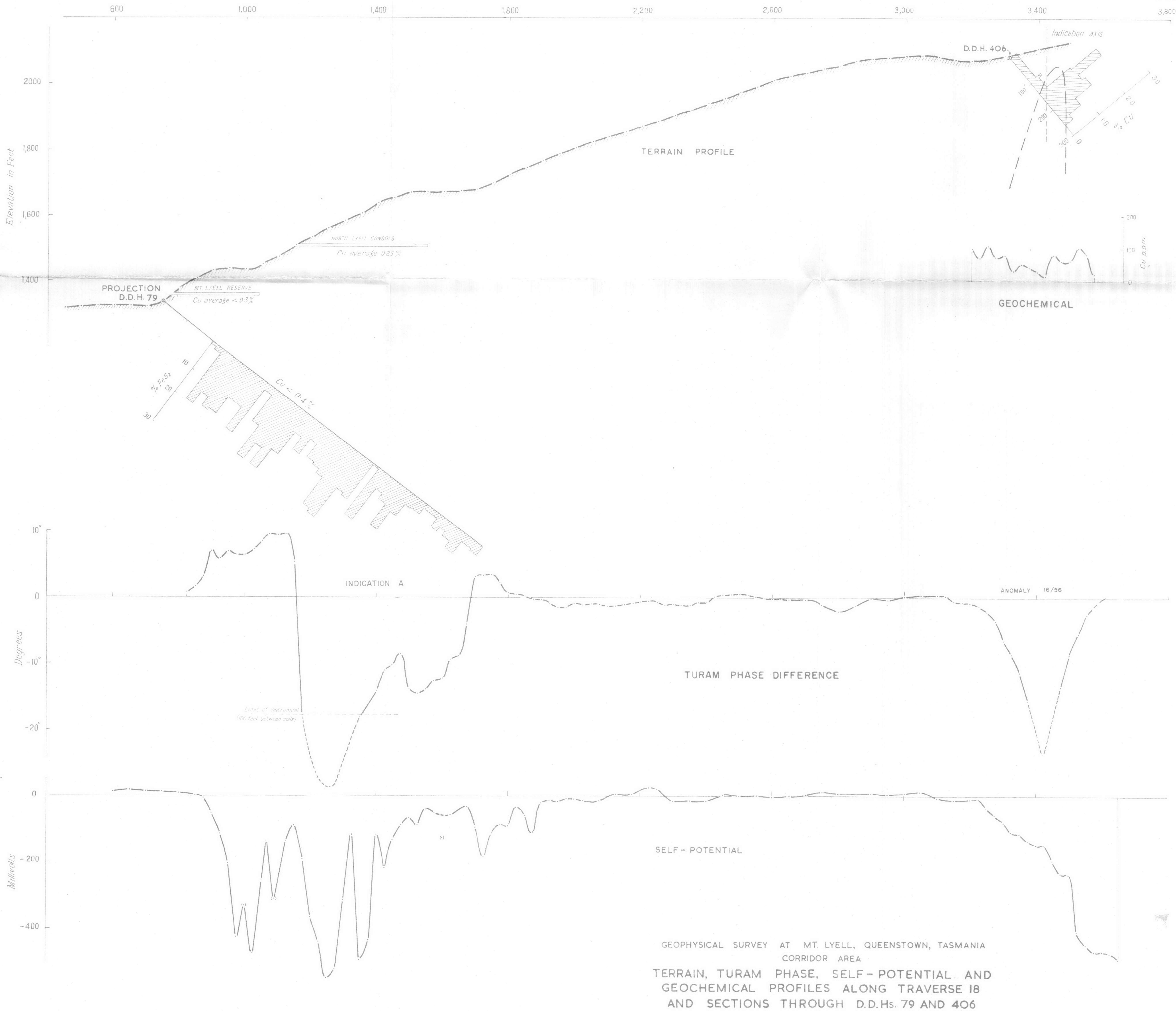
TURAM PHASE CONTOURS

Conglomerate
Schist
Zone 18
Zone 16
Zone 19
Zone 17
Schist-Conglomerate contact (approx)
Indication Zone B
ANOMALY 31/56
FOOTPRINT
ANOMALY
Zone 27
Indication Zone A
LEGEND
-300 to -500 mV
>-500 mV
Equipotential Zone Boundary
SCALE IN FEET
GEOPHYSICIST
GEOPHYSICAL SURVEY AT MT LYELL, QUEENSTOWN, TASMANIA
CORRIDOR AREA
SELF-POTENTIAL CONTOURS
G 26-27



GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA
CORRIDOR AREA
TERRAIN, TURAM PHASE, AND SELF-POTENTIAL
PROFILES ALONG TRAVERSE 16
AND SECTION THROUGH D.D.H. 79

