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A GEOLOGICAL REVIEW

OF THE

TYNDALL EXPLORATION LICENCE 9/66

WESTERN TASMANIA

UNCLASSIFIED

JUNE, 1983

- J.G. PURVIS
- M.T. JONES
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River

ROSEBERY

RENISON BELL

▲ Mt. Murchison

5 cm

ZEEHAN

**E.L. 9/66
TYNDALL J.V. AREA
586 sq. km.
G.F.E.L. - GETTY OIL**

Mt. Tyndall

Mt. Geikie

E.L. 9/66

▲ Mt. Sedgwick

**MT. LYELL
CONSOLIDATED
MINING LEASE
30M 80
11.71 sq. km.**

Henty

River

Mt. Lyell

**E.L. 9/66
BUFFER ZONE
51 sq. km.
MT. LYELL**
Includes 30 sq. km excluded
from Consolidated Mining
Lease & 21 sq. km. Princess
Creek tailings dam area.

Gormanston

▲ Mt. Owen

QUEENSTOWN

STRAHAN

▲ Mt. Huxley

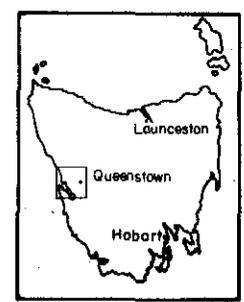
▲ Mt. Jukes

River

▲ Mt. Darwin

MACQUARIE

HARBOUR



0 5 10
Kilometres

GOLD FIELDS EXPLORATION PTY. LIMITED

E.L. 9/66
LOCALITY MAP

FIG. 1

Date: June, 83 | Scale 1:250,000

A4-68

42°00'

T.N.

145°30'

1. SUMMARY (J.G. Purvis)*

The Tyndall Exploration Licence 9/66, covering 637 sq km of the Cambrian Mt. Read Volcanics near the Mt Lyell and Rosebery mines in western Tasmania, has been geologically evaluated by a four-man Review Team.

Mines Department regulations require the reduction of the E.L. to 125 sq km by August 1984 and complete relinquishment by August 1987. The aim of the Review was to identify those areas of prime interest and to design appropriate exploration programmes for them, to meet these time constraints.

The Review involved some 18 man-months of work, 8 of which was spent in helicopter-supported field traversing. Core from almost 50 drillholes was examined, as was the voluminous data from 16 years of systematic exploration.

For the most part, exploration on the E.L. appears to have been reasonably effective. An over-reliance on geophysical surveys has been at the expense of drilling and good geological mapping, which are now the principal techniques required to complete the testing of the E.L.

Several prospective areas, some of which are rated highly, are identified. Recommended work programmes for these areas are outlined in detail. The total amount of drilling specifically recommended is 4,500m. A timetable is given under which these programmes could be completed in three further summer seasons.

Many features of the volcanics and mineralization suggest they largely formed in a sub-aerial to shallow sub-aqueous environment. Such an environment is presently not considered conducive to the formation of massive sulphide bodies. This may explain their relative paucity despite the presence of strong hydrothermal-sulphide systems in many areas of the E.L. Conditions were evidently locally suitable

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for massive sulphide formation, but recognition and testing of these restricted environments is a major exploration problem.

A close spatial and genetic relationship between rhyolitic lava domes and the sulphide systems is noted.

An immediate reduction of the E.L by 40% to around 375 sq km, is recommended. This is achieved by trimming from the western and eastern sides of the E.L., areas in which the exploration potential has been adequately tested.

* Throughout the report those responsible for writing each section are identified. The views expressed however, are those of the entire Review Team.

2. CONCLUSIONS AND RECOMMENDATIONS (J.G. Purvis)

The following summarizes the major conclusions and recommendations for each of the 13 review areas on the E.L. Detailed conclusions and recommendations are given at the beginning of each section on the individual areas.

A suggested timetable for the scheduling of the proposed exploration on the E.L. is outlined in section 2.2. General geological conclusions on the E.L. as a whole are included in section 4.

An immediate reduction in the size of the E.L. from 637 sq km to around 375sq kms, is recommended. The proposed reduced E.L. comprising a JV area of 345 sq km and a Buffer Zone of 30 sq km, is shown in Fig 2. The reduction incorporates the recommended relinquishments detailed below.

2.1 CONCLUSIONS AND RECOMMENDATIONS FOR INDIVIDUAL REVIEW AREAS

SELINA

1. Geologically, the potential for a massive basemetal sulphide deposit at Selina is good. Given the great size and strength of the mineralizing hydrothermal system, such a deposit could be large. In this respect Selina exceeds all other areas seen on the E.L. during the Review.
2. A programme of detailed geological mapping is recommended to define horizons where massive sulphides may have accumulated, and drill them.
3. One such area has already been roughly outlined in the Western Pyrite Zone and 3 drillholes totalling 750m are recommended.

012

RED HILLS

1. The present drill spacing indicates that the massive sulphide body within the Red Hills Basin at RH5 does not exceed one million tonnes.
2. A zone of gold mineralization has been delineated in the vicinity of RH5. Five drillholes indicate around one million tonnes of 2 g/t Au with possible credits from Pb, Zn and Ag. The zone is open at depth and above RH5.
3. Additional drilling of this gold zone is recommended: 2 holes (A and B) to test possible high grade extensions of the gold-bearing massive sulphide in RH5, and 2 holes (C and D) to test the down dip extension. Holes A and B would be 150m and 200m long. Holes C and D would be 400m long. The drilling of hole D should be conditional on satisfactory results being obtained in the other 3 holes.
4. Potential still exists for the discovery of a massive sulphide in the southern part of the mineralized Red Hills Basin sequence. It is recommended that the southern extension be spatially tested by 2 diamond drillholes (E and F), each 250m long.

JUKES-DARWIN

1. 250,000 tonnes of copper-gold mineralization grading 1.25% Cu, 1.2 g/t Au, is indicated at the JUKES PTY. prospect. The mineralized zone is open to the south and at depth, and potential exists to develop sufficient tonnage for a viable orebody. Two drillholes totalling 500m are recommended as an initial test of this potential.

013

2. Jukes-Darwin includes the largest area of under-explored prospective volcanics remaining on the E.L., in the GARFIELD and CURRIE VALLEYS. The valleys contain altered and mineralized volcanics with stringers of massive sulphide and a three-year programme of systematic exploration is recommended.
3. On the Jukes-Darwin Ridge, significant gold values have been discovered in stockwork mineralization in the lavas on MT. DARWIN. These need to be evaluated by further sampling.
4. The extensive copper-gold mineralization at the EAST DARWIN prospect is too weak to be of interest. All the volcanics east of the lavas of the Jukes-Darwin Ridge, should be excised from the E.L.
5. Despite the presence of pyritic black shales and other sediments within the volcanics of the CLARKE VALLEY, the consistent lack of base-metals emphasizes the low prospectivity of these rocks. This area should also be excised from the E.L.

HUXLEY

1. There is an untested potential for stratiform base metal mineralization extending south from Nasty Knob close to the Owen Conglomerate contact. Initially two drillholes totalling approximately 400 metres are recommended to test this zone.
2. Reconnaissance mapping and a programme of rock chip and stream sediment geochemistry to the east and west of Mt. Huxley is recommended to outline zones that may merit more detailed exploration. Several gold stream sediment anomalies occur in this area.

014

3. That part of the area west of 145° 34' and the area of Owen Conglomerate to the north-west, do not merit further work and should be relinquished.

HENTY FAULT ZONE

1. Holes HFZ 6, 9, 10 and surface exposure, delineate a pyritic massive sulphide body at least 300m long, 100m wide and from 0.5 - 1.5m thick, open at depth and to the south. The Henty Fault parallels the body, being localised within the soft rock of the hydrothermal alteration zone beneath it.
2. This feature, and the consistent thinness of the massive sulphide, make it an unattractive exploration target and no further work to test it can be recommended.
3. Gold grades in the southernmost holes HFZ 10, (up to 7 g/t Au over 0.6m and 5 g/t Au over 1.1m), indicate a southward trend of increasing gold content in the 35m thick host sequence. There is sufficient room and potential for the existence of a body of economic gold mineralization in the 800m undrilled gap between HFZ 10 and HFZ 3. At 275m drillhole is recommended to test the host sequence 200m south of HFZ 10.
4. The geology at the northern and southern ends of the Henty Fault Zone, is difficult to correlate with that in the vicinity of the massive sulphide body. No exploration potential remains in these areas.

HOWARD'S ANOMALY

1. The 200-400m wide Sulphide Zone defines the

prospective units at Howard's Anomaly. The area of highly anomalous zinc soil values located within the zone on the south bank of Newton Creek, warrants immediate drilling.

2. The zinc anomaly is due to grains of zinc sulphide (with pyrite) within the soil, clearly locally derived from either massive sulphide or strongly disseminated sulphides. Flanking IP anomalies confirm that the source is local.
3. Two 200m drillholes are recommended to test for the source of the zinc anomaly.
4. No drilling can be recommended elsewhere within the Sulphide Zone. Further evaluation of the zone would require upgrading the geological and geochemical coverage which in places is unreliable and patchy. This should be undertaken only if encouragement is received from the drilling of the zinc anomaly.
5. The silver mineralization within the Silver Zone at Howard's has no economic potential.

BASIN LAKE

1. A linear Sulphide Zone exists beneath glacial cover in the eastern Basin Lake area. Bedded, massive pyrite has been intersected within this zone in BL4. This horizon warrants further testing to evaluate the massive sulphide potential along strike.
2. Two holes (totalling 450m) are proposed to test the horizon at least 250 metres along strike to the north and south of BL4.

016

3. A third hole (250m) is recommended approximately 400 metres to the south of BL1, to test the massive sulphide potential of the southern end of the Sulphide Zone.

WEST SEDGWICK

1. Highly altered and pyritic zones identified in the eastern part of the West Sedgwick area are suggestive of the sulphidic envelopes associated with massive sulphide bodies. To date only minor base metal values have been obtained from these zones.
2. The belt may extend north beneath thick moraine to the Basin Lake Sulphide Zone. Although no work is recommended at West Sedgwick at present, this eastern sector should be retained pending evaluation of the Sulphide Zone in the Howard's Anomaly - Basin Lake area.
3. In contrast the western half of West Sedgwick appears unprospective, and should be relinquished.

BEATRICE

1. The NW sector of the Beatrice grid centred on Itat Creek, is the only area warranting further exploration. The geology shows similarities to that at Red Hills.
2. The potential of this area is dependent on the geological interpretation applied. It is recommended that detailed geological mapping be undertaken in this area, the aim being to determine which interpretation can be substantiated. This work would take about 4 weeks, and enable a decision to be made as to whether further drilling should be undertaken at Beatrice.

017

3. The potential to outline a body of gold mineralization (analogous to that at Red Hills), is very real. Systematic assaying for gold of existing sample pulps is recommended.

DORA-SPICER

1. No significant mineralization has been discovered here, and geological considerations confirm the lack of prospectivity of the volcanics. It is recommended that the area be relinquished from E.L. 9/66.

WHITE SPUR

1. The Western and Central parts of the White Spur area appear unprospective from geological considerations. The main geophysical and geochemical anomalies have been tested and adequately explained, confirming the geological interpretation. These areas should be relinquished.
2. The Eastern White Spur area contains favourable lithologies in a good geological setting (i.e.: possible time equivalence with the deposition of Rosebery), but testing has failed to indicate significant mineralization. Further work on this area cannot be recommended.

HENTY RIVER - WEST TYNDALL

1. The Henty River - West Tyndall area is made up of a fault-bounded wedge of Cambrian volcano-sedimentary lithologies not directly related to the main Mt. Read Volcanics.

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2. Drilling in the vicinity of old workings in the Henty River gorge has indicated a maximum potential of 1.5 MMT of 6% Pb + Zn for the mineralization, which as such does not warrant further work.
3. No other mineral potential has been identified in the area. It is therefore recommended that the Henty River - West Tyndall area be relinquished from E.L. 9/66.

HENTY-YOLANDE

1. Geological considerations suggest that the rocks of the Henty-Yolande area have little potential for hosting massive sulphide deposits.
2. Gold mineralization here is economically unimportant. No other mineral potential is evident. It is recommended that the whole area be relinquished.

2.2 RECOMMENDED TIMETABLE FOR COMPLETION OF EXPLORATION

The scheduling of further exploration on the E.L. is governed by two important Mines Department requirements:

1. The reduction to 125 sq km due 5th August, 1984.
2. The relinquishment of the E.L. due 5th August, 1987.

Efficient exploration on the E.L. is limited by weather and ground conditions to a period of intense activity over the summer season from January to March. This particularly applies to drilling.

The meeting of the first Mines Dept. requirement is likely to prove the most difficult, given that only one seasons work is left before the reduction.

All the proposed work could be completed as early as the 1985-86 summer season, even allowing for some encouragement and expansion of the programme during the course of exploration. Activity will be at a high level in 1983-84 and 1984-85, with a marked scaling down in the 1985-86 season.

The programme for the 1983-84 season is particularly important, as exploration must not only be undertaken on those areas of greatest interest, but must also be undertaken on those areas of large extent even if these seem of lesser priority.

It is suggested in 1983-84 the drilling required to complete the testing of Red Hills, Henty Fault Zone and Howard's Anomaly be undertaken, with a view to relinquishing these areas as a block in the 1984 reduction if results are bad. This scheduling is justifiable on exploration potential priorities anyway.

The size of the Selina system makes it unlikely that an exhaustive test could be achieved in one seasons drilling. The potential of Selina makes drilling in 1983-84 desirable, and the area should almost certainly be part of the reduced E.L.

The Basin Lake drilling is recommended to be held over until the 1984-85 season only because of the heavy work commitments already suggested for the 1983-84 season. This means the Basin Lake - West Sedgwick areas should also form part of the reduced E.L. after August 1984.

A problem area north of Queenstown is Beatrice. A large amount of ground is being held pending clarification of the potential of the Beatrice prospect and the aeromagnetic anomaly NE of Mt. Sedgwick.

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It is important that the geological mapping required be undertaken in the 1983-84 season, so a decision on the area is taken prior to the E.L. reduction.

The same comments apply to much of the Jukes-Darwin area south of Queenstown. Large reductions in this area are necessary to get the E.L. down to 125 sq km. The drilling programme at Jukes Pty., the sampling of Mt. Darwin, and the geological mapping in the Garfield and Currie Valleys, should all be undertaken in 1983-84 so that the ground worth retaining is clearly defined.

The Garfield and Currie Valleys could well be the longest-lived of all the project areas on the E.L., given that exploration is essentially only just commencing there. Under the envisaged schedule, detailed ground work would be undertaken in 1984-85, with drilling in 1985-86 season, leaving one further season to complete any necessary follow-up drilling. Given the logistical constraints in this difficult area, it is almost impossible to compress the programme into a shorter time - unless of course, initial results are not encouraging.

Huxley will have to be retained within the reduced E.L. as the potential there will take at least two, and possibly three seasons to evaluate. The geological mapping at south Huxley and initial drilling at north Huxley should be undertaken in the 1983-84 season, because of the potential of this area as well as the time constraints.

SUGGESTED SCHEDULE OF EXPLORATION E.L. 9/66

1983-84 Season:

SELINA - Geological mapping and initial drilling.

RED HILLS - HFZ - HOWARD'S ANOMALY - Drilling (Completes?).
BEATRICE - Geological mapping (Completes?).
HUXLEY - Geological mapping and initial drilling.
JUKES PTY. - Drilling (Completes?).
GARFIELD/CURRIE - Geological mapping.
MT. DARWIN - Rock sampling (Completes?).

-- REDUCTION OF E.L. TO 125 SQ KM. --

1984-85 Season:

SELINA - Drilling (Completes?).
BASIN LAKE - Drilling (Completes?).
HUXLEY - Drilling. Detailed ground surveys.
GARFIELD/CURRIE - Detailed ground surveys.
BEATRICE? - Drilling? (Completes?).

1985-86 Season:

HUXLEY - Drilling (Completes?).
GARFIELD/CURRIE - Drilling.

1986-87 Season:

GARFIELD/CURRIE? - Drilling? (Completes).

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3. INTRODUCTION (J.G. Purvis)

The Tyndall Exploration Licence 9/66 covers 637 sq km of the Cambrian Mt Read Volcanics and associated rocks, in western Tasmania. The licence extends southwards for 55 km from just south of Rosebery and surrounds the Mt. Lyell Consolidated Mining Lease (see Fig. 1). A 51 sq km 'buffer zone' around the Mining Lease is excluded from the 586 sq km of the E.L. which comprises the G.F.E.L. (60%) - Getty Oil (40%) Joint Venture. The Review covered the Joint Venture area.

Since it was pegged in 1966, E.L. 9/66 has been enlarged by the incorporation (in 1978) of E.L.'s 10/69, 41/71 and 21/76. Since May 1976 the E.L. has been the subject of a Joint Venture with Getty Oil. Total expenditure between February 1967 and June 1983 is around \$4.13 million. Exploration has been continuous and a large proportion of the E.L. has been systematically gridded and explored, producing an enormous amount of technical data.

Sixty-four diamond drillholes totalling over 18,000m have been put down. Although significant intersections have been made, including the delineation of syngenetic massive sulphide bodies at Red Hills and Henty Fault Zone, no orebodies have been discovered.

Under new regulations brought in by the Mines Department in 1982, the Tyndall E.L. is required to be reduced to 125 sq km by August 1984, and completely relinquished by August 1987. The Review was conceived partly as a response to these new regulations and partly because it was considered timely to review the state of exploration on the E.L.

During a visit to the Jukes-Darwin area with Dick Sillitoe (Consultant) in November 1982, it became clear that an evaluation by experienced geologists of the volcanic

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environments and facies in the various prospective areas of the E.L., was fundamental to the success of the Review. Much of the existing geological data was superficial or inaccurate, and did not allow exploration results to be put in context.

The Review Team was formed in January 1983 with the aim of identifying those areas of prime interest and designing appropriate exploration programmes for them. The Team was asked to complete the Review by June.

The Team comprised:

- Gerald Purvis - Senior Geologist, G.F.E.L. (Team Leader)
- Mel Jones - Senior Geologist, G.F.E.L.
- Fergus FitzGerald - Geologist, Getty Oil.
- Roger Poltock - Contract Geologist.

The following rough economic guidelines were used by the team to assist them in making judgments on the merits of the various prospect areas. The guidelines were not rigidly applied, nor were they intended to be. Every area and prospect has its own positive and negative features which have also to be taken into account.

<u>TARGET DEPOSIT</u> <u>TYPE</u>	<u>GRADE</u> <u>REQUIRED</u>	<u>MINIMUM</u> <u>DESIRABLE DEPOSIT SIZE</u>
MT LYELL TYPE	~2%Cu equivalent	around 10 mt.
GOLD	+ 1 g/t Au	approx. 15 million gms.
MASSIVE SULPHIDE	~20% Pb + Zn	3 mt.

The E.L. was divided into 13 areas (see Fig. 2), and a file prepared on each summarizing the results of previous

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exploration. These files were used as a guide during the period of field traversing and drillcore examination, which extended from 4th January to 4th March. A helicopter was utilized for logistical support for greater efficiency. The Team made extensive notes, took samples for geochemical and petrological analysis, and had over 500 existing sample residues further analysed - mainly for gold. Subsequent to the field work, the data on those areas not clearly unprospective, was gone through in detail. In some cases plans and sections had to be drawn up to enable conclusions to be made on difficult areas.

Throughout the Review, an attempt was made to maintain a geological basis for the evaluation of each area, by analysis of the depositional environment and setting of the mineralization. The Review can not be considered 100% exhaustive, given the time constraints, the size of the E.L. and the enormous amount of data from previous exploration.

The report is subdivided into the 13 exploration areas on the E.L. Additional comments on the Red Hills, Henty Fault Zone and Huxley areas, which were all included in the project work carried out this year, can be found in the E.L. 9/66 Annual Report for 1982-83.

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4. GEOLOGY (J.G. Purvis)

4.1. STRATIGRAPHY AND GEOLOGIC SETTING

It is apparent some fundamental revisions are required of the stratigraphy and rock unit relationships currently proposed for the Mt. Read Volcanics in the E.L. area.

The essential elements of the stratigraphy are three fold:

Lower Ordovician to Upper Cambrian	OWEN CONGLOMERATE	Quartzite pebble conglomerate
	- ? Conformity ? -	
Middle to Upper Cambrian	MT. READ VOLCANICS	Andesitic to rhyol- itic volcanics and associated sediments.
	- Unconformity -	
PreCambrian	METAMORPHOSED SEDIMENTS	

Normally, an unconformity is placed between the Mt. Read Volcanics and the Owen Conglomerate. While this is true in many areas, the last-formed volcanics (e.g.: the Selina Belt) have a conformable relationship with the Owen. It is here suggested that the unconformity occurs within the volcanics.

The Mt. Read Volcanics are currently subdivided by Corbett (1981) into a (lower) Western Sequence, Central Sequence, and (upper) Eastern-Sequence/Tyndall Group. These subdivisions may be more geographic than stratigraphic. In many cases units placed in these various sequences show complex inter-relationships not suggestive of major divisions. There are problems particularly with the Tyndall Group, originally defined as an unmineralized group of quartz-phyric volcanics unconformably overlying the mineralized volcanics at Mt. Lyell.

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The huge volcanogenic hydrothermal-sulphide system at Selina is in volcanics which are apparently Tyndall Group equivalents. In the Howard's Anomaly and Henty Fault Zone areas, Tyndall Group volcanics have a conformable and transitional contact with mineralized volcanics mapped as Central Sequence.

It is considered that the Mt. Read volcanics on the E.L. comprise the variably-preserved and complexly inter-related products of numerous over-lapping eruptive centres of andesitic to rhyolitic volcanism. This volcanism apparently spanned many millions of years.

The contact relationship between the volcanics and the Owen Conglomerate, which varies from conformable to high-angle unconformable, suggests volcanism did extend over a considerable time span interspersed with periods of structural disturbance, collapse and uplift. It seems highly probable that the bulk of the volcanics we now see comprise products of the younger eruptive centres, interspersed with remnants from older events. An enormous amount of erosion of the volcanics seems to have occurred - probably during pauses in the volcanism.

This is best demonstrated in the vicinity of the Cambrian Darwin Granite at the southern end of the E.L. The granite intrudes rhyolite lava domes which are stockworked with magnetite - hematite - sulphides not spatially or genetically related to the granite. In adjacent domes these stockworks are seen to be products of a syn-volcanic de-gassing process that occurred at surface, and affected nearby contemporaneously - deposited sediments which contain lava fragments. The exposure of the granite implies that the domes at the present surface were once covered by from 1-3 km of volcanics (a 'stack' of

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domes?) (Sillitoe pers. comm.), and that this volume of volcanics has been stripped off to expose the granite. If Corbett (1979) is correct in suggesting the eastern contact of the granite is an erosional unconformity overlain by later volcanics, then the stripping-off of the 1-3 km of volcanics occurred during breaks in the volcanism.

Given losses from the rock record on this scale, it is obvious that correlation of the volcanics between the various areas on the E.L., and interpretation of the overall geological setting, is exceedingly difficult. Surprisingly, it is possible to correlate some areas along strike e.g.: the Selina-Dora Spicer areas, the Howard's Anomaly-Basin Lake areas, and (possibly) the Red Hills-Beatrice areas. Correlations across strike are impossible for almost all areas.

It would perhaps be more realistic to attempt to define the major eruptive centres and map out their products and associated sediments, than to try and fit regional divisions and an overall stratigraphy to these volcanics.

4.2 GEOLOGICAL SETTING OF THE MINERALIZATION

Most evidence points to the volcanics having been deposited in sub-aerial to shallow sub-aqueous conditions (Jones pers. comm.). Welded and unwelded ignimbrites are widespread and voluminous. The apparent paucity of massive sulphide on the E.L. despite the presence of many large and strong hydrothermal-sulphide systems, would confirm that the environment was only locally suitable for massive sulphide formation. That ignimbritic terrains are prospective (this one in particular), is not in doubt given the presence of the Mt. Lyell and Rosebery orebodies in these rocks.

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Sillitoe (pers. comm.) suggests the widespread disseminated sulphides possibly formed in a 'sulphide spray' caused by boiling of the ore fluids in a shallow sub-aqueous environment. Current thinking is that water depths of at least 90-300m are necessary to prevent boiling. Shallow sub-aqueous conditions probably also favour sub sea-floor deposition (Mt. Lyell Type) rather than syngenetic massive sulphide accumulation (Sillitoe 1982).

Interpretation of the geological environment is a major problem in rock identification for the field geologist working with the highly-deformed hydrothermally-altered Mt. Read Volcanics. Truly-welded ignimbrites are often difficult to recognise because of the formation of 'pseudo autaxitic' textures by the schistose deformation of altered rocks. This deformation flattens pumice and even lithic fragments, producing 'fiamme-like' features. These have been noted in clearly bedded sedimentary rocks.

Given the uncertainties, the presence of bedded massive sulphides (however small), is obviously the most important indicator of a favourable depositional environment (essentially regardless of whether other evidence seems to be to the contrary). This is well demonstrated by the massive sulphide (2.8m @ 45% Pb + Zn) in the Red Hills Basin, which occurs in a 10m wide tuffaceous sediment host horizon flanked by apparently-welded ignimbrites. This sequence of units is repeated throughout the Red Hills Basin and the whole E.L. In many cases (including the Red Hills host horizon), the ignimbrites are often more strongly mineralized than the adjacent sediments - a feature for which there is no explanation at present.

There is a marked spatial and genetic relationship between rhyolite lava domes and sulphide mineralization

(including massive sulphide) in adjacent basinal rocks, e.g.: Red Hills, Jukes Pty. The mineralization in the domes themselves comprises Cu-Au in hematite-magnetite-sulphide stockworks accompanied by chloritic alteration. The mineralization in the the basinal rocks is mostly of Pb-Zn-Au type in the northern part of the E.L., and Cu-Au type in the Jukes-Darwin area to the south.

Some of the most significant mineralization occurs in the volcanics in close proximity to the Owen Conglomerate boundary e.g.: Garfield River, Huxely, Selina and of course, Mt. Lyell itself. This association has long been recognised but never satisfactorily explained.

Generally most mineralization in the volcanics contains significant gold values and the potential for an economic gold deposit is quite high. The systems where gold is not present (e.g.: Selina, Howard's Anomaly) may be highlighting differences in age between the volcanics within the belt. The one known gold-only system which is in any way comparable to volcanogenic bulk low-grade gold occurrences in other volcanic areas, is around Mt. Ellen in the Huxley area. However the system is extremely weak and appears deeply eroded.

An interesting form of volcanogenic silver mineralization occurs at Howard's Anomaly, where erratically-distributed silver values are associated with chloritisation and hematisation of tuffaceous sediments and ignimbrites. The mineralization appears partly syngenetic and partly of replacement type, and was possibly related to fumarolic hydrothermal activity in shallow sub-aqueous conditions.

It is felt that because volcanogenic precious metal deposits often form subaerially or in shallow lacustrine

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environments at high levels in the volcanic pile,
they would be particularly susceptible to erosion
(Jones, pers. comm.).

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5. SELINA (J.G. Purvis)5.1 SUMMARY

This very large mineralized hydrothermal system is one of the most prospective areas remaining on the Tyndall EL.

Dispersed pyrite and magnetite, with minor basementals, occurs throughout the Selina volcanics but is concentrated in two parallel linear zones - the 4 km long Western Pyrite Zone (W.P.Z.) and the 3.5 km long Eastern Pyrite Zone (E.P.Z.). Eight drillholes have been put down in these zones since 1969, in conjunction with intensive geological, geochemical and geophysical surveys. Exploration ceased in early 1982.

The weak link in the exploration to date is geology. The volcanic setting of the mineralization has not been understood and the areas in which massive sulphides could have been deposited have not been defined.

Within the W.P.Z., which as currently known comprises stockwork style footwall mineralization, the Review has highlighted extensive untested areas in which, on geological grounds, massive basemetal sulphides could occur. Because the stockwork mineralization is so extensive and strong, it is felt any massive sulphide body present could well be large.

A programme of detailed geological mapping is recommended for the Selina volcanics to place the known mineralization in its geological context and to define horizons where massive sulphides may have accumulated, and drill them.

Such areas have already been roughly outlined in the Western Pyrite Zone and will require drilling. Initially perhaps 3 drillholes totalling 750m are warranted.

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5.2 CONCLUSIONS AND RECOMMENDATIONS

1. Geologically, the potential for a massive basemetal sulphide deposit at Selina is good. The mineralization is strong and extensive, basemetals are a minor but ubiquitous component, the volcanic setting is right, and there are substantial prospective areas which have not been tested.
2. Given the great size and strength of the mineralizing hydrothermal system, such a deposit could be large. In this respect Selina exceeds any other area seen on the Tyndall EL during the Review.
3. A thin strip along the western side of the Western Pyrite Zone is considered to be one area where a massive sulphide body could be present, and drilling is recommended. Three holes totalling approximately 750m would be required to do this.
4. The geological setting of the mineralization is not sufficiently well known at this time to position these holes or to adequately evaluate the potential of the other mineralized areas at Selina.
5. A programme of detailed geological mapping is recommended in the mineralized area, prior to drilling. Existing geochemical and geophysical data will be important in the generation of drilling targets but no new surveys are required.

5.3 GEOLOGICAL SETTING

The Selina volcanic belt is 10 km long and averages 1.5 km in width. It extends from the Cambrian Murchison granite in the north, to the rhyolite lava complex around Lake Dora in the south.

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The gross facing of the volcanics is to the west. To the east the volcanics are underlain by Cambrian sediments which rest unconformably on Precambrian basement. The Cambrian sediments were derived from the Precambrian quartzites and schists, and comprise an upwards-fining sequence of conglomerate, sandstone, siltstone and black shale. These sediments were considered by Mt. Lyell geologists to be Lower Cambrian Success Creek Group correlates, but for reasons given later, the Review Team agree with Corbett (pers. comm.) that they are probably Middle to Upper Cambrian in age. The contact between the sediments and the volcanics is conformable and transitional.

The volcanics are quartz and feldspar-phyric rhyolites and dacites typical of the Mt. Read Volcanics - lavas, ignimbrites, pyroclastics, with minor volcanoclastic sediments and tuffs. Because of their generally quartz-phyric nature Corbett separates them from the largely feldspar-phyric rhyolitic volcanics which predominate to the west of Selina along the central axis of the Mt. Read Volcanics (Central Sequence of Corbett).

A distinction based on the presence or absence of quartz phenocrysts could be considered a bit artificial (the type of volcanism at Selina is identical to that in the Central Sequence, and the Selina volcanics are not always quartz-phyric), however the distinction is confirmed by what appears to be a very real age difference between the Central Sequence and the Selina volcanics.

At their western (upper) contact the Selina volcanics apparently pass conformably into units of the Upper Cambrian Owen Conglomerate (this contact is seen in drillholes LS 1,2,3, and 7). This suggests that the Selina volcanics are younger (Middle to Upper Cambrian) than the Central Sequence which generally ^{has} high angle unconformable contacts with the Owen. It appears that the Selina volcanics are time equivalents of the Tyndall Group as presently defined.

The relationship between the Selina volcanics and the Murchison granite is not clear, but the similarity between the granite and the coarser-grained, probably intrusive, phases* of the rhyolite lavas would suggest that the granite was a high level intrusion coeval with the volcanism (the magma chamber?).

* Note, Hutton (1981/82) maps these as granites at Selina.

5.4 MINERALIZATION

Dispersed pyrite and magnetite mineralization, with minor levels of copper, lead, zinc and silver, occurs throughout the Selina volcanics but is concentrated in two linear zones - the 4 km long Western Pyrite Zone (W.P.Z.) and the 3.5 km long Eastern Pyrite Zone (E.P.Z.). The former is 100-300m+ wide, the latter 50-150m wide. Within these zones pyrite and/or magnetite generally average around 10%.

Both zones are parallel and essentially strataform, and occur in a steeply-dipping sequence of highly chloritic and/or sericitic, brecciated and silicified lavas, pyroclastics and ignimbrites, with subordinate volcanic sediments. The W.P.Z. is a very large stockwork with little or no recognisable syngenetic mineralization. The E.P.Z. is possibly substantially of syngenetic type with subordinate stockwork style mineralization.

The mineralization at Selina contains minor, but significant, values of copper, lead and zinc. Silver values are consistently anomalous, but gold is almost entirely lacking (a rather unusual feature for mineralization in the Mt. Read Volcanics). Tin and tungsten are insignificant but there are persistent traces of molybdenum. The tenor of the mineralization can be gauged by quoting some of the best intersections from drillholes in the W.P.Z.:

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LS 3 : 6.1m @ 1% Pb
LS 5 : 4.6m @ 0.65% Zn, 24 g/t Ag
LS 6 : 3.1m @ 0.82% Cu
6.1m @ 44 g/t Ag
1.5m @ 0.67% Pb

Interestingly, Pb and Zn show a marked low in LS 4 which is the strongest part of the pyritic stockwork.

Some of the strongest surface indications of basemetal mineralization fall in a circular pattern (termed the Mt. Selina Anomaly Zone by Hutton), at the southern end of the E.P.Z. (see Fig. 3). The geology of this area is poorly known but the soil values (up to 4000 Pb, 1400 Zn, 8 Ag) and rock sample values (up to 3370 Pb, 1.35% Zn, 24 Ag), appear to be due to disseminated mineralization in ignimbrites, and possible faulting on the contact between the ignimbrites and volcaniclastic conglomerates. The zone coincides with a break in the IP and magnetic trends, and is a most unusual feature.

5.5 PREVIOUS EXPLORATION

The Western Pyrite Zone was discovered by prospectors at the turn of the century and several adits and trenches were excavated (the 'Lake Selina Workings'), between lines 48N and 104N (see Fig. 3).

Systematic exploration commenced in 1957 with an aeromagnetic survey by RTAE, but ground surveys didn't get underway until 1969-70 when Mt. Lyell cut gridlines 245m (800') apart over a 9 km strike length from Lake Dora (line 144S) to Anthony Creek (184N).

Initially, only the area south of 80N was mapped, soil sampled (where not moraine-covered), and surveyed with magnetic, pole-dipole IP and SP. This work defined the southern end of the Western Pyrite Zone

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(from 40N to 80N), as a marked IP anomaly with coincident magnetic and geochemical anomalies. This part of the zone was drilled in the winter of 1970 by holes LS 1-3, which intersected pyritic altered rhyolitic volcanics with minor basemetals.

After the holes were drilled, mapping was completed over the northern part of the grid from 88N to 184N; pole-dipole IP and magnetics from 88N-160N (only over the W.P.Z.); and soil sampling from 88N to 128N. These surveys showed that the W.P.Z. was best expressed between 112N and 144N, and this area was drilled with holes LS 4-6 in the winter of 1971 and LS 7 in December 1972. The holes all intersected extensive zones of strong pyrite-magnetite mineralization but basemetal values were low.

In 1972, a brief reconnaissance survey of the area north of 184N outlined a linear zone of weak pyrite-magnetite mineralization in altered rhyolites. Thought correlatable at the time with the W.P.Z., this was shown ten years later to be the northern extension of the Eastern Pyrite Zone.

Apart from a small, partially-successful Turair EM survey in 1973 over the area drilled by LS 4-7, and an inconclusive study of cobalt levels in pyrite of the W.P.Z., interest in the Selina area lapsed at this stage.

In 1975 a comprehensive review of all results concluded that the style and degree of mineralization in the W.P.Z. around 120-136N, was similar to that at Mt. Lyell. A deep hole was recommended to test the W.P.Z. in this vicinity. A programme of drilling on several weak geophysical responses not associated with the W.P.Z. was also recommended, as was systematic exploration of the NE part of the grid in which the E.P.Z. was later found.

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None of these recommendations were carried out.

Exploration was renewed in 1979-80 after another data review, and a Dighem survey of the area north of 96N, showed that outcrops of pyritic volcanics mapped in 1970-71 several hundred metres east of the W.P.Z. on line 144N, were associated with a magnetic signature similar to the W.P.Z. A second mineralized zone was suspected, and later discovered in the 1980-81 season by mapping and gradient array IP surveys in the NE part of the grid from 96N to 184N. The zone comprised small bands of massive pyrite in a thin unit of altered pyritic vitric tuffs, but basemetal values were low in surface sampling. Despite this, the E.P.Z. was drilled by LS 8 on 184N in September 1981. The hole showed a zone of strong banded and disseminated magnetite-pyrite mineralization flanked the pyritic tuff, but again, basemetal values were insignificant.

In 1981-82 the E.P.Z. was traced 1700m further north to 248N by surveys on the extended grid. However no significant basemetals could be found in geochemical sampling. At the completion of the seasons work it was concluded that no further work was warranted anywhere at Selina. This conclusion was reinforced by an alteration study of the Mt. Read Volcanics by Eastoe, which concluded that the Selina mineralization was 'deep footwall type' related to the Cambrian Murchison Granite, and unsuitable for the formation of massive sulphide.

5.6 LEAD ISOTOPE RESULTS

Thirty samples from the Selina area were analysed to determine their lead isotope ratios, by Dr. B. Gulson of the C.S.I.R.O. Gulson's report appears in Appendix A, and the results are summarised in Table 1.

TABLE 1

SELINA LEAD ISOTOPE RESULTS

* Favourable = ratio between 18.26 - 18.34.

* Radiogenic = ratio more than 18.35.

		LEAD 206/204 RATIO		* FAVOURABLE (✓)	WHOLE ROCK - PPM		
		WHOLE ROCK	PYRITE	* RADIOGENIC (X)	Pb	U	Ba
<u>SOUTHERN W.P.Z.:</u>							
27397	LS1	18.302	18.316	✓	390	2.2	
27398	LS3 282'	18.346	18.243	✓	20	4.2	
LS2	600-605'	18.327		✓	500		2280
LS2	665-670'	18.268		✓	500		417
LS2	680-685'	18.266		✓	900		832
LS3	265-270'	18.268		✓	1.16%		2780
LS3	275-280'	18.266		✓	2.13%		1690
LS3	360-365'	18.343		✓	1.01%		1520
2590	48N	18.264		✓			
2591	LS1	18.257		✓			
<u>NORTHERN W.P.Z.:</u>							
27402	LS7 1260'	18.423	18.360	X	1700	4.9	
27399	LS4	18.561	18.592	X?	20	3.1	
27400	LS5	18.272	18.280	✓	850	4.8	
27401	LS6 246'	18.858	18.780	X?	550	35.1	
LS4	790-795'	18.496		X	300		1940
LS4	975-980'	18.299		✓	500		3530
LS5	480-485'	18.272		✓	3100		
LS5	655-660'	18.335		✓	960		3570
LS5	835-840	18.272		✓	1600		
LS6	275-280'	18.338		✓	700		1030
LS6	915-920'	18.292		✓	800		970
LS6	920-925'	18.258		✓	1100		1390
2592	96N	18.255		✓			
<u>E.P.Z.:</u>							
LS8	21-23.6m	18.272		✓	840		2490
27393	LS8	18.133	18.261	✓	20	0.7	
LS8	225-226m	18.375		X	1150		875
27403	LS8 225.8m	18.356	18.419	X	3900	2.3	
LS8	345-350m	18.281		✓	920		513
27347	144N	18.292	18.311	✓	50	0.3	
<u>MT. SELINA ANOMALY ZONE:</u>							
27384		18.248		✓?	1900	6.6	

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Putting the results into geological context, the following comments can be made:

1. The favourable lead isotope signatures lend support to the geological conclusions that the Selina mineralizing system is capable of hosting a major basemetal massive sulphide deposit.
2. Stockwork mineralization, introduced into pre-existing volcanics (e.g.: 2590 - veins in lava), gives the same favourable ratios as mineralization formed on the sea floor (e.g.: 27347 - massive pyrite). Clearly the isotopes give a signature for the mineralizing system as a whole.
3. The more radiogenic samples from the upper parts of holes LS 4 & 6 (samples 27399 and 27401), are not reflecting any geological trend. All the mineralization within the Western Pyrite Zone where the holes were drilled, is part of the one system regardless of depth. Note, a later sample only 30' downhole from 27401 gave a favourable ratio. The geological considerations would tend to confirm that the radiogenic nature of 27399 and 27401 is due to their significant uranium contents relative to lead.
4. There is no geological basis for suggesting that those samples with the more-radiogenic signatures are in any way fundamentally different in mineralization style and origin, than those with favourable signatures.
5. However, the most radiogenic samples (excluding 27399 and 27401) are in quartz-sericite schists, which have been deformed subsequent to being altered and mineralized. Perhaps the deformation is altering the Pb isotope ratios?

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6. The samples can be grouped into geological zones as shown in Table 1. It can be seen that all 10 samples from the southern end of the Western Pyrite Zone (W.P.Z.), give favourable ratios.

The first batch of 4 samples from the northern end of W.P.Z. gave only one good result. Although two results are suspect (27399 and 27401), sample 27402 which has a radiogenic ratio came from the horizon in this hole most considered to host syngenetic mineralization. The sample may be influenced by a major contact only 1.5m away, with some shearing on it. However, the second batch of 9 samples from this part of the W.P.Z. all give favourable ratios with only one exception.