GEOPHYSICIST D.L. Rowston

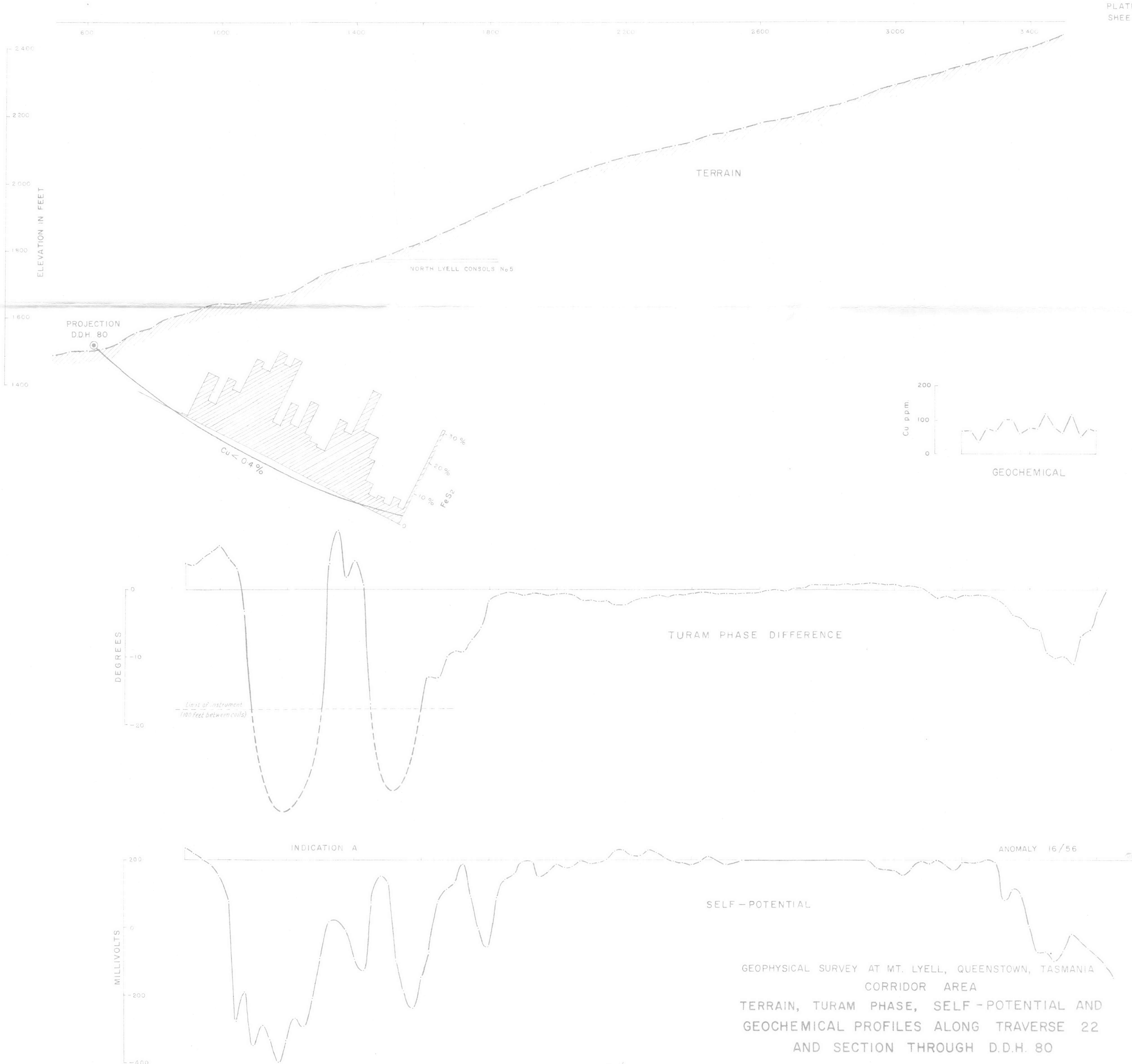


GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA
CORRIDOR AREA

TERRAIN, TURAM PHASE, SELF-POTENTIAL AND GEOCHEMICAL PROFILES ALONG TRAVERSE 18 AND SECTIONS THROUGH D.D.Hs. 79 AND 406

SCALE IN FEET
200 0 200 400 600

GEOPHYSICIST



GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA

CORRIDOR AREA

TERRAIN, TURAM PHASE, SELF - POTENTIAL AND GEOCHEMICAL PROFILES ALONG TRAVERSE 22 AND SECTION THROUGH D.D.H. 80

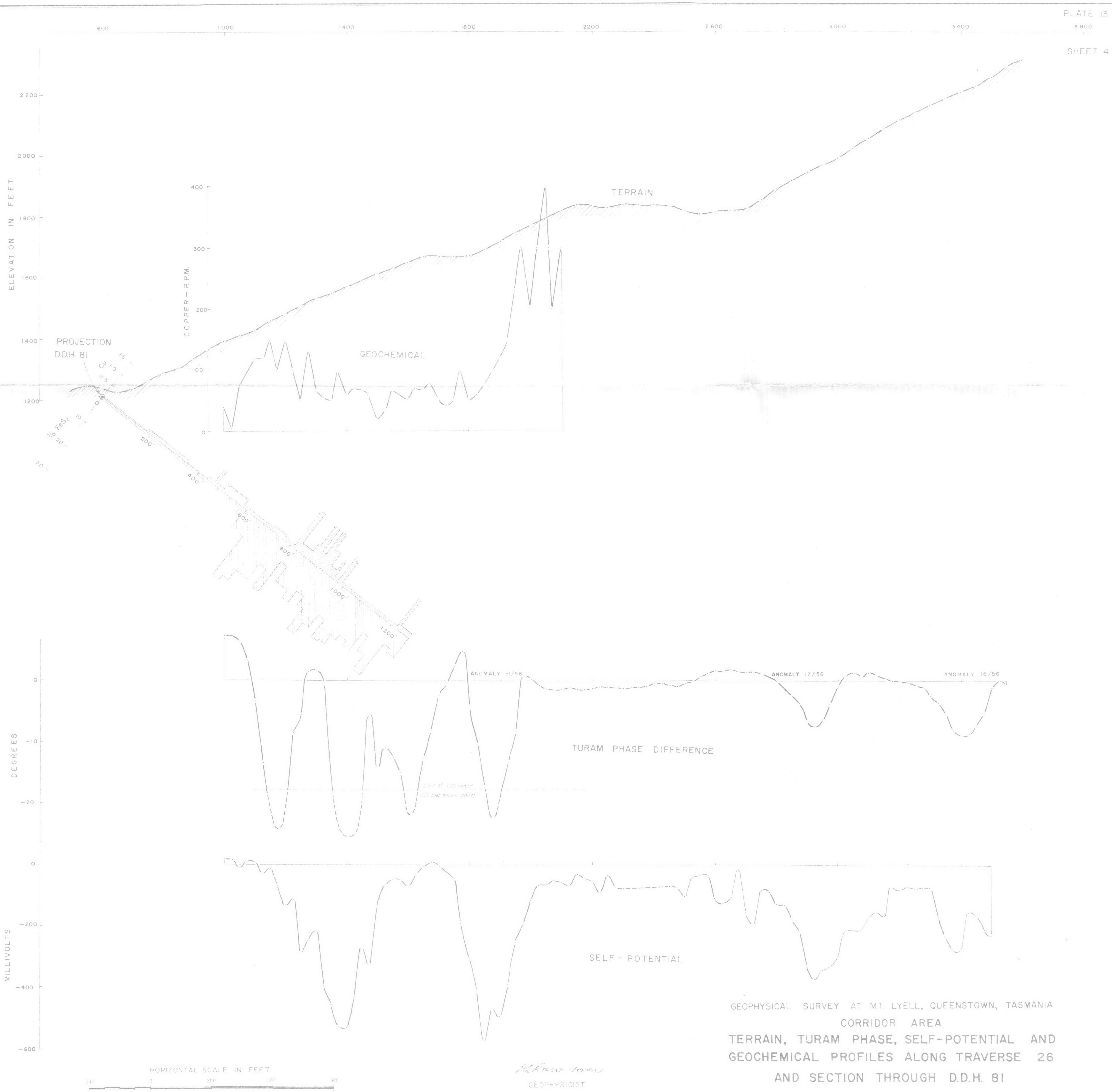
GEOPHYSICIST D. Houston

HORIZONTAL SCALE IN FEET

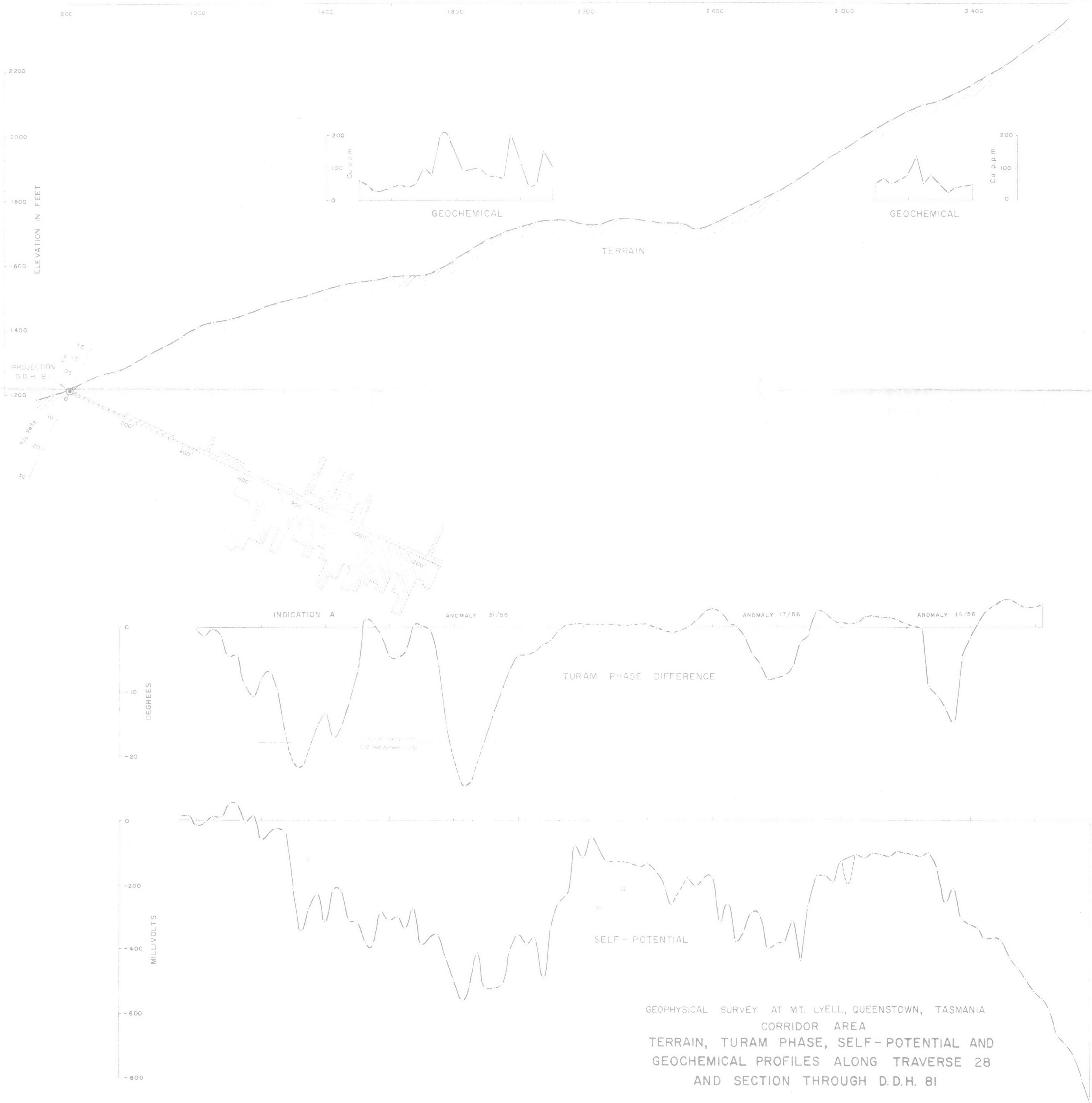
200 0 200 400 600

Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics

G 26 - 43



GEOPHYSICAL SURVEY AT MT LYELL, QUEENSTOWN, TASMANIA