7. The 6 results from the Eastern Pyrite Zone give favourable ratios except two samples which were inadvertently taken from the same unit in LS 8. Both give radiogenic signatures - in this case a rather neat test of the repeatability of results. However, the mineralization in these samples is no different from the mineralization elsewhere in this hole which gives favourable ratios.

5.7 POTENTIAL OF THE SELINA AREA

5.7.1 WESTERN PYRITE ZONE

The W.P.Z. extends 4 km from line 160N to line 40N, and possibly continues further south under moraine. In the north it passes beneath Owen Conglomerate (see Fig. 3). The zone comprises disseminated and vein, pyrite and magnetite mineralization averaging 5-15% over widths from 100-300m+. It is marked by coincident strong IP and magnetic anomalies.

The mineralization is of stockwork type and occurs within an altered rhyolite lava mass, and the flanking ignimbrites and pyroclastics on its western side. There are some layered volcanoclastics and minor bedded tuffaceous sediments in these flanking rocks, indicative that submarine conditions prevailed at times. A feature of the lavas is the brecciation and fracturing which possibly indicates the lavas were extruded into water and/or were proximal to a volcanic vent. Hydrothermal breccias are present in LS 4.

Evidence of submarine deposition is clearest at both ends of the W.P.Z. - in holes LS 1-3 drilled on 48-72N, and in a sequence of well bedded, altered, cherty tuffaceous sediments at 152-160N. Similar sediments are found scattered along the western side of the W.P.Z. e.g.: west of the collar of LS 6 on 136N, and on 88N.

Present knowledge, based on 7 drillholes and the limited surface exposures available, is insufficient to accurately define the shape of the stockwork and the lateral alteration zone extending from it, but the stockwork is apparently centered on holes LS 4 and 5 around 120-128N where it is over 300m wide. It is characterised by intense brecciation, silicification, chloritisation, pyritisation and potassic(?) alteration. Quartz-chlorite veining is common. There is locally intense sericitic alteration in places towards the western margin of the zone-particularly in holes LS 4 and 7.

One of the Review Team (Jones), who spent some time studying in Japan, sees similarities in the W.P.Z. with the footwall mineralization in some of the Kuroko deposits. In this model, LS 4 missed the massive sulphide and intersected

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SELINA

Siliceous ore (keiko) equivalent, Western Pyrite Zone.

IS4, 500-540'



SELINA

Siliceous ore (keiko) equivalent, Western Pyrite Zone.

IS4, 500-540'



SELINA

Graded bedding in rhyolitic pyroclastics.

Walford Peak Area.

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the lateral chlorite-pyrite mineralization before passing eastward into the stockwork zone.

The indications are that untested areas exist in this northern part of the W.P.Z. in which, on geological considerations, a substantial massive sulphide body could be present. The geometry of the geology and mineralization would have to be more accurately determined by geological mapping prior to drilling. At a very rough estimate, an initial test could take 3 drillholes of around 250m each. Because of the wealth of available data, no other surveys are required.

The main prospective area appears to extend in a thin 1500m long strip along the western edge of the W.P.Z., from LS 7 northwards past the western end of LS 4, west of the collars of LS 5 and 6, to the tuffaceous sediments on 152-160N. One possible indication of the zone may be the 20m of highly pyritic, siliceous sericite schist (tuff?), intersected in LS 7 on the western edge of the volcanics against the Owen Conglomerate. This was the only hole to fully traverse the W.P.Z.

The northern end of this strip appears at this stage to be the most prospective. The clearest indications of quiet sedimentary conditions are in the north, there is a trend in the drillholes towards increasing basemetal and silver values in this direction, and there is a coincident IP anomaly (S1 NW of Bishop and Hutton), which splits from the main W.P.Z. response north of LS 6. Bishop remarks that S1 NW is possibly a response to mineralization in a different stratigraphic horizon than the main W.P.Z., and this could be the case.

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That part of the W.P.Z. south of LS 7 is also prospective. The 1200m gap between LS 7 on 112N and LS 1 on 72N, is marked by more subdued IP response than elsewhere, but there is no doubt significant sulphides are present. Small sedimentary lenses are present along the western edge of the volcanics in this area, and the largest old workings are here - on lines 104N, 96N and 80N.

The far southern end of the W.P.Z. was drilled by holes LS 1-3 on lines 72N-48N. The broad elements of the geological setting of the zone further north are the same here, viz: disseminated pyrite and basemetal mineralization in a west-facing sequence of sericitic chloritic ignimbrites and submarine(?) volcanoclastics, flanked 400m to the east by chloritised, brecciated lavas with weak vein pyrite-galena-chalcopyrite mineralization. The main W.P.Z. is marked by a strong IP anomaly, but the mineralization in the lavas gives only a weak, shallow IP response (albeit more extensive than the surface showings suggest).

In the holes, the mineralization is a 40-90m wide zone of 5% pyrite with minor basemetals, flanked immediately to the west by a 20-90m wide zone of disseminated hematite-magnetite with low basemetals, which is in contact with the Owen Conglomerate to the west. Basemetal values in the sulphide zone improve southwards (best interval: 1.5m @ 0.74% Cu, 2.3% Pb, 0.16% Zn, 8 g/t Ag, in LS 3), but 250m south of LS 3 the W.P.Z. disappears beneath moraine in the Lake Rolleston area which is from 50-130m deep according to electrical soundings.

A deep-penetration dipole-dipole IP survey was run over lines 40N-56N around LS 3 in 1981.

This picked up a very strong IP response on 56N between LS 2 and 3 lying immediately east of the drilled mineralization at a depth of 150m. The anomaly may be spurious (Bishop pers. comm), but in this geological situation would warrant drilling if a genuine response. It occurs in a 500m long gap in the previous drilling which tested the mineralized zone at a shallower level (50-140m below surface). The anomaly should be resurveyed prior to any drilling.

5.7.2 EASTERN PYRITE ZONE

The E.P.Z. is much less well understood than the W.P.Z. Only one hole (LS 8 on 184N) has been drilled in this zone which, as currently outlined, extends for 3.5 km from 136N to 248N (see Fig. 3).

The E.P.Z. is centered on a remarkably uniform lithological unit of quartz-sericite-chlorite-pyrite schist, apparently a band of altered siliceous, tuffaceous pyritic sediment. The unit is from 5 to 40m wide, steeply dipping and contains some thin bands of massive pyrite 0.1-0.2m thick. The general environment of deposition in this area seems to have been submarine, as lenses of sediment occur within the volcanics on either side of the main pyritic unit. On 184N, the sequence from east to west is:

- 250m+ - brecciated, chloritised rhyolite lava.
Weak pyrite-magnetite.
- 100m - sericitic, chloritic, submarine pyroclastics or ignimbrites, with sediment lenses. Minor pyrite.
- 5m - quartz-sericite-chlorite schist. 15% disseminated pyrite.
- 100m+ - banded and disseminated pyrite-magnetite-chlorite in unidentified rhyolitic volcanics.

The last two units are the principal components of the E.P.Z. The zone is marked by a strong IP anomaly 50-150m wide, and a series of associated, generally-coincident, magnetic anomalies. The basemetal geochemistry of the zone is even more subdued than in the W.P.Z. The pyritic schist in LS 8 gave a best interval of 1m @ 370 Cu, 1150 Pb, 1400 Zn; the best soil or rock samples from the zone (including the massive pyrite bands) did not exceed 700 ppm for Cu, Pb or Zn, and 5 ppm Ag. The fact that syngenetic mineralization in the E.P.Z. is so consistently low in basemetals is a significant discouraging factor.

The setting of the E.P.Z. is not well understood. Which way is the facing and what is its relationship with the W.P.Z.? In examining the mineralization in LS 8 most of the Review Team felt that the strong banded and disseminated pyrite-magnetite-chlorite mineralization was of replacement/stockwork footwall type, and the pyritic schist was the 'host horizon' where massive sulphide could form. However Jones, drawing again on his Japanese experience, considered the pyritic schist could have been footwall to overlying syngenetic banded pyrite-magnetite-chlorite mineralization - similar to some kuroko proximal alteration zones. This latter model would conform to the regional facing.

The geological setting of the E.P.Z. needs to be examined in greater detail by careful mapping before any drilling could be recommended, but its potential has not been fully evaluated by the exploration to date.

5.7.3 WALFORD PEAK AREA

On the road down to Lake Rolleston from Walford

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Peak, a sequence of altered quartz-phyric rhyolitic volcanics is exposed, comprising ignimbrites and pyroclastics with intercalated tuffaceous siltstones and sandy volcanoclastic sediments. Clasts of shales occur in the pyroclastics. These rocks are flanked to the east by a ridge of flow-banded rhyolite lava and more rhyolitic volcanics further east.

These volcanics mark a change in the geology from the lava domes which host the prospects at Lake Dora immediately to the south, and are clearly part of the more variable rhyolitic volcanics of the Selina area.

Only minor zones of chloritisation and disseminated pyrite-magnetite were noted in these rocks, with traces of basemetals being restricted to the three small old workings (North Dora adit etc.), just NE of Walford Peak. IP and soil anomalies over the volcanics in this area are weak.

Despite the lack of obvious mineralization, the Walford Peak area should be included in the mapping to be undertaken at Selina, as it is an integral part of the system.

5.8

GENERAL DISCUSSION

The first impressions of Selina were very favourable - the mineralization and alteration in both the Western and Eastern Pyrite Zones, is strong and extensive. It was felt that such mineralizing hydrothermal systems are most likely to generate larger orebodies. In these respects Selina exceeds anything else seen on the Tyndall EL during the Review.

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Previous exploration reports on Selina suggested that the mineralization was essentially pyritic and barren (hence the names - Western and Eastern Pyrite Zones), but again, the Team were impressed by the ubiquitous presence of basemetal sulphides. Selina is not a barren sulphide system and the chances for basemetal accumulations are good.

On paper, Selina doesn't look quite so attractive. There seems to be some geological and geophysical restrictions on the size of the prospective zones that have not been tested, and the consistently low tenor of soil and drillcore geochemical results is depressing.

Because of our poor state of knowledge of the geology, including probable structural complications, these size restrictions may be more apparent than real.

Very definitely, the weak link in exploration to date is geology. Previous explorers mapped the area in detail without getting an understanding of the volcanic setting of the mineralization. Hutton (1982) even concluded (albeit heavily influenced by Eastoes conclusions from his Alteration Study), that the mineralization was unrelated to the volcanics, being associated instead with the intrusion of the nearby Cambrian Murchison granite.

In the short time they were in the area, the Review Team recognised some broad elements of the volcanic setting of the mineralization which is clearly volcanogenic. The W.P.Z. is a stockwork apparently related to the western margin of a highly altered rhyolite lava complex (probably a cumulo dome). The area where the mineralization may have debouched onto the sea floor to form massive sulphide is broadly defined as being

along the western side of the W.P.Z., more particularly towards its northern and (possibly) southern ends. (Detailed mapping will undoubtedly show that the picture is much more complex than this).

The W.P.Z. mineralization as known at present, shows a lot of similarity with Mt. Lyell style mineralization. Given the low tenor of the copper and silver values, and the absence of gold, this target is not viable and reinforces the need to identify areas with massive sulphide potential at Selina.

The Reveiw Team concluded that it is possible at Selina to outline extensive areas of such horizons or at least form a good idea of where they should occur. To do this no further geophysical or geochemical surveys are needed - only good geological mapping followed by drilling. The geochemical and geophysical data would still have an important role to play in the generation of drilling targets.

An important point at Selina is not how much we know about it after 14 years exploration, but how little we know about it. At least 50% of the volcanics are not exposed, much under deep moraine. Some of the existing geophysical and geochemical data is poorly understood because it can't be put into geological context. A good example is the Mt. Selina Anomaly Zone which has some of the best surface basemetal indications at Selina, but seems to lack geophysical anomalies. The significance of this zone is presently not understood but it could be considerable. What lies at depth in this area? The Review Team's traversing here showed the existing mapping left a little to be desired. Detailed mapping would probably quickly resolve the zone's significance.

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Another area with possible potential is along the line made by projecting the E.P.Z southwards beyond the Mt. Selina Anomaly Zone. This area is covered by moraine, some of it undoubtedly of considerable depth. Knowing this, the reliability of previous work in this area may be questionable. In 1971 a very weak IP response and coincident magnetic response was obtained in this area (on lines 16N to 16S), undoubtedly from bedrock under the moraine. This signature, although extremely weak, is the same as that over the E.P.Z. further north. If the geological mapping shows the E.P.Z. to be of greater importance than currently thought, it must be borne in mind that it could have a southern extension.

5.9 HENTY-ANTHONY HYDRO-ELECTRICITY SCHEME

The HEC plan to build a dam on Anthony Creek (just north of line 160N), and form a large shallow lake to the west of the W.P.Z. This is a key part of the overall Henty-Anthony scheme which is due for completion in 1990. The dam and lake would be formed by 1988. At present the HEC are carrying out preliminary surveys, including drilling, in the area.

The lake level as proposed would cover part of the prospective zone outlined along the western side of the W.P.Z. The zone would essentially follow the lake shore.

The proposed hydro works do not alter the potential or prospectivity of the Selina area, but exploration work should continue as quickly as practicable so that the prospective zones are evaluated while HEC planning is still flexible.

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6. RED HILLS (F.G. FitzGerald)6.1 SUMMARY

A total of 9 drillholes (including RH 13 and 14R drilled in 1982-83) have failed to locate any extensions of the massive sulphide lens intersected in RH 5. Equivalent horizons to the host rock in RH 5 were intersected in most holes. The best mineralization in these holes usually occurs as disseminated sphalerite in the base of this horizon and the top of the underlying pyroclastic sequence. Most lithologies within the Red Hills Basin appear to be high energy deposits and would have been unfavourable for the development of a volcanogenic massive sulphide deposit. Other negative features are the overall low sulphide content and moderately weak alteration of the system. The present drill spacing indicates that the massive sulphide body within the vicinity of RH 5 does not exceed one million tonnes.

However, a potential zone of gold mineralization has been delineated in the vicinity of RH 5. Five drillholes here have intersected significant gold (best assay: 1.5m of 8.1 g/t Au in RH 8), within the host horizon - pyroclastic sequence. This horizon is up to 7.5m thick and although apparently closed off along strike is still open at depth and above RH 5. Potential exists to develop an economic gold ore body which should be tested by further drilling.

No economic mineralization has been intersected in the 5 drillholes (including RH 15 drilled this season), in the southern part of the Red Hills Basin. Suitable host lithologies may extend for 900-1200 metres along strike further south beneath a glacial cover of unknown thickness. There is little evidence of an increase in grade of disseminated lead-zinc mineralization to the south, but until the basin

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has been closed off potential for discovery of an ore body still exists and should be tested.

Geological and geophysical evidence indicates that the Red Hills Basin is closed off to the north. However, a weak IP anomaly over a 600m x 100m swamp-covered area commencing 500m along strike north from the basin axis may represent basinal lithologies. The weak geophysical response and lack of geochemical anomalies downgrades interest in the area.

No other units in the Red Hills area, including the previously tested Red Hills Lava, appear to have further economic potential.

6.2 CONCLUSIONS AND RECOMMENDATIONS

1. A zone of gold mineralization has been delineated in the vicinity of RH 5. Five drillholes have significant gold assays which indicate around one million tonnes of 2 g/t Au with possible credits from Pb, Zn and Ag. The zone appears closed off along strike but is open at depth, and above RH 5.

Additional drilling is recommended: 2 holes (A and B) to test possible high grade extensions of the gold-bearing massive sulphide in RH 5, and 2 holes (C and D) to test the down dip extension of the gold zone in RH 8 (see Fig. 5). Holes A and B should be collared in the vicinity of lines 2550N and 2400N and would be about 150m and 200m long. Holes C and D could be drilled on the same sections and would be approximately 400m long. The drilling of hole D should be conditional on satisfactory results being obtained in the other 3 holes.

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2. The massive sulphide intersected in RH 5 has been followed up by 8 drillholes. The drill spacing indicates that the massive sulphide body is less than one million tonnes and no further testing of this target is warranted. The massive sulphide should in future be evaluated only as an integral part of the gold mineralized zone.

3. The main geophysical and geochemical anomalies in the southern part of the Red Hills Basin have been tested by 5 drillholes without intersecting economic base or precious metals. The basin may extend for 1200m along strike to the south beneath glacial cover. Although the grade of mineralization does not appear to increase, the total metal content may be increasing southwards and potential still exists for the discovery of an ore body.

It is recommended that the southern extension be spatially tested by 2 diamond drillholes (E and F), each 250m long (see Fig. 5). Diamond drilling appears to be the most cost effective method of evaluating the glacial covered area.

4. The Red Hills Basin appears to terminate north of RH 12. A swamp-covered area 600m x 100m lying 500m north of the basin may be underlain by basinal lithologies. Geophysical and geochemical indications are weak. Because of this and the apparent size restrictions, it is recommended that no further work be carried out north of Red Hills.

5. Both the copper and gold potential of the Red Hills Lava have been adequately tested with negative results.

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6.3 PREVIOUS EXPLORATION

1957-59 Rio Tinto and EZ carried out parallel exploration in the Red Hills - Gooseneck area. Ground EM, magnetic and gravimetric surveys outlined an anomalous zone at least 1500m long. Three holes, GN 1 and 2 (RTAE) and RHP 95 (EZ) were completed within this zone (total 635m). All holes intersected black shales carrying syngenetic pyrite and pyrrhotite which were considered sufficient to explain the anomalies. A fourth hole RHP 94 (376m) was drilled to the north within the flanking Red Hills Lava. No significant base metals were discovered in any holes.

1969-77 Mt. Lyell focused attention on the Red Hills Lava where Cu mineralization had been worked at the turn of the century. Mapping, pole-dipole IP, SP and magnetic surveys, geochemical sampling and a partially successful percussion drill programme lead to 4 diamond drillholes, RH 1 to 4 (total 706m). It was concluded, from the disappointing results, that no bulk low grade Cu potential existed at Red Hills.

1977-82 Mt. Lyell (Goldfields-Getty Joint Venture) turned their attention to the volcanogenic massive sulphide potential in the sedimentary basin immediately west of the Red Hills. Pole-dipole IP surveys had defined a linear anomalous zone at least 1100m long, co-incident, in part, with a sequence of graphitic shales carrying disseminated pyrite and pyrrhotite (the same belt investigated by RTAE-EZ). RH 5 was drilled to test the northern part of the IP anomaly and to intersect the altered contact of the Red Hills Lava. The hole intersected 2.8m of banded massive sulphide (assaying 34.5% Zn,

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RED HILLS

Red Hills rhyolite
lava dome.

Looking east from
across the Red
Hills Basin.

RED HILLS

Lake Westwood.

The southern ext-
ension of the host
horizon lies under
the glacials in
left foreground.

JUKES DARWIN

Looking north along
the rhyolite lavas
of the Jukes-Darwin
Ridge.

Intercolonial Spur
middle distance,
Mt. Jukes beyond.

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11.4% Pb, 0.3% Cu, 250 g/t Ag and 6.5 g/t Au) between the target positions. A further 7 holes (RH 6 to 12) were drilled in the basin (total 3102m). Although the equivalent host horizon was recognized in some holes and disseminated base metal sulphides intersected in all holes, no extension of the massive sulphide was found.

As part of the search for continuation of the massive sulphide lens additional geophysical surveys were carried out (see section 6.5). In general the results obtained were either inconclusive or negative. Additional geochemical sampling, petrological studies and alteration mapping programmes were carried out to further evaluate the area. Some of the targets generated by this work were tested by drilling.

6.4 WORK COMPLETED 1982-83

An evaluation of results from all previous work at Red Hills, including the re-logging and re-interpretation of existing drill core, showed that three mineral targets remained inadequately tested, viz:

1. the massive sulphide in the vicinity of RH5;
2. the sulphide mineralization in the southern part of the basin and
3. the gold potential of the whole area.

Target 1 was further tested by two drill holes (RH13 and 14R, total 825m) and has been adequately evaluated without significant results. Target 2 was tested by a 30m costean and one drill hole (RH15, 320m) and remains open to the south. Target 3 was evaluated by assaying specific mineralized horizons intersected by the current, as well as the earlier, drill holes for gold (total 192 samples) and indicated a zone of significant gold mineralization in the vicinity of RH5.

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6.5 GEOPHYSICS

A summary of all geophysical surveys carried out over the Red Hills area is presented in table 2. As part of the Review, Consultant J.R. Bishop was asked to examine this data, comment on the results and make recommendations. The following conclusions are summarized from Bishop's report (Nov. 1982).

The Turam EM and IP surveys responded strongly to the black shale horizon. The presence of a buried massive sulphide body close to this horizon could be difficult to detect by electrical methods.

As a consequence the Rio Tinto (RTAE) gravity survey is of particular interest. An anomaly compilation map (Fig. 4a) shows the gravity and Turam results to be near coincident. Geological considerations suggest that south of RTAE 58S is of more interest because the gravity high lies just east of the Turam. North of RTAE 40S the gravity high is west of the Turam. Both zones, where drilled, have been adequately explained by density variations in the local rock types (Bonniwell, RTAE 1959).

Applied potential surveys were conducted in 1978 and 1982 in an attempt to define the extent of mineralization intersected in RH 5. Results from these surveys suggested a very limited strike length for the mineralization. However, down hole IP and EM (Sirotem) surveys showed the black shales and massive sulphides were chargeable but not particularly conductive. Thus the results of the applied potential survey are largely negated.

Apart from the down hole geophysics, the only result which may be recognized as a possible separate response due to mineralization is a gradient array IP profile over RH 5. A clear chargeability/resistivity anomaly was defined over the black shales with a weaker,

TABLE 2

RED HILLS GEOPHYSICAL SURVEYS

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SURVEY METHOD		COVERAGE	RESULTS	COMMENTS
E.M.	1. Turam (RTAE), 1958	4N-78S (RTAE grid)	Strong responses, apparently co-incident with graphitic shales.	*
	2. Sirotem (Geoex), 1982	4S-40S	No response.	Did not detect black shales defined by Turam survey
	3. Genie (Scintrex), 1982	4S & 29S	Weak response over py-cp-mag veins(?) in Red Hills lava.	Did not detect RH5 massive sulphide or 1Hadit py-cp
I.P.	1. Pole-dipole (CGG), 1971	32N-80S	Strong responses, apparently co-incident with graphitic shales.	*
	2. Gradient (Scintrex), 1977	80S-98S	Response on 80S & 86S, probable southern continuation of black shales.	* Lack of response on lines 92S & 98S possibly because coverage not extended far enough west or glacial cover too thick or pyritic black shale terminated.
	3. Gradient (Scintrex), 1978	Profile over RH5	Clear response over black shales, smaller response 100m east.	2nd response over small occurrence dissem. py-gn in fgd siliceous tuffs (ACW) host rock equivalent (FGF)
	4. Gradient (Scintrex), 1978	16N-68N (Red Hills N grid)	Weak response along strike from main IP axis in basin to south.	* Swamp covered, apparently not black shale.
	5. Dipole-dipole (Scintrex), 1982	33S	Good response over black shales, no evidence for contribution from any adjacent body.	Survey done to check (erroneous) results from applied potential survey.
MAGNETICS				
	1. Vertical field (RTAE), 1958	20S-74S (RTAE grid)	Strong responses over parts of Red Hills rhyolitic lava complex apparently related to magnetite stockwork. Red Hills basin generally magnetitic low.	* Results not evaluated by Bishop, method not diagnostic for sulphides in Red Hills Basin.
	2. Vertical field (CGG), 1971	32N-80S		
	3. Total field (Mt. Lyell), 1976	8N, 0N, 8S, 16S, 24S		
	4. Total field (Scintrex), 1978	16N-68N (Red Hills N grid)		
S.P.	1. (CGG), 1971	32N-80S	No response over basin, weak response over lavas.	
GRAVITY				
	1. (RTAE), 1958	20S-78S (RTAE grid)	Well defined anomalies.	* Adequately tested by holes GN1, GN2 & RHP95, satisfactorily explained by density contrasts in rock types.
	2. (Scintrex), 1980	8S, 72S, 86S	Anomalies on 8S & 86S are single point values, results do not agree with RTAE on 72S,	Test surveying only on applicability of method.
DOWN HOLE				
	1. Specific gravity (EZ), 1959	RHP94 & 95		Values used in RTAE evaluation of gravity anomaly
	2. IP (Scintrex), 1978	RH5, 6R, 7, 8, 9 & 10	Black shale responses quite variable, no IP "signature" RH5 charge./resist. response to massive sulphide (197m) & unexplained similar response at 185m.	Apart from RH5 no other survey covered zone of interest because of cave-in too high up hole.
	3. M.M.R. (Scintrex), 1978	RH5	Mineralization traced 40m north.	Test survey, not evaluated by Bishop.
	4. Applied pot. (Scintrex), 1978	RH5		Superseded by later survey.
	5. Applied pot. (Scintrex), 1982	16S-40S (electrode RH5)	Discouraging results	Method assumes mineralization is conductive, I.P. & E.M. surveys suggest it is not, negating survey.
	6. Sirotem (Geoex), 1982	RH5	No response to massive sulphide.	Mineralization not significantly conductive, probably due to high sp. content.

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but still clear anomaly 100m to the east. This was related to a small occurrence of disseminated pyrite-galena(?) in fine grained siliceous tuffs (A.C. Walter 1978), which may be equivalent to the host rock (FGF interpretation).

If the mineralization intersected in RH 5 was a consistent 3 to 5m thick with its top at 100m+ from the surface, and it maintained its composition and position relative to the black shales, then it is probable that a substantial tonnage would not be detected by geophysical methods. The drilling, however, suggests that such a body is not present. To fit ore-body sized sulphides within the existing drill pattern, quite thick models are required (e.g. the 40m maximum thickness of Que River), such bodies would be readily detected by geophysical methods.

"Integration of the drilling and geophysical results show no encouragement for economic-sized mineralization [massive sulphide] between lines 00S and 86S*" (Bishop, 1982).

6.6 DISCUSSION OF RESULTS

6.6.1 RED HILLS BASIN IN VICINITY OF RH5

6.6.1.1 RH 5 Interpretation

The following observations and conclusions came from re-logging and re-interpretation of the RH 5 drill core in 1982:-

1. The banded massive sulphide (2.8m true width) shows little evidence of re-texturing or significant re-mobilization.
2. Both margins of the massive sulphide are relatively copper rich.

* i.e. between RH12 and GN2 in Red Hills Basin.

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3. The host rock is 15m thick (including massive sulphide). It is a light grey very fine grained rock which is siliceous and indurated close to and within the massive sulphide. The host rock is commonly laminated, has coarser interbeds and some syn-sedimentary brecciation zones.
4. Petrographic work noted possible fine clastic quartz and muscovite grains as well as glass shards, and describes the host rock as either volcanic ash or tuffaceous argillite.
5. The western contact of the host rock appears faulted. The eastern contact is gradational into coarse lithic ignimbrites which appear marginal to talus from the Red Hills Lava. The lava contact is only 20m east of the massive sulphide and indicates a westerly facing for the sequence.
6. There is no evidence of development of a typical chlorite or sericitic foot-wall style of alteration beneath the massive sulphide and a cherty unit in this position suggests a possible easterly facing.
7. Generally the host rock has a low base and precious metal content apart from the massive sulphide and a 30cm band of semi-massive sulphide cement in a breccia zone.

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In summary, the grade and style of the mineralization in RH 5 are encouraging but very few other features typical of a large volcanogenic massive sulphide body are evident. In particular the weak alteration, and low overall sulphide content of the adjacent predominantly high energy pyroclastic lithologies, appear an unfavourable environment in which to discover a massive sulphide ore body.

6.6.1.2 Extensions of Host Horizon

An horizon with lithologies equivalent to those hosting the massive sulphide has been delineated by drilling for at least 800m along strike. The horizon thins rapidly away from RH 5 but is consistently intersected 30-40m west of the Red Hills Lava contact.

The horizon is typically a fine grained, light grey, siliceous sediment or pelitic ash with a cherty appearance. Further from RH 5 the sequence is less siliceous, more sericitic or chloritic, and is interbedded with coarse clastic and possible pyroclastic material. Soft-sediment brecciation is often noted.

Generally the host horizon contains minor disseminated sulphides, principally sphalerite. Remobilization is common, and clasts of semi-massive sulphide (e.g. RH 14R) and thin lenses of semi-massive sulphide (e.g. RH 9), are present.

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6.6.1.3 Black Shales

The black shale sequence defining the Red Hills Basin extends over 2.5km from RH 12 to GN 2 and beyond. The shales thicken southwards but consistently thin down dip (steeply west) and even pinch out (as in holes RH 7, 12 and 14R). The thinning coupled with opposite facings in the drill core suggest that the sedimentary basin is an in-folded syncline.

The shales are variably graphitic and pyritic (\pm pyrrhotite) but in general contain only minor base metal sulphides. Minor concentrations of base metals occur in the eastern (basal?) margin of the shales towards the south (see Discussion 6.6.2). It appears that deposition of the shales is later and unrelated to the massive sulphide formation in RH 5.

6.6.1.4 Gold Potential

Gold assays from the current drill programme as well as from specific units in earlier drilling, have delineated a zone of significant gold mineralization in the vicinity of RH 5. The zone appears to be one horizon which generally straddles the basal part of the host horizon and the upper part of the underlying (?) pyroclastic sequence. The gold horizon varies from 3 to 7.5m in width. Assays for the 5 holes within the zone are shown in Table 3.

The 5 holes have delineated an inferred one million tonnes at 2 g/t Au with 1.3% Pb, 4.6% Zn and 37 g/t Ag. The horizon appears closed to the north at RH 7 and

TABLE 3

RED HILLS GOLD MINERALIZATION

Hole	Interval	Thickness	Cu%	Pb%	Zn%	Ag g/t	Au g/t	Lithology-position
RH5	196.0-198.8	2.8m	0.3	11.4	34.5	250	6.5	massive sulphide
	196.0-200.0	4.0m	0.4	8.5	26.0	198	5.0	massive sulphide + top host rock
RH6R	306.0-309.0	3.0m	<0.1	0.1	1.6	3	0.7	ignimbrite above host rock
RH8	321.5-326.0	4.5m	<0.1	0.1	1.5	2	3.6	ignimbrite below host rock
	320.0-327.5	7.5m	<0.1	<0.1	1.1	2	2.3	base host rock + ignimbrite
RH13	215.0-218.0	3.0m	<0.1	0.4	3.1	7	0.9	base host rock + ignimbrite
RH14R	365.5-369.7	4.2m	<0.1	0.5	1.3	31	2.2	host rock
	362.0-369.7	7.3m	<0.1	0.5	1.2	30	1.5	host rock

Note: drill thickness = true width in all holes at this depth.

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to the south at RH 9, but is open at depth 250m below the surface. Potential also exists to extend the mineralization between RH 5 and the surface, approximately 150m (see Fig. 5).

6.6.1.5 Other Mineralization

Apart from the massive sulphide, the best base metal mineralization occurs either at the eastern (basal?) margin of the host horizon or in coarse pyroclastics (ignimbrites?). No other suitable horizons for the development of a volcanogenic massive sulphide deposit have been identified.

Petrographic work suggests that most of the mineralization within the ignimbrites is later replacement of the fine grained, vitric matrix. Some lithic clasts within the coarser pyroclastics are mineralized indicating at least some pre-existing sulphides. Minor mineralization was also noted around the margins of deformed pumice clasts.

The 20cm semi-massive sulphide lens in RH 8 appears to be a replacement vein within strongly welded ignimbrites.

6.6.2 RED HILLS BASIN-SOUTH

Five drillholes totalling 1176m have been completed to date in the southern part of the Red Hills Basin (see Fig. 4). All holes were collared in black shales and drilled east with holes RH 10, 11 and 15 intersecting the Red Hills Lava margin. A possible lateral equivalent of the host horizon further north was intersected in RH 15 but contained only minor disseminated sulphides.

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The best mineralization intersected in all the holes (apart from RH 10 drilled into a structurally complex area), occurs in the eastern (basal?) section of the black shale sequence. Holes RH 11 and RH 15 both intersected disseminated galena and sphalerite averaging 0.7% Pb + Zn in a zone 50m thick. Narrow higher grade lenses up to 7% Pb + Zn have been drilled within this sedimentary sequence.

There is no evidence that the grade or thickness of this mineralized zone is changing significantly to the south. It is also noteworthy that no significant gold assays have been obtained in the southern part of the Red Hills Basin.

South of RH15 the Red Hills Basin rocks are covered by outlier's of Owen Conglomerate and glacial deposits. Holes RH 15 and GN 2 showed this cover to be less than 20m thick. However, south of GN 2 an aerial photo interpretation indicates that the cover is much thicker than 20m. The geophysical responses along the basin terminate abruptly at this point, but the drill results in GN 2 indicate that the black shales continue and may extend along strike for another 700m to Lake Westwood.

6.6.3 RED HILLS-NORTH

Five hundred metres north of the last outcrops of the Red Hills Basin (just north of RH 12), there is a zone of low-lying swampy ground 100m wide extending 600m to the Tyndall Group boundary in the north. The swamp is flanked on the east by the northern continuation of the Red Hills Lavas, and on the west by massive felsic ignimbrites and lavas. It thus lies in the same geological position as the main Red Hills Basin.

A weak IP anomaly (<20msec) coincides with the swamp and may reflect underlying basinal rocks. However, the IP response is too small to be caused by significant sulphide mineralization, and the geochemical soil and rock values in this area are not significant. It is worth noting that samples of the flanking lavas and ignimbrites contain elevated Pb (up to 1400 ppm), which is unusual.

A major E-W trending electrical discontinuity cuts through the pyroclastics in the 500m zone separating this area from the main basin, confirming a geological break in the basinal lithologies.

6.6.4 RED HILLS LAVA

The copper potential of the rhyolitic lava complex forming the Red Hills has been adequately tested by previous exploration without significant results. Additional assaying of rock samples and earlier drill core by the Review Team has also shown that no significant gold mineralization occurs within the Red Hills Lava (see Appendix C).

7. JUKES-DARWIN J.G. Purvis7.1 SUMMARY

Amongst the rhyolitic lava domes comprising the Jukes-Darwin Ridge, 250,000 tonnes of copper-gold mineralization grading 1.25% Cu, 1.2 g/t Au, is indicated at the JUKES PTY. prospect. The mineralized zone is open to the south and at depth, and potential exists to develop sufficient tonnage for a viable orebody. Two drillholes are recommended as an initial test of this potential.

Only 9 drillholes have been put down in the Jukes-Darwin area during exploration spanning the last 27 years. It is not surprising therefore that Jukes-Darwin includes the largest area of under-explored prospective volcanics remaining on the EL, in the GARFIELD and CURRIE VALLEYS. The valleys contain altered and mineralized volcanics with suitable massive sulphide host lithologies, and a three-year programme of systematic exploration is recommended.

On the Jukes-Darwin Ridge, significant gold values have been discovered in stockwork mineralization in the lavas on MT. DARWIN. These need to be evaluated by further sampling. Apart from JUKES PTY., all the other well-known prospects on the Ridge are of no interest.

The extensive copper-gold mineralization at the EAST DARWIN prospect is too weak to be of interest. The prospect was adequately tested by the INCO drilling in 1974. All the volcanics east of the lavas of the Jukes-Darwin Ridge, should be excised from the EL.

Despite the presence of pyritic black shales and other sediments within the volcanics of the CLARKE VALLEY, the consistent lack of basemetals emphasizes the low

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prospectivity of these rocks. This area should also be excised from the EL.

The Jukes-Darwin area review is divided into several sections. Detailed conclusions and recommendations appear at the end of each section.

7.2 INTRODUCTION

This area comprises all that part of EL 9/66 to the south of the King River.

Because of the sparse vegetation cover in places and proximity to the old copper smelters at Crotty, there was a flurry of exploration activity from 1897-1903, in which a large number of small prospects (principally copper but also gold and barite), were discovered. Production from these was negligible.

From 1903-1956 almost no work was done. From 1956 until 1976 when the area was pegged by Mt. Lyell, exploration was undertaken (in chronological order) by Lyell-EZ Explorations, US Metals, BHP, INCO and EZ. A total of 7 drillholes were put down at the Prince Darwin (2), East Darwin (2), Lake Jukes (2), and Jukes Pty. (1), prospects.

After 1976, Mt. Lyell initially concentrated their attention on the Clark and Garfield valleys. In the Clark they carried out a major programme of gridding and the usual mapping, geochemical and IP surveys, with discouraging results. Work in the Garfield was only of a reconnaissance nature comprising partial coverage by geochemical surveys. Mt. Lyell then turned their attention to Jukes Pty. where two holes were drilled in 1982. One of these holes intersected ore-grade copper/gold mineralization over a width of 10m.

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Prior to the Review, in November 1982, four days were spent with Sillitoe (Geological Consultant) examining the geological setting of mineralization at Jukes Pty., East Darwin and at various places along the Jukes-Darwin Ridge. Sillitoe's contribution to the understanding of the geology of these areas is gratefully acknowledged, and his notes have been drawn on in compiling sections of this report.

The Jukes Darwin area Review is presented in its major geological components:(1)the sequence of rhyolitic ignimbrites, lavas and sediments west of the Jukes-Darwin Ridge: i.e. CLARK, GARFIELD and CURRIE VALLEYS.

(2) the rhyolitic lava domes of the JUKES-DARWIN RIDGE, including the JUKES PTY. prospect.

(3) the sequence of volcanoclastics and ignimbrites east of the ridge, principally the EAST DARWIN prospect.

7.3 JUKES-DARWIN RIDGE

7.3.1 GENERAL

There are numerous copper prospects among the coalescing rhyolite lava domes which form the high ridge extending from Mt. Jukes to South Darwin Peak. Most of these prospects were examined during the Review, but apart from Jukes Pty. all are of no economic significance (see Fig. 6). These prospects are of two, associated, types:

1. Cu-pyrite mineralization in chloritised sediments in deformed remnants of very small basins on the margins of the domes.
2. Hematite - magnetite ± Cu-pyrite stockwork-type mineralization within the lavas.

Findons is an example of the former type, Prince Darwin an example of the latter. Jukes Pty. has both types in association.

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JUKES-DARWIN

Mt. Darwin a rhyolitic cumulo-dome (?).

JUKES-DARWIN

Looking south into Clark Valley from Mt. Darwin.

Rhyolite lavas of the Jukes-Darwin Ridge on left.

JUKES-DARWIN

Hematite stock-working in rhyolite dome lava.

Allan's Creek workings.

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Because of the significant gold values at Jukes Pty, the alluvial/colluvial gold workings in the Darwin Gap-Allans Creek area on the northern side of Mt. Darwin, and reports of gold in the soil on Intercolonial Spur (Cundy 1903), the Review Team paid particular attention to the gold potential of mineralization on the Jukes-Darwin Ridge.

Generally, gold is absent or present in only trace amounts. However, reconnaissance sampling of the hematite-magnetite stockworks extensively developed on Mt. Darwin, obtained two significant gold values - 5.9 g/t and 2.3 g/t - from typical iron oxide stockwork material. Basemetal values were low, but tungsten values were as high as 0.68% WO_3 and tin 0.1%.

CONCLUSIONS AND RECOMMENDATIONS

1. The gold potential of the lavas will need to be more closely examined by further sampling, particularly on and around Mt. Darwin.
2. Apart from Jukes Pty., all the known copper prospects on the Jukes-Darwin Ridge are of no economic significance.

7.3.2 JUKES PTY.

This prospect comprises disseminated copper-gold mineralization within intensely chloritised 'basinal' rocks, which separate a series of post-mineral ignimbrites on the east from a pre-mineral rhyolitic endogenous lava dome on the west.

The 'basinal' rocks form a vertical zone 25-50m wide and 350-400m long at surface, lying against the dome.

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They are coarse grained, quartz-phyric rhyolitic volcanics, apparently largely of ignimbritic type (see petrological descriptions in Appendix B). There are also lenses of tuffaceous siltstone and horizons containing Precambrian quartzite pebbles. The ignimbrites contain abundant lithic clasts including fragments of the siltstone and the dome lavas.

The lava comprises a steep-sided bulbous mass. It is feldspar-phyric and has the snowflake devitrification texture so typical of other lava domes on the EL. There is patchy development of stockwork alteration and mineralization (chlorite-quartz-magnetite-specularite+ pyrite-chalcopyrite-gold), which is strongest along the margin flanking the mineralized 'basinal' rocks.

It is inferred that the 'basinal' rocks were deposited in a depression against the margin of the dome, and were altered and mineralized by fluids emanating from the dome via the stockwork in its flank. The environment of deposition was predominantly high energy mass-transport type. Caught up within the 'crumble breccia' of lava fragments on the outside of the dome there are occasionally pebbles of Precambrian quartzite and tuffaceous siltstone, which suggest that there may have been some basinal rocks present prior to the emplacement of the dome.