CORRIDOR AREA
TERRAIN, TURAM PHASE, SELF-POTENTIAL AND
GEOCHEMICAL PROFILES ALONG TRAVERSE 26
AND SECTION THROUGH D.D.H. 81



GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA
CORRIDOR AREA

TERRAIN, TURAM PHASE, SELF-POTENTIAL AND GEOCHEMICAL PROFILES ALONG TRAVERSE 28 AND SECTION THROUGH D.D.H. 81

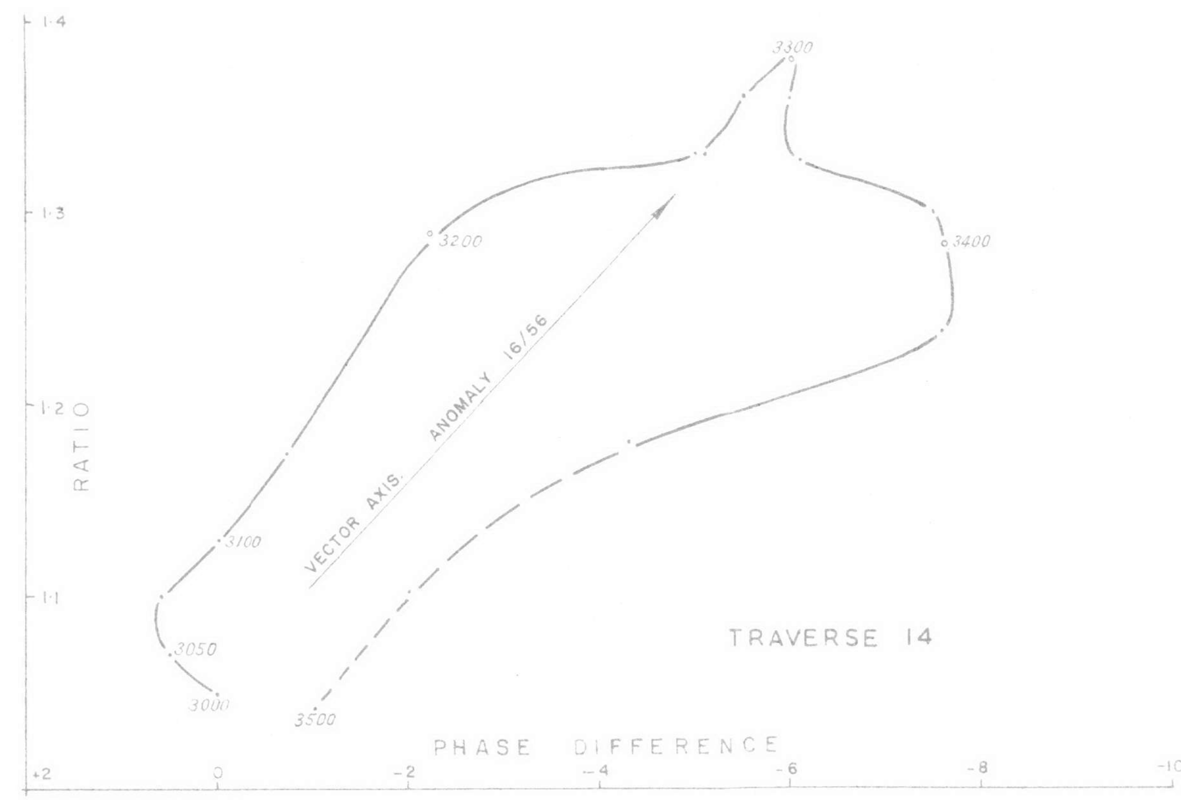
HORIZONTAL SCALE IN FEET
200 0 200 400 600