The mineralized rocks are in faulted contact to the east with massive quartz-phyric ignimbrites that are essentially unaltered and completely unmineralized. They are separated by the Jukes Pty. Fault, a major vertical structure which is unmineralized and obviously post-mineralization.

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The best mineralization is concentrated in the stratigraphic top of the 'basinal' rocks adjacent to this fault, and comprises disseminated grains and clots of chalcopyrite-pyrite-magnetite, with traces of galena, sphalerite and barite.

Numerous adits and trenches were excavated when the prospect was discovered in the late 19th Century. Of the three large adits, N°s 1 and 3 were driven on the main mineralized zone in the 'basinal' rocks, and N°2 was driven on mineralization in the lava. There may have been some minor production.

In 1974 INCO drilled a hole beneath the mineralization in N°3 Adit but the hole intersected only 4.5m* of 0.59% Cu and <0.5 g/t Au.

In 1981-82 Lyell chip sampled the adits and delineated zones of significant gold and copper values, particularly towards the southern end of the exposed mineralization where a 10-12m wide zone averaging better than 1% Cu and 1 g/t Au was indicated (see Longitudinal- Fig. 7). (As at East Darwin, the Lyell sampling in the adits showed lower copper values than those obtained by INCO which must be regarded as suspect. Apparently INCO did not sample the adits for gold.)

After the customary IP, EM, magnetic, geochemical and geological surveys, Lyell drilled two holes 80m either side of the INCO hole. JP1, to the north, intersected 2m @ 0.41% Cu, <0.1 g/t Au, and was stopped while still in altered, weakly mineralized 'basinal' rocks. JP2, the southern hole, passed only 20m ahead of the mineralization in the face of N°3 Adit, and intersected 10m @ 1.55% Cu and 1.56 g/t Au (see Longitudinal- Fig. 7).

* all widths quoted here are true widths

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The work to date has outlined a zone of mineralization within the 'basinal' rocks at least 100m long, 10m wide and 75m deep, with an indicated grade around 1.25% Cu, 1.2 g/t Au. The zone is open to the south and at depth. On the surface, the 'basinal' rocks peter-out 150m south of JP2, but the flanking stockwork zone in the lava continues another 100m to the contact with the overlying Owen Conglomerate. Ultimately, the limits to the amount of mineralization that could be present are defined by the shape of the original basin or depression against the lava dome. However, a large section of the 'basinal' blocks as currently outlined contains no ore-grade mineralization.

CONCLUSIONS AND RECOMMENDATIONS

1. A zone of mineralization of approximately 250,000 tonnes with an indicated grade of around 1.25% Cu, 1.2 g/t Au, is indicated by hole JP2 and adit sampling, to exist within the 'basinal' rocks flanking the lava dome.
2. Under the guidelines given to the Review Team, at least 5 million tonnes of this mineralization is required for a viable orebody. The potential for this sort of tonnage would appear to exist in a down-dip direction to the south.
3. Two drillholes are recommended to test this potential. Hole A (275m), would test 100m directly beneath drillhole JP2. Hole B (225m), would test 100m south of JP2 at the same RL (see Fig. 7).
4. Significant, but patchy, copper-gold mineralization occurs in places in the flanking lava. Both holes should continue 50m into the lava to test for this mineralization.

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7.4 EAST DARWIN

This zone of copper mineralization occurs within a bedded sequence of coarse volcanoclastics on the eastern margin of the rhyolitic lavas of the Jukes-Darwin Ridge. The sequence is steeply-dipping and faces eastwards. The principal rocks are volcanoclastic breccio-conglomerates, lithic tuffaceous sediments and tuffaceous siltstones, with minor cherts. The sedimentary environment seems to have been fairly high energy. This sequence is overlain to the east by massive quartz-phyric welded ignimbrite, and underlain by massive rhyolite lava cut by a stockwork of specularite, magnetite, chlorite and minor pyrite-chalcopyrite.

The mineralized zone is strataform, approximately 900m long by 60m wide, and carries variable amounts of disseminated pyrite with lesser chalcopyrite, specularite and magnetite. There are bands of massive pyrite-chalcopyrite up to 15cm, some disseminated sulphides are crudely bedded, and minor veinlet sulphides occur. The mineralization is associated with locally intense sericitisation, chloritisation and silicification. This alteration envelope is more extensive than the mineralization and is traceable at least 1100m southwards to the Darwin Extended Adit on Sumpters Peak where weak pyrite-chalcopyrite mineralization is known (see Fig. 9).

The East Darwin mineralization was first tested by three groups of adits put in at the turn of the century. From north to south these comprise: Darwin Pty., Pearce's/Dillon's, and Souter's (see Fig. 9). The copper mineralization was found to be generally low grade and there was no production. Gold was detected at Darwin Pty. where a 2 ton bulk sample of picked ore assayed 12.4 g/t Au and 6.35% Cu, with smaller samples going as high as 37.3 g/t Au, 14.9% Cu (Batchelor 1906). Only traces of gold were obtained from the other adits.

The adits were sampled by Douglas (1940) and Inco (1973). Douglas's copper results were of lower tenor than Inco's, but 22 continuous-chip samples taken from the adits by the Review Team, confirm the reliability of Douglas's results (see Appendix C & Fig. 9). Typical grades in the adits are :

6.1m @ 0.23% Cu, 0.13 g/t Au	Souter's Lower (Douglas)
3m @ 1.03% Cu,	Dillon's Lower (Douglas)
4.6m @ 0.35% Cu,	Dillon's Lower (Douglas)
12.2m @ 0.18% Cu,	Pearce's (Douglas)
8m @ 0.09% Cu, <0.1 g/t Au,	Darwin Pty. (Review Team)
0.55% Cu,-	Inco result for same interval.

The Review Team's sampling was undertaken to test the gold potential which had not been systematically evaluated before. Despite a 9.6 g/t Au, 15 g/t Ag result from picked ore (2.13% Cu) from the dump of the Darwin Pty. adit, and traces of gold with up to 30 g/t Ag from high grade ore at Pearce's and Souter's, none of the 22 chip samples contained any gold. Apart from a 4m interval in Souter's Top Adit which assayed 0.35% Pb and 0.18% Zn, lead, zinc and silver values were insignificant.

In 1974 INCO put down two drillholes 400m apart and tested the mineralized zone 130m beneath Pearce's Adit (i.e: 220m below surface), and 100m beneath Darwin Pty. Adit (i.e: 140m below surface). The holes intersected the mineralized zone but it was pyritic with only traces of chalcopyrite (best interval: 6m @ 0.11% Cu, 10 g/t Ag in the hole under Darwin Pty. The stockwork specularite-magnetite-sulphide mineralization in the underlying lavas actually gave a better intersection: 6m @ 0.29% Cu). Lead, zinc and silver were negligible and no gold was detected.

Geophysical IP and EM surveys over East Darwin show discrete anomalies that essentially coincide with the old workings. The strongest responses (coincident IP & EM) are centered on Pearce's and Dillon's adits in the central part of the

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zone. All other responses are weak. J. Bishop (Consultant Geophysicist), comments that the EM response at Pearce's is comparable to some of the more pyritic zones at Lyell. The IP chargeability is well defined but there is no marked resistivity anomaly, confirming the disseminated nature of the mineralization and the lack of chalcopyrite.

The EM responses were analysed and indicated depths are all <50m. Penetration by the Turam EM survey was a maximum of 100m, and for the pole-dipole IP around 50-100m.

CONCLUSIONS AND RECOMMENDATIONS

1. Despite the presence of an extensive zone of alteration and pyritisation developed in a geologically favourable environment (viz: within basinal volcanoclastic sediments in contact with mineralized lavas), it appears the mineralization at East Darwin is too weak to be of interest. The system is essentially pyritic with minor chalcopyrite, and traces of gold and silver.
2. Geologically, the potential is for essentially a Mt. Lyell-style deposit i.e. disseminated pyrite-chalcopyrite with possibly some small lenses of massive pyrite-chalcopyrite. Given the required tonnage and grade for a viable orebody of this type (a minimum of 10 million tonnes @ 1.5% Cu), it is clear that the potential has been adequately evaluated by exploration to date, particularly the two INCO drillholes.
3. It is recommended that no further exploration be undertaken at East Darwin. Given that this is by far the strongest and most extensive mineralization known in the volcanics east of the lavas of the Jukes Darwin Ridge, these volcanics should be excised from the EL.

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7.5 GARFIELD AND CURRIE VALLEYS

These valleys comprise the largest area of under-explored volcanics remaining on the EL. Very little is known in detail about the geology as exploration has been hampered by dense vegetation and difficult access. The old prospectors located weak pyrite-chalcopyrite mineralization in altered volcanics at the Snake Spur Costean prospect in the Currie, plus two small gold prospects in Owen Conglomerate - Flanagans Flat in the Garfield, and Sailor Jacks Goldmine in the Currie.

EZ did a limited amount of drainage sampling in the Garfield in 1975, and Lyell carried out soil and drainage sampling along widely-spaced cut traverse lines in 1977-78. Basemetal values were low (with one exception - a 330 ppm Pb result from a large drainage on the NE side of the Currie. This drainage was resampled by the Review Team and returned 50 and 60 Pb, which is still anomalous given that the creek is largely carrying glacials derived from the Owen Conglomerate). The geochemical sampling could have been unreliable due to intense leaching, glacial deposits and lag gravels.

The Clark Valley volcanics trend northwards and some of the basic elements of the geology may be present in the Garfield and Currie. Belts of pyritic, bedded tuffaceous sediments and black shales occur immediately south of the Lyell Currie camp, and to east of the Garfield camp (see Fig. 6). These possibly equate with the similar sediment lenses along the eastern side of the Clark Valley. Elsewhere, the weakly to moderately sericitic, quartz-phyric rhyolitic volcanics (largely ignimbrites?), are similar to those in the Clark.

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There are at least two features in this area that have no known counterparts in the Clark, and indicate the superior prospectivity of the Garfield and Currie Valleys. One is the Snake Spur Costean mineralization, a 30m wide zone of disseminated pyrite-chalcopyrite in sericitised cherty tuffs (which assays 8m @ 0.96% Cu, trace gold). This occurrence may be associated with the belt of pyritic sediments near the Currie camp.

The second, more important feature, is a sequence of strongly altered pyritic siliceous tuffaceous sediments, cherts and tuff-shales, exposed in the northern part of the Garfield River on the western margin of the area.

This sequence is +100m wide, at least 1200m long, and lies in steep west-dipping conformable contact with hematitic volcanoclastic conglomerate (Jukes?) and Owen Conglomerate.

The Review Team found small deformed lenses of massive pyrite (up to 70cm x 2cm), extending over a 100m strike length within massive siliceous tuffaceous sediments of this sequence. Although the massive pyrite contained no significant base or precious metals, minor galena and sphalerite was noted elsewhere in the sequence (best assay: 0.59% Pb). Some float of extremely altered pyritic quartz-augen schist, is evidence of the strength of the mineralizing system here.

This sequence is definitely worthy of further exploration.

CONCLUSIONS AND RECOMMENDATIONS

1. The Garfield and Currie Valleys contain volcanics with suitable massive sulphide host lithologies, and strong alteration with sulphides in places.

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The tuffaceous sedimentary sequence containing massive sulphide stringers, exposed in the Garfield River against the Jukes/Owen Conglomerates contact, is a prime exploration target. The volcanics along this contact should be carefully examined, particularly to the south towards the Clark Valley where the sequence may exist under cover.

2. The whole Garfield-Currie area should be systematically explored. The best method of doing this is to cut open the drainages in the first summer season to provide access to exposures for geological mapping and systematic rock sampling (the most reliable geochemical samples in this environment).

Any areas delineated as worthy of further work could be gridded and geophysically surveyed in the second season, and drilled if necessary in the third.

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7.6 CLARK VALLEY

The quartz-phyric rhyolitic volcanics of the Clark Valley include massive ignimbrites, flow banded lavas, pyroclastics (submarine?), tuffaceous volcanoclastic sediments and shales. The environment appears to have been dominantly submarine. Alteration is generally weak to moderate sericitisation.

Major lenses of grey to black shales up to 75m wide and 1500m long occur within the volcanics, principally along the eastern contact with the rhyolitic lavas of the Jukes-Darwin Ridge, and on the lower slopes of Mt. Sorell on the western side of the valley. The shales are associated with volcanoclastic sediments and cherts. Dips are steep and facing is westward.

Pyrite is not common and mainly occurs as disseminations and fracture-fillings in the shales and associated volcanoclastic sediments, where it rarely exceeds 1-2%. Basemetal sulphides are extremely rare. The pyrite in the shales appears to be mainly of biogenic type (with some probable remobilisation into the intercalated volcanoclastics), and of little significance in a volcanogenic context.

This conclusion is confirmed by preliminary lead isotope results from 11 samples of shales, sediments and volcanics, which have signatures "..... more akin to low - Pb iron sulphide mineralization with local Pb-rich pockets. They are not that expected of another Rosebery." (B. Gulson pers. comm.).

Apart from a few extremely small diggings for alluvial and quartz-vein gold there are no old prospects in the Clark Valley volcanics. Systematic exploration didn't start until 1975 when comprehensive drainage sampling by EZ failed to locate any significant basemetal anomalies. From 1977-79 Lyell carried out a major

programme of mapping, geochemical and IP surveys on a grid covering the whole valley. The pyritic black shale lenses gave strong IP anomalies, but basemetal geochemistry was consistently low, (although some of the soil sampling could have been unreliable due to strong leaching and glacial deposits in places). Over 1000 soil and rock samples produced no soil values greater than 500 ppm Pb, Zn or Cu, and the highest rock result was only 2550 Pb from a pyritic black shale. No basemetal sulphides were seen anywhere during the two years of exploration.

The Review Team did note rare traces of galena and sphalerite, but 28 samples of the best-mineralized rocks seen did not exceed 1300 ppm for Cu, Pb or Zn, 3 Ag and nil Au.

The geophysical data was reviewed with Consultant J. Bishop who commented that the IP anomalies have signatures typical of black shale units, being long and thin with variable (generally high) resistivities. Some of the IP anomalies over the shale lenses along the eastern margin of the valley, have weak IP anomalies flanking them on their eastern sides. These are apparently due in places to hematite-magnetite-pyrite mineralization in the lavas of the Jukes-Darwin Ridge, but in the NE corner of the valley such responses could possibly be due to sulphides in Clark Valley volcanics flanking the shales.

CONCLUSIONS AND RECOMMENDATIONS

1. There is clearly a lack of basemetals in the Clark Valley volcanics which emphasizes their low prospectivity, despite the favourable quiet sedimentary conditions that prevailed at times during the volcanism.

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2. Pyrite in the shales and some associated sediments appear to be mainly of biogenic type and of little significance in a volcanogenic context. This conclusion is supported by the unfavourable signatures from preliminary lead isotope studies.

3. No further work is warranted in the Clark Valley and it is recommended the area be excised from the EL.

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8. HUXLEY (M. Jones)8.1 SUMMARY

The Huxley area can be broadly divided into three geological units; an older, westerly sequence of sediments, tuffs and generally intermediate to basic volcanics; a central intra-caldera sequence of predominantly acid volcanic character within which rhyolite domes, ignimbrites, air-fall tuffs, and sediments, including possible exhalites, have been recognised; the Owen Conglomerate which is in faulted contact with the Cambrian volcanics in the north-east of the area.

A number of minor workings, mostly for gold, are recorded in the area. Modern exploration has employed mapping, geochemistry, magnetics, I.P. and a Dighem survey but has stopped short of drilling. Superficially therefore, the area may appear somewhat more prospective than other parts of the E.L. where similar surface expressions of mineralization have already been tested at depth.

Two main targets can be recognised in the Huxley area. The first, of high priority, is the stratiform base metal potential of an anomalous zone extending south from Nasty Knob close to the Owen Conglomerate contact. This merits early drill testing. The second, and more speculative, is the gold (+ basemetal) potential of pyritic exhalite units such as the one exposed in the Mountain Maid workings. Further mapping and geochemistry are needed to better define areas of interest.

8.2 CONCLUSIONS AND RECOMMENDATIONS

1. There is an untested potential for stratiform base metal mineralization extending south from Nasty Knob close to the Owen Conglomerate contact. Initially two drill-holes totalling approximately

400 metres are recommended to test this zone; the siting of these should be preceded by a small programme of mapping and rock chip geochemistry.

2. Reconnaissance mapping and a programme of rock chip and stream sediment geochemistry to the east and west of Mt. Huxley is recommended to outline zones that may merit more detailed exploration.
3. Known gold occurrences within the area do not in themselves warrant further work. However, low order gold stream sediment anomalies to the east and west of Mt. Huxley should be followed up if they are further defined by the extended sampling programme recommended above.
4. That part of the area west of 145° 34' and the area of Owen Conglomerate to the north-west, do not merit further work and should be relinquished.

8.3 INTRODUCTION

The Huxley area is bounded to the north by the E.L. 9/66 Buffer Zone lease boundary and to the south by the King River (see Fig. 2).

Several old workings, mostly for gold are known within the area. Modern exploration dates from the mid-sixties and has embraced geological mapping, soil, stream sediment and rock chip geochemistry; ground magnetics, I.P. and a Dighem survey but no drilling.

Exploration has been carried out over four grids - Lynch Creek, Huxley (two) and Little Owen - Roaring Meg, the latter largely outside the Joint Venture Area. These have not covered the entire area and although the stream sediment survey extended the coverage, gaps remain, particularly in the south and south-east.

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Lynch Creek - exploration on this most westerly grid in the Huxley region was carried out by Cyprus Mines. An I.P. survey indicated a relatively conductive surface layer, possibly deeper weathered clay to judge by exposures in the vicinity of the King River Gold Mine. A broad anomalous zone defined by soil copper values over 100 ppm occurs in the region of Lynch Creek but is probably more a reflection of the basic-intermediate character of the volcanics than an indication of mineralization.

An anomalous gold value from stream sediments south-east of the King River mine most probably represents another quartz vein occurrence although none are recorded except that in the Specimen Adit.

Several Dighem anomalies in the western Huxley area most likely indicate the presence of black shales; no evidence of mineralization is forthcoming from stream sediment results nor traversing of the area.

Little Owen - Roaring Meg - extensive stream sediment and soil sampling have yielded numerous copper anomalies but the significance of these is debatable due to possible smelter contamination.

An I.P. survey defined several anomalous zones which, with one exception, lie outside the Joint Venture Area. Of possible significance is a weak anomaly on Line 14 in the vicinity of the gossanous zone east of Nasty Knob.

Huxley - a 1972 mapping and geochemical programme defined almost no anomalies and interest in the area lapsed until 1982.

Recent work on a grid which overlaps the northern end of the area surveyed in 1972, is described by Komyshan in the 1982-83 Annual Report. Significantly, the

geochemical sampling which comprised bedrock sampling and was carried out using a power auger to penetrate the highly leached soil cover, obtained numerous strong anomalies over areas where low values were obtained in 1972. This highlights the unreliability of much of the early geochemical sampling on the Tyndall E.L.

Significant basemetal anomalies and showings of Pb-Zn-Cu mineralization occur within strongly altered volcanics near the Owen Conglomerate contact in the north-east of the grid and along a second zone 200-300m further west.

The Dighem survey did not detect this mineralization or any of the other known mineralization in the area. An anomaly was recorded over one of the rhyolite domes but does not appear due to mineralization.

8.4 GEOLOGICAL SETTING

A broad, three-fold division of geological units can be made into a westerly sequence dominated by sediments and basic to intermediate volcanics; a central sequence of mainly acid volcanic character with features supportive of an intra-caldera environment; and the Owen Conglomerate to the north-east in apparent faulted contact with the Cambrian volcanics.

The western sequence is interpreted by Corbett (1979) as a pre-caldera volcano-sedimentary sequence developed in a large marine basin deepening westwards. Sediments include greywacke, sandstone, shale and submarine tuffs of andesitic composition, although Corbett also recognises air-fall tuffs. An ignimbrite unit identified on the Huxley track may be an outflow facies west of the inferred caldera margin. In the Lynch Creek area lavas and tuffs of basic to intermediate composition occur and are host to minor quartz-vein gold deposits such as the King River Mine.

Features supportive of the intra-caldera environment proposed by Corbett were apparent during the field reconnaissance. The geological elements of the area can be interpreted in terms of basin and dome development but the detailed relationship of the various units awaits further mapping.

Rhyolitic lava domes form prominent topographic features: in one instance south of the Huxley Saddle a probable crumble breccia marginal to such a dome was recognised, and in the vicinity of 14S 75W an aphanitic, flow-banded lava has been disrupted and incorporated in a subsequent feldspar-phyric lava flow. (This flow-dome complex may correspond to the flow-breccia shown on Corbett's (1979) map.)

Ignimbrites are recognised at a number of points in the central sequence although the distinction between such rocks and possible sedimentary debris flows cannot always be made with conviction. South of the Huxley Saddle a unit with abundant lithics including siltstone and large rhyolitic lava blocks outcrops. This may represent the basal section of an ignimbrite, or a breccia derived by slumping from a caldera wall. Corbett (1979) who interprets this central area as a caldera margin sequence, suggested such breccias might occur although he did not observe them.

Fine grained chloritic tuffaceous sediments occur (on the grid) towards the Owen Conglomerate and are variably sericitised and mineralized. In this area and also in the vicinity of the Mountain Maid prospect a siliceous, sericitic, pyritic exhalite unit was noted. Both are of significance as potential hosts to basemetal and/or gold mineralization.

In the north-east of the Huxley area the volcanics are in apparent faulted contact with and overlain

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On skyline
'Nasty Knob'
rhyolite lava dome

Left to Right
R. Poltock
G. Purvis
R. Sillitoe



HUXLEY

Looking north from
Huxley Saddle.

Mineralized zone
against Owen
Conglomerate on
right.



HUXLEY

Looking south.

"Nasty Knob" dome
in left foreground.

Mt. Huxley in
middle distance
with Jukes-Darwin
area beyond.

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by the Owen Conglomerate. The nature of this contact is not well defined and its actual shape is important for further exploration of the mineralized zone exposed in gossans near Nasty Knob (see Fig.10).

Some 150 metres south of Nasty Knob a steeply dipping outcrop of Jukes Breccia(?) occurs, apparently a fault wedge and discordant with the Owen. Downslope of this, folded tuffaceous sediments have a near vertical plunge. This may well be a critical area to understand why mineralization often seems to be developed close to the contact with Owen Conglomerate and/or "Tyndall Group equivalents" a relationship noted also, for example, at Howard's Anomaly, Selina and Henty Fault Zone.

8.5 DISCUSSION

Significant basemetal values were obtained by Komysan (1983) from a manganiferous gossan in the vicinity of Nasty Knob. This occurrence appears to be structurally complex with the gossan outcropping in deformed volcanics and possibly representing remobilisation of stratiform mineralization into a shear zone.

However, the mineralized horizon extends well to the south as a fine-grained bedded tuffaceous unit carrying pyrite and basemetals associated with moderate sericite-chlorite alteration. It represents an attractive environment for massive sulphide mineralization as yet untested by drilling.

This zone is the highest priority target in the Huxley area and merits early drill testing following rock chip sampling and some locally detailed mapping.

There is a similarity between the volcanics containing abundant lithics east of Mt. Huxley and some of the volcanics within the mineralized sequence at East Darwin.

If such a correlation is valid it implies a southern limit to the Nasty Knob prospective zone at about the Huxley Saddle.

Consideration has been given to the bulk-mineable gold potential in the vicinity of several of the known occurrences:

Mt. Ellen - a weak stockwork comprising quartz veinlets and limonite (after sulphide) veinlets is hosted by an argillically altered, deeply weathered intermediate (?) lava. Sampling of the open-cut gave scant encouragement for disseminated gold potential and essentially confirmed earlier sampling dated back to 1904. The mineralization may represent a weak root zone to a stratiform pyritic body perhaps similar to that at the Mountain Maid.

West Diorite Creek - the workings appear to have exploited an eluvial occurrence in quartz lag gravels which formed from weathering of a thick sequence above the present surface. There is no evidence of significant veining in the exposed bedrock.

Mountain Maid - two trenches on a northerly spur of Mt. Huxley have exposed a 2-5 metre thick exhalite band which is brecciated, carries significant pyrite and shows pronounced sericitisation. Only low basemetal values have been recorded and limited sampling indicates low gold values at the Mountain Maid itself.

The style of mineralization appears to have similarities to certain Precambrian volcanogenic pyritic gold deposits, e.g. Hemlo, Ontario (Patterson, 1983) and it is suggested that this type of mineralization offers the best gold target in the Huxley area. Further reconnaissance mapping has been recommended south of the 1982/83 grid and should, int. al., further define the Mountain Maid exhalite zone.

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King River Gold Mine - excavations within yellow clay (after andesite) and a stock-pile of milky quartz mark the site. Early workings may have concentrated on eluvial/alluvial mineralization rather than lode mining. There is no evidence of quartz stockworking although manganeseiferous partings are common in the weathered andesite. Analyses of the wall rocks were below the detection limit of 0.1 ppm Au. Minor copper mineralization (covellite or chalcocite) was noted in the quartz. The type of mineralization is possibly analogous to the deeper levels of epithermal vein systems in andesite terrain, but no evidence could be found regionally for the preservation of higher levels of such a system and further work is not warranted.

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9. HENTY FAULT ZONE (J.G. Purvis)9.1 SUMMARY

A re-evaluation of the results of previous exploration in the vicinity of the massive sulphide body discovered in 1974, suggested that the structural constraints placed on the body's size by previous workers, may not exist.

This was subsequently confirmed by the results from three further drillholes (HFZ 9-11) put down to test for extensions of the body, two of which (HFZ9 and 10) intersected pyritic massive sulphide.

Holes HFZ 6,9,10 and the surface exposure, delineate a syngenetic pyritic massive sulphide body at least 300m long, 100m wide and from 0.5-1.5m thick, open at depth and to the south. The Henty Fault parallels the body along its western side, being localised within the soft rocks of the hydrothermal alteration zone beneath it. It is unlikely the two will separate, which with the consistent thinness of the massive sulphide, makes it an unattractive exploration target.

The basemetal content of the massive sulphide is variable and of only moderate tenor, but the precious metal contents are significant and increase towards the south, being 7 g/t Au and 126 g/t Ag in the southernmost hole HFZ 10. This hole also intersected a second mineralized chert horizon 28m above the main massive sulphide, and this assayed 5.1 g/t Au over 1.1m.

A drillhole is recommended to test the gold potential of the +35m thick mineralized host sequence to the south of HFZ 10.

No other exploration potential is recognized in the Henty Fault Zone area.

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9.2 CONCLUSIONS AND RECOMMENDATIONS

1. The structural constraints placed on the potential size of the massive sulphide body by earlier workers, are not tenable. Both the Henty Fault and the Tyndall Group contact parallel the massive sulphide in strike and dip, and do not cut it off at depth.
2. Holes HFZ 6, 9, 10 and the surface exposure in the costean, delineate a pyritic massive sulphide body at least 300m long, 100m wide and from 0.5-1.5m thick, open at depth and to the south (see Fig. 23*). The body has a variable basemetal content in the range of 1-4% Cu, 2-11% Pb + Zn, and a significant precious metal content in the range of 40-125 g/t Ag and 1-7 g/t.
3. The massive sulphide is clearly of bedded syngenetic type and everywhere lies on the eastern margin of the Henty Fault. Because the fault is localised within the hydrothermally altered zone or pipe that underlies the massive sulphide body, there is little hope that the two will separate.
4. This feature, combined with the consistent thinness of the massive sulphide, makes the sulphide body an unattractive exploration target and no further work specifically to test it can be recommended.
5. The development in the southernmost hole HFZ 10, of a second mineralized horizon 28m stratigraphically above the main sulphide body and well away from the fault, is very significant. This mineralization is characterised by elevated gold values (up to 5.1 g/t Au over 1.1m in pyritic chert overlying thin bands of semi-massive pyrite).

* Annual Report. Appears as Fig. 13 in Review Report.

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This, and the 7 g/t Au value in the main sulphide body intersection in this hole, indicate a trend southwards of increasing gold content in the mineralized host sequence.

6. Given this trend, the gold grades in HFZ 10, and the +35m thickness of mineralized host sequence, it is concluded there is sufficient room and potential for the existence of a body of economic gold mineralization in the 800m undrilled gap between HFZ 10 and HFZ 3 further to the south.
7. One drillhole is recommended to test this gold potential. The holes should be located 200m south of HFZ 10 and intersect the host sequence 200m below surface. The possibility of collaring this hole in the Tyndall Group rocks and drilling westwards, to lessen the meterage required and avoid possible problems with the fault, should be considered.
8. The geology at the southern end of the Henty Fault Zone, drilled by holes HFZ 3, 4, 7 and 8, is difficult to correlate with that in the vicinity of the massive sulphide body. However, the holes traversed the critical zone from the western sequence of ignimbrites and basic volcanics to the Tyndall Group, without intersecting any significant basemetal or precious metal mineralization, and effectively define the southern limit of the prospective zone.
9. The weak py-cp mineralization in chloritised tuffaceous sediments at the northern end of the Henty Fault Zone has been adequately tested by the previous drilling with negative results.

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9.3 INTRODUCTION

9.3.1 WORK COMPLETED PRE-1982

Systematic exploration of the Henty Fault Zone area commenced in 1968-69 with gridding on a quarter-mile spacing. The grid was soil sampled, mapped and covered by ground EM and magnetics. No anomalies of significance were outlined.

An old shaft was located on line 63N at the northern end of the area, with pyrite-magnetite-chalcopyrite in chloritic volcanics on the dump. A costean was excavated here exposing 40' of 1.22% Cu within quartz-chlorite schists after altered tuffaceous sediments. This mineralization was later drilled by holes HFZ 1 & 2 in 1973, which showed that the mineralization was patchy and weak - best intersection being 250' of 0.11% Cu (including 5' @ 0.6% Cu), in HFZ 1. (Pb and Zn values were <300 ppm).

Several zones of pyritic quartz-sericite schist with traces of chalcopyrite were outlined towards the northern end of the HFZ area, mainly immediately west of the fault. This led to the grid being tightened up to 600' spacing in 1972-73 with further mapping and a gradient array IP survey. The IP got 17 strong anomalies in 8 groupings, including one over the old working on 63N. Other anomalies coincided with the pyritic schist zones near the fault. A sharp, shallow 40 m.sec. chargeability anomaly was detected on Line 49N immediately east of the fault. This response was later shown to be due to the massive sulphide body.

In 1973-74 a major programme of pole-dipole IP, soil geochemistry, costeaning and diamond drilling, was commenced to evaluate the IP anomalies.

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The soil geochemistry gave very low values (average <20 ppm for Cu, Pb, Zn), with "anomalies" up to a maximum of only 85 ppm Pb. The massive sulphide body, covered by 50cm of glacials, gave a soil value of only 15 Pb, 15 Zn and 15 Cu. The known mineralization on 63N gave a soil anomaly of 700 Cu (possibly contaminated by the shaft dump material). Costeaming of the IP anomalies was only partially successful.

Eight drillholes totalling 1744m, were put down on the IP anomalies between November 1973 and January 1975. HFZ 1 & 2 as already mentioned, tested the mineralization around the old shaft on 63N. HFZ 3 & 4 drilled on lines 42 & 43N, intersected black shales and only traces of basemetal sulphides - the best intersection was 10' @ 0.12% Cu in HFZ 3.

While HFZ 3 & 4 were being drilled, a costean was cut over the IP anomaly on 49N. The costean exposed 1.5m of bedded pyritic massive sulphide assaying 1.67% Cu, 1.68% Pb, 0.2% Zn, 95 g/t Ag and 1.6 g/t Au, hosted by vitric and cherty tuffaceous sediments immediately east of the fault. Hole HFZ 5 drilled 120m beneath the costean was barren, but HFZ 6 125m further south, intersected 0.55m of massive sulphide assaying 1.11% Cu, 4% Pb, 7%Zn, 85 g/t/ Ag and 2 g/t/ Au. The massive sulphide lay against the Henty Fault, and the Mt. Lyell geologists inferred that the mineralization would be pinched out at depth between the fault and the Tyndall Group 'unconformity' to the east. Apart from an Applied Potential survey in 1979-80, which showed that sulphides extended at least 250m along strike, no further exploration was carried out in the vicinity of the massive sulphide body until 1982-83.

Holes HFZ 7 and 8 were drilled on IP anomalies with coincident weak soil geochemical values, on lines 40N and 38N at the southern end of the HFZ. The holes intersected weak mineralization, the best intersections being 8' @ 3100 Cu, 2500 Pb, 5300 Zn in pyritic altered ignimbrites(?) in HFZ 7, and 10' @ 385 Cu, 1425 Pb, 4550 Zn in similar rocks in HFZ 8.

9.3.2 WORK COMPLETED 1982-83

A cursory review of the geology in holes HFZ 5 & 6 (drilled in 1974), suggested that the structural limitations placed on the potential size of the massive sulphide body by the interpretations of earlier workers, may not exist. To test this idea, contract geologist P.W. English was asked to re-evaluate all data and drillcore over a 1700m zone between lines 42 - 51N (roughly from HFZ 4 to HFZ 5). His report (less plans) is presented in Appendix E*. As part of this work, English relogged holes HFZ 3-6; reviewed and interpreted all the geological, geochemical and geophysical data; theodolited in a small metric grid aligned magnetic E-W over the massive sulphide body; and drew up new geological sections.

English concluded that there was room for extensions of the massive sulphide and showed that there was little evidence to suggest the massive sulphide would be cut off by the Henty Fault and/or the Tyndall Group contact. He recommended five holes (A-E totalling 1040m), but only three totalling 606m were drilled: A = HFZ 11 (88m) located 80m north of HFZ 5 and the coast; D = HFZ 9 (268m) located 80m down-dip from HFZ 6; and E = HFZ¹⁰_A (250m) located 100m south of HFZ 6.

* Annual Report.

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The Henty Fault Zone was included in the 1983 Review of the Tyndall E.L. The observations and conclusions of the Review Team on the potential of the prospect are incorporated in this report, which appears in both the 1982-83 Annual Report and the Review Report.

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92.

HENTY FAULT ZONE

Bedded massive sulphide in costean.

(1.5m @ 1.7% Cu
1.7% Pb
0.2% Zn
95 g/t Ag
1.5 g/t Au)



HOWARD'S ANOMALY

Looking north from Basin Lake area.

Sulphide zone just to the right of shadow in centre of photo.



BASIN LAKE

Looking north along glacial-covered Sulphide Zone from vicinity of BL 1.

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9.4 DISCUSSION OF RESULTS

9.4.1 VICINITY OF THE MASSIVE SULPHIDE BODY

Detailed results of the 1982-83 drilling are given in the drill logs in Appendix D and in Figs.22-29. (Annual Report); and Figs12-13(Review Report).

To summarize: HFZ 9, 80m down-dip below the 0.55m* of massive sulphide in HFZ 6, intersected 0.7m of pyritic massive sulphide assaying 1.1%Cu, 1.1.% Pb, 2.1% Zn, 41 g/t Ag and 1.3 g/t Au. HFZ 10, 100m south of HFZ 9 and at the same RL, intersected 0.6m of pyritic massive sulphide assaying 3.75% Cu, 1.3% Pb, 0.6% Zn, 126 g/t Ag and 7 g/t Au. A 1.1m thick interval of sulphidic chert located 28m stratigraphically above the massive sulphide in HFZ 10, assayed 5.1 g/t Au. The significance of this intersection is discussed in detail later. HFZ 11, drilled a shallow depth 80m north of the costean, was barren (although like barren hole HFZ 5, it did intersect the massive sulphide host horizon). These two holes effectively define the northern limit of the sulphide body.

The massive sulphide is hosted by altered, cherty, sulphidic tuffaceous sediments. It occupies a consistent stratigraphic position and is clearly one continuous body. Holes HFZ 6, 9, 10, and the exposure in the costean, delineate a massive sulphide body at least 300m long, 100m wide and from 0.5-1.5m thick, open at depth and to the south (see Fig.23**). The body has a variable base metal content in the order of 1-4% Cu, 2-11% Pb + Zn, and significant precious metal

* all widths quoted are true widths.

** Annual Report. Appears as Fig.13 in Review Report.

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values in the order of 40-125 g/t Ag and 1-7 g/t Au.

The sequence in the vicinity of the massive sulphide body is now fairly well defined. West of the Henty Fault is a thick sequence of steeply-dipping markedly bi-modal volcanics, comprising albitised felsic welded ignimbrites, cut by dykes and sills of chloritised basic volcanics (basalts and micro-gabbros). Some complex zones of intermixing suggest these two suites of volcanics were formed contemporaneously.

The Henty Fault marks a rock type change to a steeply west-dipping, east-facing bedded sequence of sulphidic cherts and altered sulphidic tuffaceous sediments. These rocks host the massive sulphide body. Minor thin intercalations of deformed black tuff-shales are present in the altered zone beneath the sulphide but are not seen in the generally-siliceous rocks above it.

This sequence is overlain to the east by barren volcanoclastic breccio-conglomerates and cherts of the Tyndall Group. In keeping with the Tyndall Group elsewhere, these rocks are characterised by clasts of quartz-phyric volcanics. The contact between the Tyndall Group and the underlying mineralized sequence is conformable although locally sheared. The presence of cherts (grey and sulphidic in the mineralized sequence, pink or white and barren in the Tyndall Group), would suggest that the depositional environment of the two sequences was similar and that no great time break is represented by the contact.

The massive sulphide body lies on the eastern margin of the Henty Fault. The fault dips west at about 65° in this area and parallels strike.

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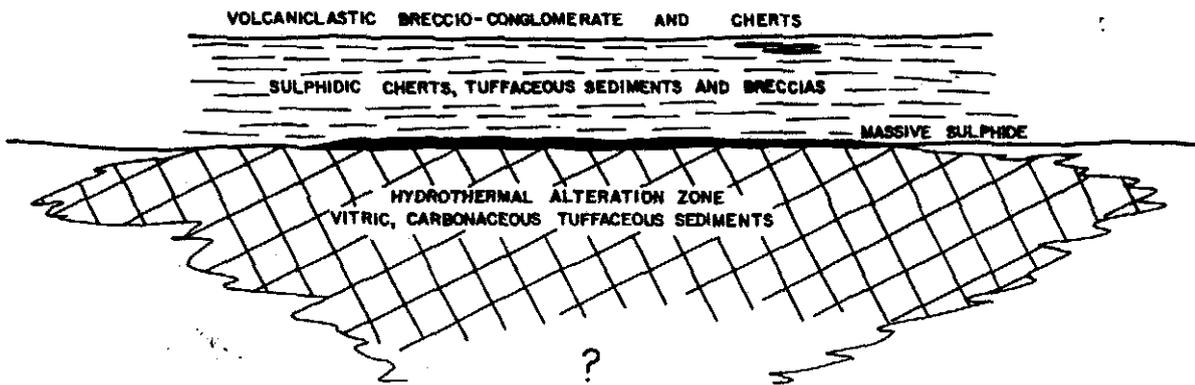
It comprises a zone of intense fracturing and mylonisation up to 20m wide. The change of rock type from the western sequence of ignimbrites and basic volcanics to the eastern sequence of mineralized tuffaceous sediments, occurs in the middle of the mylonised zone.

The massive sulphide is clearly seen in the costean to be of bedded syngenetic type. It always lies against the fault zone, and it is apparent that the fault in this area is localised within the soft rocks of the intense hydrothermal alteration zone or pipe that originally formed beneath the massive sulphide body (see sketch). This would explain the tremendous width of deformation associated with the fault in this area (it is much weaker to the south - see later). However, because of its localisation within the alteration zone, the fault will continue to parallel the massive sulphide in both strike and dip, and there is little hope that the sulphide body will separate from it - an important unfavourable feature of the prospect.