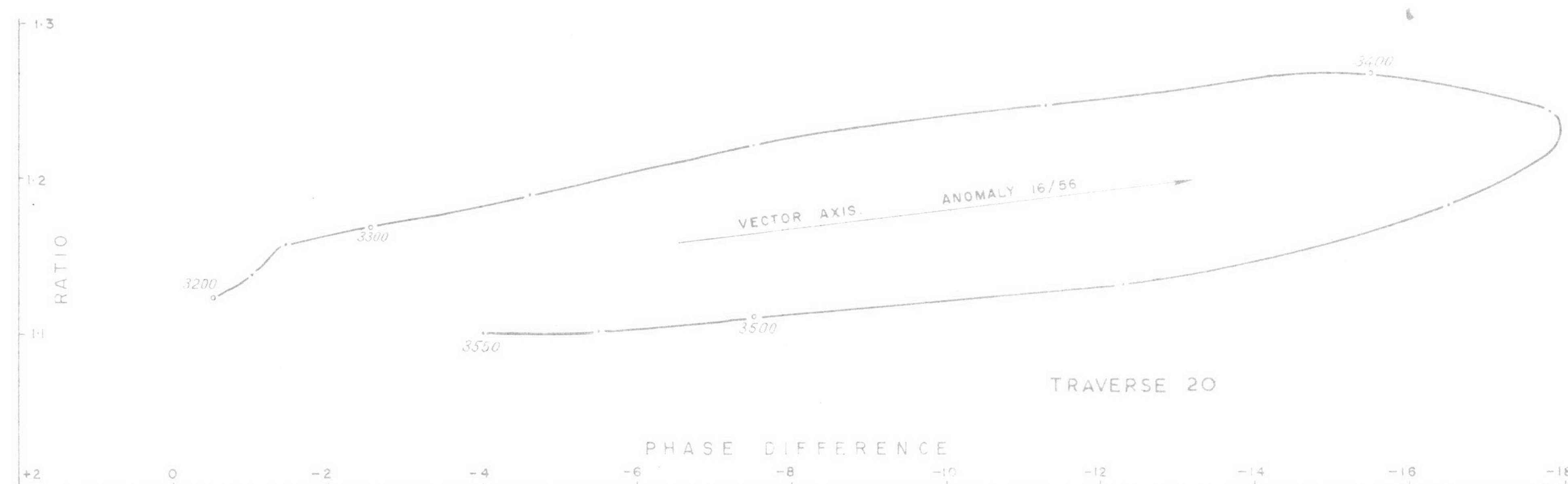
GEOPHYSICIST D.H. Rowston

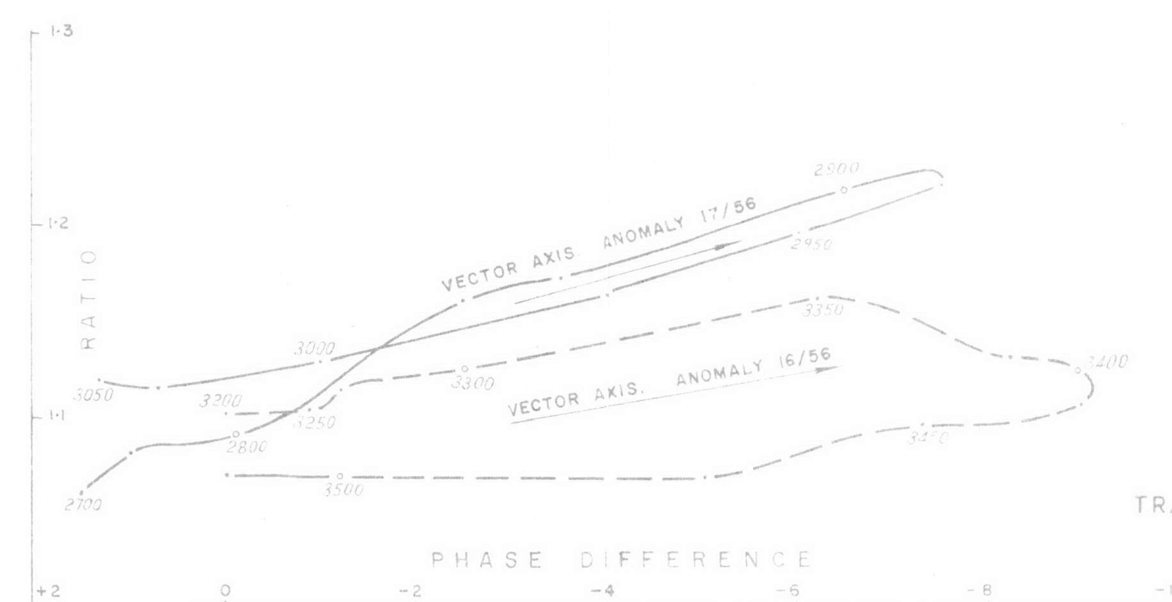
Geophysical Section, Bureau of Mineral Resources, Geology and Geophysics