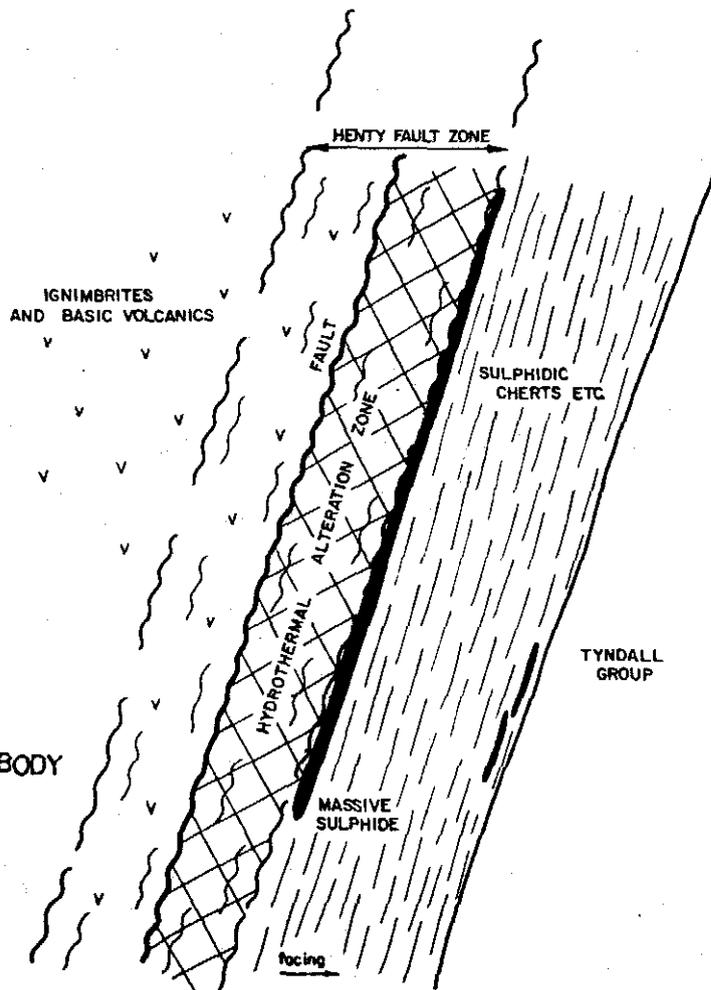
The two structural constraints placed on the potential size of the sulphide body by earlier workers (e.g: Reid & Meares 1981), viz: that the mineralization would be pinched out at depth between the fault and the Tyndall Group 'unconformity', are not tenable. Both features parallel the massive sulphide in strike and dip, the Tyndall Group boundary being conformable. Although the massive sulphide is sometimes broken up by the adjacent fault, there is no evidence within the fault zone in the way of massive sulphide fragments or highly sulphidic zones, to suggest that it has sheared off any significant proportion of the original thickness of the massive sulphide

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HENTY FAULT ZONE
 MASSIVE SULPHIDE BODY
A. PRE - FAULTING



HENTY FAULT ZONE
 MASSIVE SULPHIDE BODY
B. POST FAULTING

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body.

In the southern-most hole, HFZ 10, the host tuffaceous sediment sequence is + 35m thick, and there is a second development of semi-massive bedded pyrite (0.35m thick) towards the stratigraphic top of the sequence, some 28m above the main massive sulphide zone. Although this semi-massive pyrite contains only minor metal values (0.5 g/t Au, 11 g/t Ag), a 1.1m thick bed of sulphidic chert immediately stratigraphically overlying it assayed 5.1 g/t Au, with 0.45% Cu.

These results indicate the development of a second horizon of mineralization, characterised by significant gold values, well away from the fault zone and open to the south (it is not present in the holes further north). The high gold content of the main massive sulphide body in HFZ 10 (7 g/t Au) is much higher the gold grades in the massive sulphide elsewhere, and also suggests a trend of increasing gold content southwards in the host sequence.

Given these grades, the +35m thickness of the mineralized host sequence here, and the 800m long gap between HFZ 10 and the next hole to the south (HFZ 3), it would appear there is sufficient room and potential for the development of a body of economic gold mineralization south of HFZ 10, and this possibility should be tested by drilling.

9.4.2 SOUTHERN HENTY FAULT ZONE

This area was drilled in 1974-75 by holes HFZ 3,4,7 and 8, sited to test IP anomalies and weakly anomalous soil geochemistry. The anomalies were found to be due more to black and grey shales than sulphides.

Only minor basemetal sulphides were intersected in the holes. The best intersections were from pyritic altered ignimbrites(?) in holes HFZ 7 + 8 which assayed 0.31% Cu, 0.25% Pb, 0.53% Zn over 8' in HFZ 7, and 0.14% Pb, 0.45% Zn over 10' in HFZ 8. There was no significant basemetal values in HFZ 3 or 4.

No gold assaying was carried out on the core until this year. Although no anomalous values have yet been detected, some of the stratigraphically critical zones remain unsampled. This work is continuing.

The geology in the holes is difficult to correlate with that further north in the vicinity of the massive sulphide body, due partly to the fact that the Henty Fault splits into west and east branches in this area - the latter being the main fault zone. English relogged holes HFZ 3 and 4 and his sections are shown in Figs.28,29*. Following the drilling of HFZ 9-11, the author briefly re-examined HFZ 3 and 4, and has overlain on the sections one possible interpretation of the stratigraphy. The geology can be divided into three broad rock groupings, apparently separated by the branches of the Henty Fault (which here are much more poorly expressed than further north):

- the normal western sequence of ignimbrites and basic volcanics

* Annual Report.

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- a central sequence of weakly altered, poorly pyritic, grey to black tuffaceous shales, siltstones, sandstones and other sediments.
- the normal eastern sequence of Tyndall Group volcanoclastic sediments and cherts.

The problem is the identity of the central sedimentary sequence. This may represent the along-strike facies equivalent of the mineralized host sequence further north, or an infaulted slice of Dundas Group equivalents - the northern extremity of the sequence exposed at West Tyndall and Henty River. This latter interpretation is supported by the geology in holes 7 and 8 further south, where hematitic siltstones and altered basic-intermediate lavas (similar to those at Henty River), occur in this central sedimentary sequence.

However, notwithstanding the geological complexities, it is clear that the holes at the southern end of the Henty Fault Zone have tested right across the potentially prospective stratigraphy without significant results.

9.4.3 NORTHERN HENTY FAULT ZONE

The most significant feature of this area is the mineralization around the old shaft on line 63N, which was drilled by HFZ 1 & 2 in 1973. The mineralization occurs in chloritised, fine grained tuffaceous sediments lying immediately west of the Henty Fault. These rocks are associated with sheared, altered basic volcanics (flows?), minor crystal tuffs and ignimbrites. This sequence appears to be the same as the unmineralized rocks to the west of the fault further south.

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The altered tuffaceous sediments contain dispersed pyrite-magnetite mineralization with minor chalcopyrite. It occurs as disseminations, some stratiform and (rarely) semi-massive (up to 6cm wide), but mostly in quartz veinlets and fractures. Hole HFZ 1 intersected 250' averaging 0.11% Cu with a best interval of 0.6% Cu. Lead and zinc values were <300 ppm. Hole HFZ 2 was much worse.

The mineralization may originally have been syngenetic and remobilized by the fault into fractures and veins. The holes adequately tested the mineralization and no potential remains in this northern area.

9.5 HENTY-ANTHONY HYDRO ELECTRICITY SCHEME

Part of the proposed HEC Henty-Anthony scheme involves the building of a small dam on the Henty River (roughly between holes HFZ 7 & 8), and the formation of a Lake extending north along the Henty Fault Zone to the vicinity of HFZ 3 (see Fig.22^{*}). A main access road is to be built along the eastern side of the Henty Fault Zone - just to the east of the massive sulphide body.

* Annual Report. Appears as Fig. 12 in Review Report.

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10. HOWARD'S ANOMALY (J.G. Purvis)10.1 SUMMARY

The Howard's Anomaly area is the most continuously and intensely-explored area on the Tyndall EL. The data from the exploration is voluminous and adequately reviewing it all has been difficult.

Two mineralized zones are recognised within a 500m wide sequence of altered andesitic volcanics comprising lavas, ignimbrites, crystal tuffs and sediments, which were largely laid down under marine conditions.

The western-most Sulphide Zone contains the prospective units. The zone is marked by locally intense pyritisation and a string of IP anomalies. Three drillholes have been put down in it without intersecting significant basemetal values. The strongest basemetal indication, a highly anomalous area of zinc sulphides in soils, has not been tested and an immediate two-hole drill test is recommended. No other drilling can be recommended on the Sulphide Zone at this time.

The eastern Silver Zone, which has been drilled in four holes, contains irregularly distributed silver mineralization within hematitic, altered volcanics and sediments. This mineralization has no economic potential.

10.2 CONCLUSIONS AND RECOMMENDATIONS

1. The 200-400m wide Sulphide Zone defines the prospective units at Howard's Anomaly. The area of highly anomalous zinc soil values located within the zone on the south bank of Newton Creek, warrants immediate drilling.
2. The zinc anomaly is due to grains of zinc sulphide (associated with grains of pyrite) within the soil profile, and is clearly locally derived from a concealed source - either massive sulphide or strongly disseminated sulphides. Flanking IP anomalies confirm that the source is in the immediate vicinity of the zinc anomaly.
3. Two 200m drillholes are recommended to test for the source of the zinc anomaly. The holes would drill westwards and one should be directed beneath the zinc anomaly itself. Before siting the holes it will be necessary to establish on the ground the position of the anomaly in relation to the adjacent IP anomalies and the pyritic volcanics exposed in Newton Creek. Some deep power augering (to 4-5m) should be attempted within and around the zinc anomaly prior to drilling.
4. No drilling can be recommended elsewhere within the Sulphide Zone on present knowledge. Further evaluation of the zone would require upgrading the geological and geochemical coverage which in places is unreliable and patchy. It is recommended that this work be undertaken only if encouragement is received from the drilling of the zinc anomaly.

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5. The silver mineralization within the Silver Zone is erratically distributed and of overall low tenor. There is no potential for an economic silver deposit within this zone at Howard's.

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10.3

INTRODUCTION

The Howard's Anomaly area extends 6km along the western side of the Tyndall Range (see Fig. 2). It is the most continuously and intensely-explored area on the Tyndall EL. The data from this exploration is voluminous and it was difficult for the Review Team to assimilate it all.

The area has been repeatedly gridded, and the history of geophysical coverage is one of disastrous over-surveying. Between 1957 and 1981 there were nine separate IP surveys, two ground EM surveys, two ground magnetic surveys and one gravity survey. Line 22N was covered by IP on six separate occasions. However, only seven drillholes have been put down and much of the area is still not well mapped or understood geologically.

The earliest reference to the area is a description of the Tyndall Mine workings by Twelvetrees (1900). These workings are very small, comprising two shafts 70m apart on a quartz vein containing chalcopyrite-galena-sphalerite-tetrahedrite. The vein is on a fault (visible on Landsat images), on the margin of a rhyolite lava (dome?). Although there are gossanous patches and old excavations in the altered tuffs flanking the lava, geophysical and geochemical results show that there is no significant mineralization present. The only other old workings in the Howard's area are some pits on weak showings in silicified volcanics 800m NW of the Tyndall Mine.

Systematic exploration dates from 1957 when RTAE carried out mapping, geochemical and geophysical surveys (Turam, gravity and magnetics). They concentrated on their 'southern anomaly', a linear EM anomaly trending along the lower reaches of Tyndall Creek, *

*The EM anomaly and Tyndall Creek coincide with the Landsat lineament that extends through the Tyndall Mine.

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where they discovered a hematite-barite gossan assaying up to 1.5% Pb & 0.5% Zn (drilled by Lyell with HA4 in 1980). No drilling was carried out by RTAE before they quit the area in 1962.

Mt. Lyell commenced work in 1967 with mapping, soil geochemical and IP surveys, which essentially confirmed the presence of the anomalous zones defined by RTAE. Up to 1975, when Mt Lyell temporarily ceased work, four drillholes were put down (HA 1/2, HA 3, TYN 1 and TYN 3). All tested IP anomalies, some with coincident weak soil basemetal anomalies. No significant mineralization was intersected.

In 1979 exploration recommenced following a review of the property by Drake of Getty. Further detailed mapping, geochemical and geophysical surveys were made, mainly in the area of RTAE's 'southern anomaly'. Drillhole HA 4, put down to test the RTAE hematite-barite gossan, intersected 4m @ 251 g/t Ag - the first indication of the silver-bearing hematitic zone which extends along Tyndall Creek (see Fig. 14). As a result, the emphasis changed from seeking a basemetal target to seeking a disseminated silver deposit. Reassaying of HA 3, 650m along strike to the north of HA 4, located a 49m interval averaging 8 g/t Ag. The Silver Zone was further delineated by surface chip sampling, and then drilled in 1981 by HA 5 & 6. Both holes intersected only minor mineralization. Work ceased after it was concluded that the silver mineralization was sporadic and sub-economic.

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10.4 GEOLOGICAL SETTING

The geology of the Howard's Anomaly area is not as well understood as some areas on the Tyndall EL, despite the large amount of exploration carried out there. Mapping is hindered by extensive glacial deposits which are particularly thick towards the northern and southern ends of the area.

The volcanism at Howard's was mainly andesitic. The volcanics now dip steeply east and face east, where they are conformably overlain by the rhyolitic Tyndall Group volcanics, which are in turn in faulted contact with Owen Conglomerate further east (see Fig. 14).

The western side of the area is dominated by massive andesitic lavas and intrusives, with ignimbrites and minor sediment lenses. Although these rocks are of little exploration interest they were covered by geochemical and geophysical surveys in the early years, without delineating any anomalies of significance.

Immediately to the east of the lavas and intrusives, is an associated sequence of predominantly andesitic volcanics which includes lavas, crystal tuffs, ignimbrites, tuffaceous sediments, shales and impure limestones. This sequence is 500 m wide and encompasses the mineralized units in the Howard's Anomaly area.

The environment of deposition was apparently largely marine. The andesite lavas are invariably brecciated suggesting they may have been extruded into water, and there is an increasing amount of bedded sediments towards the upper (eastern) part of the sequence. It seems quiet, fine-grained sedimentation (often of carbonate type), was being disrupted by andesitic volcanism. Limey tuffaceous sediments, calcareous shales and impure limestones are locally abundant.

The most characteristic rock of this sequence is andesitic felsic crystal tuff - a poorly sorted, poorly bedded, mass deposition volcanoclastic with gritty texture and occasional lithic fragments.

Within this sequence two mineralized zones are recognised: the western 200-400m wide Sulphide Zone*, and the eastern 100-200m wide Silver Zone* (see Fig. 14). The Sulphide Zone is marked by locally intense pyritisation including very small occurrences of disrupted pyritic 'mud' (e.g.: in the upper 35m of HA 1), a line of IP anomalies and some moderate to strong Pb-Zn geochemical anomalies. Generally, the pyritisation is associated with locally strong alteration, principally sericitisation and silicification. Drillhole HA 1/2 was put down in this zone and holes TYN 1 & 3 are regarded as being in its poorly defined southern extension.

The Silver Zone abuts the Sulphide Zone and marks an oxide facies. It comprises extremely erratically-distributed silver mineralization (freibergite, pyragyrite and native silver), within strongly hematitic, chloritised tuffaceous sediments, ignimbrites and probable chemical sediments (hematitic carbonates and rare cherts). Magnetite and barite are ubiquitous accessories, but sulphides are generally minor (although there are some strong basemetal surface anomalies - see later). The zone coincides with the landsat lineament and EM anomaly that extends along Tyndall Creek.

The best silver values are associated with the strongest hematisation and appear unrelated to the presence or absence of carbonate. The mineralization seems to have been partly syngenetic and partly replacement (fiamme replaced by hematite were noted in the ignimbrites), and was possibly related to fumerolic

*Terms coined by the Review Team.

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hydrothermal activity in shallow marine conditions.

Overlying the mineralized volcanics at Howard's are the rhyolitic volcanics of the Tyndall Group. The contact appears to be conformable and gradational over about 20m (Komyshan, 1981).

Typical rocks of the Tyndall Group in this area are coarse agglomeratic pyroclastics and volcanoclastics, with characteristic blotchy pink (albite) and green (chlorite) colouration. These rocks, which show ignimbritic textures in places, contain angular or rounded blocks up to one metre diameter of quartz-feldspar porphyritic lavas. Other clast components are hematitic tuffs, hematitic cherts, felsic tuffs and Precambrian quartzite. Bedding is present in the volcanoclastics.

Flow banded quartz-phyric lavas (possibly domes), are also present in the Tyndall Group. The best example is at the old Tyndall Mine where the mineralized quartz vein lies on a fault structure cutting the margin of a Tyndall Group lava dome (?). Apart from weak, sporadic, pyritisation this is the only mineralization known in the Tyndall Group at Howard's.

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10.5 DISCUSSION OF POTENTIAL

10.5.1 SULPHIDE ZONE

The Sulphide Zone is essentially pyritic and the known basemetal indications are subdued, with one important exception (detailed below). The geochemical sampling results are unreliable over a large part of the area due to the glacial deposit cover and the sampling of A horizon soils. The IP anomalies along the zone have been shown by the three drillholes and by costeaning, to be mainly due to pyrite. The drillholes demonstrate the subdued geochemistry well:

Sulphide Zone - Best Drillhole Intersections:

		Cu	Pb	Zn	FeS ₂
HA1	80-85'	5'@3500	2200	6600	19%
HA2*	370-380'	10'@ 550	1100	3075	3.3%
TYN1	220-235'	15'@ 230	830	1700	
TYN3	1080-1085'	5'@ 200	2300	300	

Several areas with moderate-order basemetal geochemical responses are known, e.g.: rock chip samples of pyritic volcanics carrying up to 0.5% combined Cu-Pb-Zn in the vicinity of the Line 30N pit, and in road exposures at line 14.5N, 400E; and an isolated 1040 Pb C horizon soil sample at 11.5N, 300E. On present knowledge, none of these appear to be of significance.

However, there is one outstanding basemetal geochemical response within the Sulphide Zone and this has not been tested to date. This is an area of very strong Zn soil anomalies between lines 23.7N & 24N on the south bank of Newton

* The 30' of 0.2 g/t Au from 340-370' in this hole is the best gold value detected at Howard's.

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Creek.

Values up to 1.35% Zn, with many in the 0.25-0.75% Zn range, were obtained in normal soil sampling within a depression 90m x 60m. Lead, silver and copper values were low but manganese averaged 5%. Subsequent pitting of the anomaly and electron microprobe analysis, found that the zinc occurs as discrete grains of zinc sulphide associated with more abundant pyrite grains, within coarser grained layers (possibly alluvium) in the pit profile. The pit was 1.75m deep and did not reach bedrock.

The zinc anomaly falls centrally within the Sulphide Zone which in this area is defined by a 250m wide zone of sporadic, locally strong, pyritisation and alteration within the andesitic volcanics exposed in Newton Creek. The geophysical responses in this area are complex and pegging errors on the gridlines make it difficult to deduce the exact position of some of them. Moderate to strong IP anomalies bracket the zinc anomaly to the immediate east and west. Although the responses extend further north and south, the dipole-dipole IP surveys suggest that the bulk of the (pyritic?) sulphides is to the SE of the zinc anomaly area (J. Bishop pers. comm.).

The zinc anomaly warrants immediate drilling. It is clear that the zinc sulphide grains are of local derivation, given the location of the anomaly and the association with more-abundant pyrite grains. The source must be shallowly buried and comprise either massive sulphide or a strongly disseminated sulphide zone. Two 200m drillholes will be required given that the source of the anomaly cannot be pinpointed.

Elsewhere within the Sulphide Zone there are strong IP anomalies e.g.: under costean 4 on Line 22N, and immediately east of TYN 3. From the poor geochemical responses in costean 4 the IP anomaly there would appear to be due to pyrite, while the IP anomaly east of TYN 3 is of the same type as the one tested by TYN 1 (J. Bishop pers. comm.), and probably represents the along-strike continuation of the pyritic black shale intersected in that hole. On this basis, these responses cannot be recommended for further testing.

Evaluation of these untested geophysical and geochemical anomalies in the Sulphide Zone is difficult given the present unreliable geochemical results from ineffective sampling particularly in areas of thin glacial cover, and lack of good geological mapping in other places. Both the geological mapping and geochemical sampling would have to be upgraded in these anomalous areas before further drilling could be attempted.

10.5.2 SILVER ZONE

Ironically, the strongest surface soil and rock basemetal anomalies are in this zone, while IP responses are muted. The RTAE hematite-barite gossan lies within the zone at Line 20.2N. Rock samples of the gossan assayed up to 2% Pb, 0.28% Zn and 26 g/t Ag. On line 22N soil values were up to 2% Pb, 0.52% Zn and 17 g/t Ag. Elsewhere, there were several soil anomalies >1000 ppm Pb or Zn.

Along a 1300m length of the zone, silver values in surface rock chip sampling were strongly anomalous e.g.: 10m @ 76 g/t Ag (with 1000 Pb) on line 21N. Values were as high as

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310 g/t (on 19N), with most in the 5-25 g/t Ag range. Associated basemetal values were only slightly anomalous.

However, the Silver Zone has been well tested by drilling with discouraging results. Four holes (HA3 - 6) have been put down along a 1000m strike length beneath the best IP and surface geochemical indications. The drilling highlights the erratic distribution and overall low tenor of the mineralization, consisting typically of 2-4m intervals with + 10 g/t Ag within larger intervals averaging 4-6 g/t Ag. The best intersection quoted by Walter & Meares in the 1980 Annual Report, 35m @ 34 g/t Ag in HA4 (drilled under the RTAE hematite-barite gossan), in fact comprises 2m @ 45 g/t Ag and 4m @ 251 g/t Ag, with the remainder of the intersection ranging from <2-9 g/t Ag.