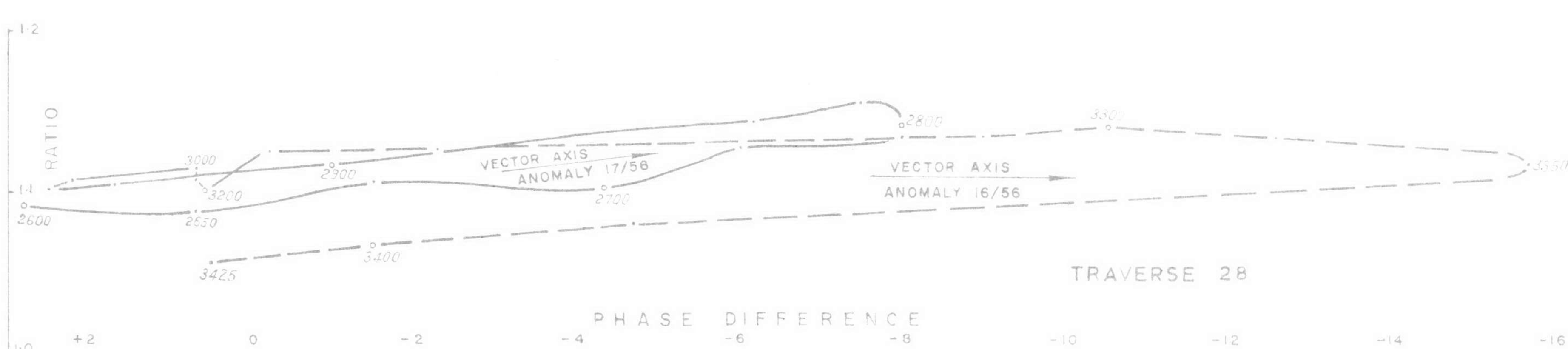
G 26-44

PLATE 14





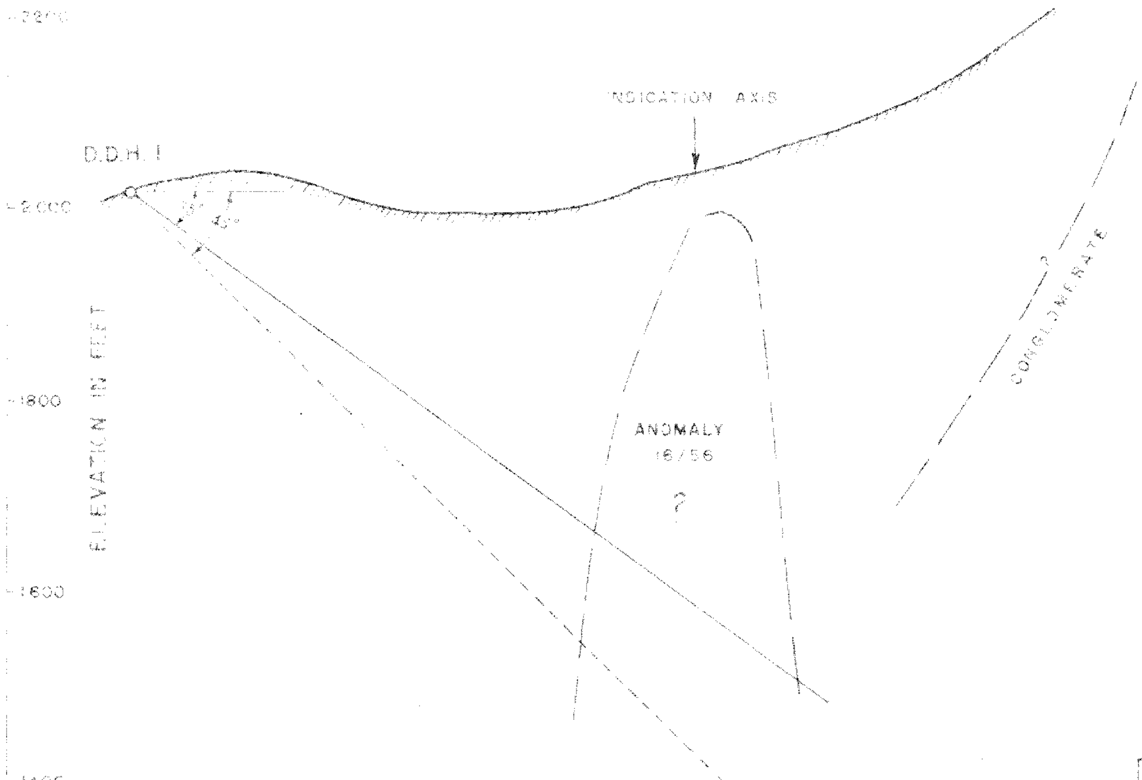




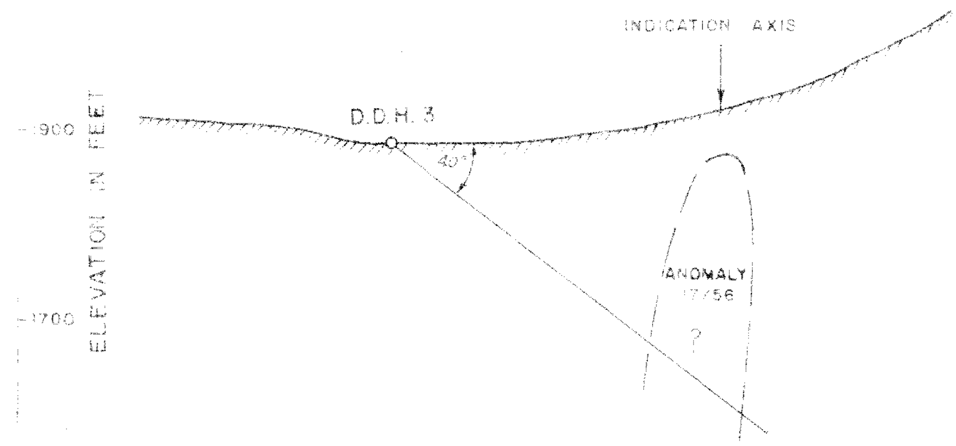
GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA

CORRIDOR AREA
TURAM VECTOR DIAGRAMS

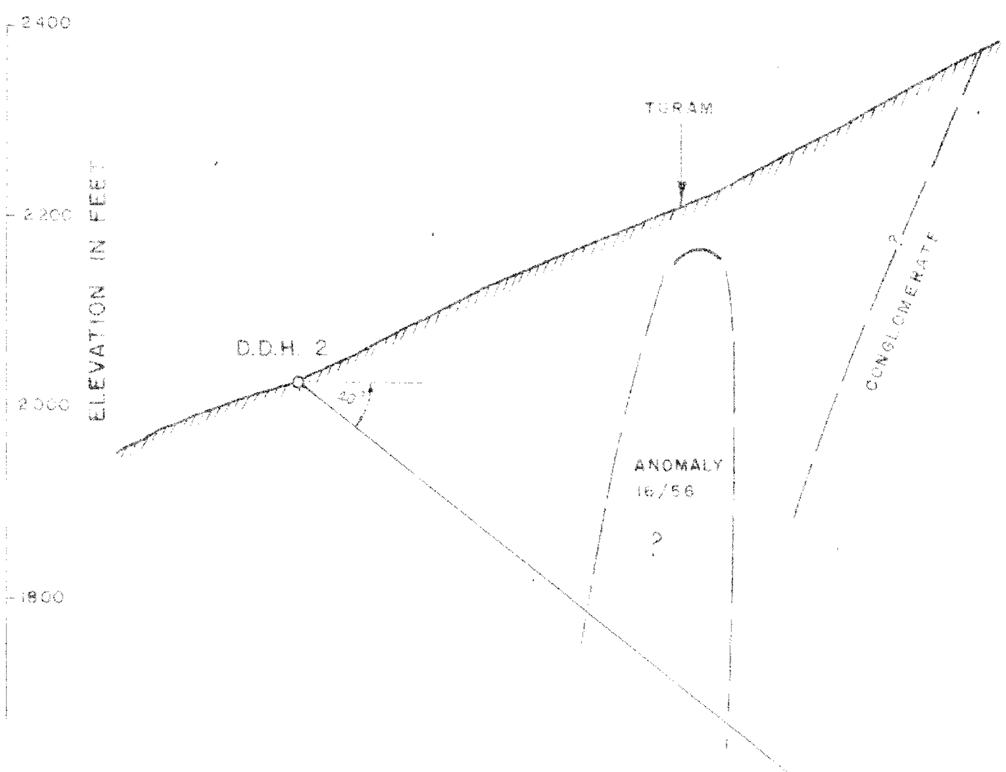
GEOPHYSICIST [signature]



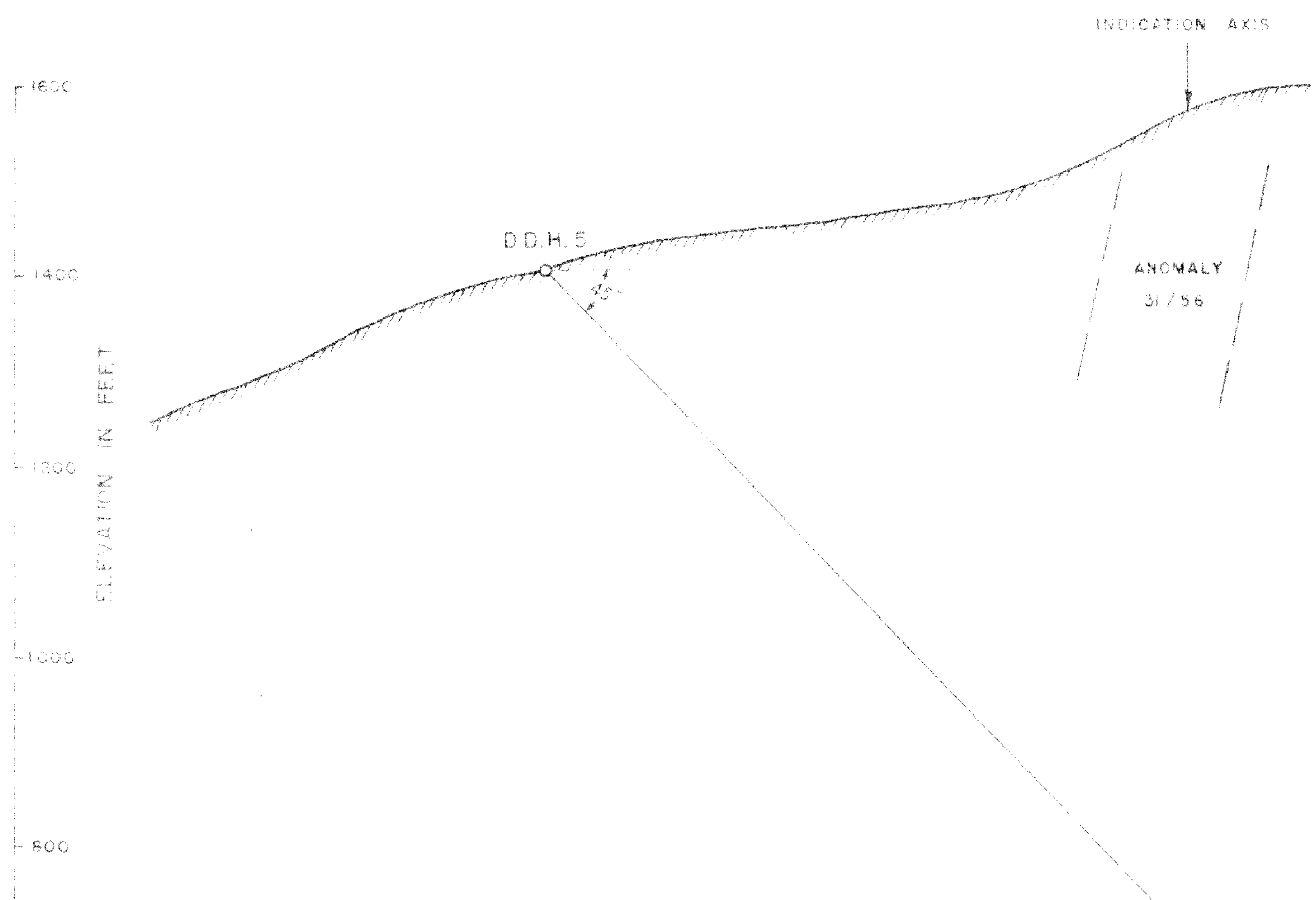
SECTION ALONG TRAVERSE 16



SECTION THROUGH D.D.H. 3



SECTION ALONG TRAVERSE 24



SECTION ALONG TRAVERSE 31

GEOPHYSICAL SURVEY AT MT. LYELL, QUEENSTOWN, TASMANIA

CORRIDOR AREA

SECTIONS THROUGH RECOMMENDED D.D.Hs.

HORIZONTAL AND VERTICAL SCALES IN FEET

200 0 200 400 600

GEOPHYSICIST D.K. Rowston