The silver mineralization is not confined to any one rock type or any particular altered horizon within the overall Silver Zone (as discussed earlier). The irregular distribution of the mineralization means that the drillholes, sited on the strongest surface indications, have not necessarily intersected the best subsurface mineralization existing in the zone. However, the testing to date clearly demonstrates that there is no potential for an economic silver deposit in this area.

Assaying by Mt Lyell and the Review Team shows there is no gold at all in the Silver Zone, and although basemetal values in the drillholes ranged up to 2m @ 1.46% Zn, 0.18% Pb in HA4, these were not associated with the silver (the best interval of 2m @ 410 g/t Ag was higher than the Pb, Zn or Cu values for that interval).

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Apart from the quoted interval in HA4, no other basemetal values exceeded 0.2% for Cu & Pb, and 0.3% for Zn. Overall basemetal values were similar to those in the Sulphide Zone.

10.6 UPPER NEWTON CREEK SEQUENCE

As part of the Review of the Howard's Anomaly area, a traverse was made to examine the Newton Creek Sandstone sequence in the Upper Newton Creek Valley. The valley cuts E-W through the Owen Conglomerate. The micaceous sandstones, siltstones and black pyritic shales exposed in the floor of the valley appear to be basal units of the Owen.

While these rocks are not considered to be of economic interest, the Red Hills - Beatrice line of rhyolitic lava domes and associated mineralized black shale basins, must underly the floor of the valley beneath them.

The Newton Creek Sandstone units would appear to be thick, suggesting the prospective volcanics are deeply buried. The black shales in the overlying Newton Creek sequence would hinder the use of electrical geophysics in exploration of the volcanics beneath. Such exploration can not be recommended at this time.

HENTY-ANTHONY HYDRO-ELECTRICITY SCHEME

The proposed HEC Henty-Anthony scheme will involve much disruption of the Howard's Anomaly area. Two dams are to be built on Newton Creek forming shallow lakes in the Upper Newton Creek valley and along Tyndall Creek. Two possible sites are under consideration for the Lower Newton Creek dam - one immediately upstream of the zinc anomaly area, the other further downstream. Both alternatives would have important implications for any mine development in the zinc anomaly area.

Much of the glacial-covered northern and southern extensions of the Sulphide Zone would be exposed by earthworks for proposed canal lines, culverts and roads. This work is planned to commence in 1985 and to be completed by 1988.

11. BASIN LAKE (F.G. FitzGerald)11.1 CONCLUSIONS AND RECOMMENDATIONS

1. A linear Sulphide Zone has been identified beneath glacial cover in the eastern Basin Lake area. This zone is probably part of a 9 km belt that stretches to the north of Howard's Anomaly. Bedded, massive pyrite has been intersected within this zone in BL4. The pyrite occurs within highly altered epiclastic rocks indicating that favourable conditions existed for the development of a massive sulphide deposit. This horizon warrants further testing to evaluate the massive sulphide potential along strike.
2. It is unlikely that additional surface geochemical data can be obtained as most of the area of interest is covered by glacial deposits. The belt has been covered by numerous geophysical surveys which may have penetrated the cover in most places and no additional surveying is warranted at this stage.
3. It is recommended that diamond drilling is the most effective method of evaluating the Sulphide Zone and two holes are proposed to test the horizon at least 250 metres along strike to the north and south of BL4.
4. A third hole is recommended approximately 400 metres to the south of BL1, which intersected encouraging base metal mineralization. This hole will test the massive sulphide potential of the southern end of the Sulphide Zone.
5. Two strongly altered pyritic zones have been outlined in the north west of the Basin Lake area. These zones are not well known geologically,

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but they may be parts of the same 1600 metres long belt within felsic pyroclastics and tuffaceous sediments. Numerous geophysical surveys over the main occurrence, the Bradshaw's Road Pyrite Zone, have accurately delineated it. Although only minor base metal mineralization has been located within these zones, the intense alteration and widespread disseminated sulphides, coupled with the presence of favourable fine-grained host lithologies, determines that they warrant further exploration. Numerous drill holes have been recommended to test these zones in the past and this now appears to be the most appropriate method to evaluate them.

6. Geological interpretation, coupled with the results of previous exploration including drilling, indicates that the rest of the Basin Lake area is unprospective. The western side of the property is composed of unaltered and unmineralized lithologies deposited in open marine conditions. The central sector is largely underlain by an essentially unaltered and unmineralized andesitic porphyry complex. East of the Sulphide Zone are intermediate volcanics and sediments deposited in an oxidizing, shallow sub-aqueous environment. These are overlain by Tyndall Group rocks and Owen Conglomerate. No further work is recommended for any of these areas, and they could be relinquished.

11.2 INTRODUCTION

The area included in the Basin Lake review is outlined in Figure 2. The eastern half of the grid area forms part of a linear belt stretching from the Henty Fault Zone prospect in the north to the West Sedgwick area in the south. Assessment of the economic potential of Basin Lake must be made in conjunction with results from these adjoining areas.

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11.3 PREVIOUS WORK

The first detailed exploration of Basin Lake was carried out by Pickands Mather between 1965 and 1971. Following an initial reconnaissance, they gridded the Mt Read volcanics-Owen Conglomerate contact for some eleven miles north of the Mt Lyell Mine Lease and surveyed this using a dipole-dipole IP array. The strongest anomaly was located north east of Basin Lake over an area covered by glacial moraine. Two vertical holes (BL 801 and 802) were drilled to test this anomaly, the second hole being abandoned before reaching target. Pickands Mather ran a Turam EM survey over this zone following the inconclusive drilling, and delineated a linear anomaly just west of the IP anomaly. The response was attributed to pyritic black shales intersected in the upper part of BL 801. They carried out no further work here, partly it appears because of serious drilling problems in penetrating the thick glacial overburden.

The northern part of the Basin Lake area was covered by dipole-dipole IP surveys in 1967-68 over the East Tyndall grid, within Mt Lyell's EL 9/66. Two anomalous zones were outlined and two drill targets were identified. These anomalies were resurveyed by gradient array IP in 1973-74 which reaffirmed the drill target in the north western zone. In-fill grids were cut and resurveyed by gradient array IP in the following year which detailed the north west zone into five anomalies. One of these was tested by hole TYN 2 drilled in 1975, but subsequent reinterpretation indicates that the anomaly has not been explained. Costeaming and a second drill hole, were recommended to test other anomalies within this zone but the programme was not carried out because of budget restrictions at the time.

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The rest of the Basin Lake area was pegged by Mt Lyell in 1971 as part of EL 41/71 but gridding and detailed exploration did not commence until 1974. The grid was initially mapped and surveyed by gradient array IP and magnetics. Primary anomalies were followed-up by soil geochemistry and infill IP surveys, and two holes (BL1 and 2) were completed in 1978 in the vicinity of the Pickands Mather drillholes. The holes intersected minor base metal mineralization in a felsic tuffaceous sequence.

Following the results of testing at Howard's Anomaly to the north, the area was further evaluated for possible southern extensions to this zone. Additional dipole-dipole IP, magnetic and soil geochemistry surveys were carried out and two holes (BL3 and 4) were drilled in 1981.

The most significant result to date at Basin Lake was the discovery in BL4 of a strongly altered and pyritic sequence of epiclastics enclosing a lens of massive pyrite up to 2.5m thick. However, basemetal values were low. Additional dipole-dipole IP and Genie EM surveys were carried out in 1982, along with reassaying of drill core and sulphidic outcrops for gold.

11.4 GEOLOGICAL DISCUSSION

Early mapping at Basin Lake was carried out by Sheppard (1973-75), whose main emphasis was on the western half of the area not covered by glacial deposits. Recent mapping and interpretation by Komyshan (1980-82) has been directed more towards the eastern half of the area, particularly following his mapping at Howard's Anomaly. The limited work of the Review Team is in agreement with the broad elements of both previous workers' interpretations.

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In general the Basin Lake area can be geologically subdivided into four zones as follows:

- (1) An eastern felsic to intermediate, volcanic and sedimentary sequence which is often quite altered and pyritic (the Sulphide Zone). This zone has been the most actively explored to date (including 6 drill holes).
- (2) A central andesitic porphyry zone which is essentially unaltered and unprospective.
- (3) Two zones of more felsic, altered and pyritic volcanic and sedimentary rocks on the western margin of the central andesite, which may have been tested in part by one drill hole (TYN 2).
- (4) A western zone of predominantly argillaceous sediments, ignimbrites and lavas which appear unprospective and can be correlated with Corbett's Western Sequence.

11.4.1 Eastern Zone

Units making up the eastern part of Basin Lake can be traced along strike to the north to the Howard's Anomaly area. Marked similarities have also been noted between this sequence and rocks to the south in the Eastern Sector of West Sedgwick.

This interpretation has come mainly from the results of drilling as large parts of the eastern zone at Basin Lake are covered by thick glacial deposits (often in excess of 20m deep).

Numerous geophysical surveys have been carried out over this area. Bishop compiled and assessed

the results of these surveys in a comprehensive review in 1982. The principal points to emerge from this report are:

- (1) The detailing of a series of linear gradient array IP anomalies designated numbers 1,5,6,6a,9 and 11 (see Fig. 14) and which have been tested in part by holes BL 2,4, and 801 and a costean of line 00N. The western of these anomalies appear to form part of the Sulphide Zone which extends for nine kilometres to the north of Howard's Anomaly.
- (2) A linear dipole-dipole IP and Turam EM anomaly delineated by Pickands Mather, just east of the gradient anomaly No.1 and tested in part by holes BL 802 and 1. This also may be part of the main Sulphide Zone.
- (3) The occurrence of a broad magnetic anomaly which lies parallel to and east of the main geophysical zone. This anomaly was tested by hole BL3 and the result suggests that the rocks here can be correlated with the Silver Zone at Howard's Anomaly.

On the basis of the geophysics and drilling to date the Eastern Zone may be tentatively subdivided into three main geological units (see Fig. 14). Going up-sequence from west to east these units are:

- (1) The Sulphide Zone. Felsic to intermediate tuffaceous sediments, interbedded with grey to black shales, vitric tuffs and possible phreatically-brecciated andesitic lava flows, all deposited in a predominantly sub-aqueous environment. The sedimentary

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sequence is often calcareous and is typically strongly altered and pyritic, including bedded massive pyrite. For example, hole BL4 intersected several bands of massive pyrite, the main lens being 2.5m thick. Quartz-sericite alteration is predominant within this unit, but chlorite-magnetite assemblages have been recognized and these may represent footwall feeder zones to the hydrothermal system.

The Sulphide Zone forms the most favourable horizon for the development of a volcanogenic massive sulphide deposit in the Basin Lake-Howard's area. However, base metal values obtained from intersections in this zone to date are discouragingly low, best assays are: BL1 (12m @ 120 ppm Cu, 976 ppm Pb and 3532 ppm Zn), and BL 802 (15 ft @ 413 ppm Cu, 4700 ppm Pb, 1900 ppm Zn). There does appear to be an increase in the base metal content of the Sulphide Zone towards the south. No significant gold assays have been obtained from this zone but it should be noted that a reassay of the massive pyrite lens in BL4 gave 1.7m @ 62 g/t Ag.

- (2) A predominantly intermediate pyroclastic sequence with minor sedimentary units interrupted by andesitic lava flows. These rocks appear to have been deposited in a shallow sub-aqueous environment. Carbonate and hematite are locally abundant, particularly within the tuffaceous units, and the general lack of pyrite suggests that these lithologies may have formed under largely oxidizing conditions. This belt may be related to the Silver Zone at Howard's Anomaly,

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although no significant silver assays were obtained from BL3 drilled east into this zone. Sporadic, minor base metal values are not thought to have economic potential here as the geological environment is considered unfavourable for the development of a massive sulphide body.

- (3) The eastern margin of Basin Lake appears to be made up of massive, pink, felsic lavas and agglomerates typical of the unprospective Tyndall Group. Hole BL1 passed conformably from sericitic tuffaceous rocks (of the Sulphide Zone), into interpreted Tyndall Group lithologies without intersecting the intermediate sequence (the Silver Zone), seen to the north. This suggests that the Silver Zone may have wedged out along the Tyndall Group contact between BL3 and BL1.

11.4.2 Central Andesitic Porphyry Zone

Interpretation of outcrops, road exposures and the intersection at the end of hole BL4, suggest that much of the central part of the Basin Lake area is underlain by a "feeder-flow" andesitic complex.

This complex appears to have formed in a largely submarine environment and the rocks are essentially unaltered and unmineralized. The lack of significant geochemical and geophysical responses confirm the unprospective nature of these rocks.

11.4.3 Central-Western Pyritic Zones

Scattered outcrops of highly sericitised and pyritic quartz-pyritic pyroclastics have been

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mapped on the western margin of the porphyritic andesite. These have been called the Leech Hill Pyrite Zone and the Bradshaw's Road Pyrite Zone (see Fig. 14). Neither zone is well known, but they appear to be 100 to 300 metres wide, and may be part of the same belt at least 1600 metres long, off-set by transverse faulting.

Both zones give strong IP responses and have been designated anomaly numbers 7, 8 and 12 (see Fig. 14). Interpretation of the geophysical results suggests that the source of the anomalies is probably disseminated sulphide, but it is conceded that a deeper massive sulphide unit could be concealed by the responses (Bishop, pers. comm.).

Limited rock chip sampling of the few outcrops and road-cut exposures has failed to locate significant base or precious metal mineralization within these zones.

Different workers over time have recommended holes to test the Bradshaw's Road Pyrite Zone, but to date none have been drilled. However, the intensity of alteration, the widespread disseminated pyrite and the presence of suitable fine grained host lithologies, are all considered to be positive features for the occurrence of a massive sulphide deposit. Drilling is the only way to evaluate this zone.

11.4.4 Western Zone

Flanking the central andesitic mass to the west in most parts of the area, is a sequence of monotonous felsic ignimbrites and argillaceous sediments. Finely laminated siltstones and grey calcareous shales are common, with black shale units generally confined to the upper (eastern) part of the sequence near the main

andesite margin.

Several gradient array IP anomalies have been outlined within this zone and designated numbers 2,3,4 and 10 (see Fig. 14). A costean over anomaly 4, which had a co-incident weak soil geochemical anomaly, exposed bog ironstone over weathered andesitic porphyry.

Anomaly No. 10, which was once thought to be part of the Bradshaw's Road Sulphide Zone, was tested by hole TYN 2. This hole intersected a sequence of unaltered and unmineralized siltstones, felsic ignimbrites and thin black shales. Reinterpretation of the geophysical data (Bishop, 1982) indicates that the gradient array IP target was not intersected. It appears that the source of the anomaly is quite shallow and is probably a thin graphitic shale lens. However the hole was collared over a deeper dipole-dipole IP anomaly within ignimbrites, which remains untested. Lithological and structural interpretation suggest that the units in the TYN 2 area have been faulted against the Bradshaw's Road Pyrite Zone and are unrelated to it.

The lithologies within this western sector appear to have been deposited largely in open marine conditions and can be correlated with Corbett's Western Sequence. The lack of significant alteration or mineralization confirms the unprospective nature of these units.

11.5 HENTY-ANTHONY HYDRO ELECTRIC SCHEME

The proposed Henty-Anthony HEC scheme will affect parts of the Basin Lake area. A dam is to be built on the upper Langdon River and the water re-directed along a diversion canal to Tyndall Creek. This

construction, which is scheduled to commence in 1985, will involve numerous access roads and cuttings within, and the partial flooding of, the prospective Sulphide Zone.

12. WEST SEDGWICK (F.G. FitzGerald)12.1 CONCLUSIONS AND RECOMMENDATIONS

1. The eastern part of West Sedgwick* is made up largely of sub-aerial volcanic lithologies within the central belt of Mt. Read Volcanics.
2. Within this volcanic sequence restricted basins evolved, creating favourable environments for the development of volcanogenic massive sulphide bodies. Highly altered and pyritic zones identified here are suggestive of the sulphidic envelopes associated with massive sulphide bodies.
3. To date only minor base metal values have been obtained from these zones and geophysical responses suggest that only disseminated sulphides are present. However, much of the area of interest is covered by glacial moraine and scree, and it appears that the belt may extend north beneath thick moraine to the Basin Lake Sulphide Zone.
4. No specific drill targets have been identified and it is recommended that no further work be carried out here at present. This eastern sector should be retained however, pending evaluation of the Sulphide Zone in the Howard's Anomaly - Basin Lake area.
5. In contrast the western half of West Sedgwick appears unprospective. Most units were deposited in open marine conditions, probably off the flanks of the main volcanic belt, and characteristically show a lack of alteration. Exploration to date, including drilling, has failed to locate any significant base or precious metal mineralization. It is recommended that this western area be relinquished.

* In broad terms, that area east of the baseline.
The West Sedgwick area is outlined in Figure 2.

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12.2 PREVIOUS WORK

Rio Tinto investigated the area from 1956 to 1962. They followed up an airborne E.M. and magnetic survey with ground E.M. This survey delineated an anomaly near the Mt. Read Volcanics - Owen Conglomerate contact southwest of Mt. Sedgwick. Detailed surveying by magnetics, gravity, stream sediment and soil geochemistry and mapping confirmed interest in the anomaly. However a later I.P. survey got no response over the E.M. anomaly and the proposed drill test was not carried out.

Pickands Mather held the ground from 1965 to 1971. After an initial reconnaissance survey they turned their attention to the volcanic-conglomerate contact which was covered by a dipole-dipole IP survey. It appears that no significant anomalies were detected in the West Sedgwick area and no further work was carried out here.

Mt. Lyell have explored West Sedgwick since 1971. They progressively gridded, mapped and surveyed the area by gradient array I.P. Detailed magnetic and soil geochemical surveys were carried out over the I.P. anomalies and these focused attention on the black shales in the southwestern part of the area. Several drill targets were identified and two of these were tested by drilling in 1977 (WS1 to 3) without encountering any significant mineralization. No further exploration has been carried out since this drilling.

During 1971 and 1972 K. and E. Corbett mapped the area as part of a Mines Department regional geological survey. A report on this work has been written (see Corbett, 1981). This report attempts to relate the geology of the area to the current thinking on the Mt. Read Volcanics stratigraphy.

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12.3 DISCUSSION OF RESULTS

Sheppard (1971-75) carried out the most detailed mapping at West Sedgwick, his descriptions of all lithologies being very comprehensive. In general the Review Team agree with his interpretations. Broadly, the area can be divided into two sectors: an eastern, predominantly sub-aerial volcanic and intermediate intrusive belt (correlated with Corbett's Central Sequence) and a western, flanking belt made up of significant sedimentary units within a predominantly sub-aqueous volcanic assemblage intruded by felsic porphyries (correlated with Corbett's Western Sequence).

In detail this picture is more complex both in terms of apparent original complexity and subsequent deformation and disruption. Corbett (1981) considers that the Western Sequence generally faces east here, and inter-fingers with the Central Sequence. He believes that Agglomerate Hill, an andesitic agglomerate and lava body within the Central Sequence, may have been a volcanic centre.

The Review is discussed in terms of the two main sectors above.

12.3.1 EASTERN WEST SEDGWICK

The eastern sector is bounded on the east by a steep scarp of Owen Conglomerate forming the Mt. Sedgwick massif. A northern continuation of the Great Lyell Fault has been postulated for the contact between the Owen Conglomerate and the Mt. Read Volcanics, however the contact zone is largely covered by glacial moraine and scree. There maybe a thin sliver of Tyndall Group rocks along this contact in the south, but further north isolated outcrops of probable Central Sequence

volcanics exposed in windows through the cover, suggest that the Tyndall Group may have wedged out against the conglomerate here.

Favourable massive sulphide host lithologies have been recognized along the eastern part of the volcanic belt. These include strongly altered and pyritic fine grained volcanoclastics, brecciated and schistose tuffs and minor shales. Only minor base metal values have been obtained from these units by previous workers and the Review Team, with highest assays being 1900 ppm Cu, 170 ppm Pb and 1500 ppm Zn (see Appendix C). The three main zones of interest have been designated the North East Pyrite Zone, the Upper Haulage Pyrite Zone and the EM Anomaly Zone (see Fig. 15).

Because of the widespread glacial and scree cover over much of the zone of interest, assessment of the area must rely heavily upon the results of the geophysical surveys. The Rio Tinto E.M. survey defined a clear anomaly along the southern end of the zone (see Fig. 15). Subsequent IP surveys by Rio Tinto, Pickands Mather and Mt. Lyell did not give significant responses over this zone, although a weak chargeability high co-incident with a resistivity low was outlined by a Mt. Lyell Mine survey in 1982, approximately 150m to the south of the EM anomaly. These responses have been related to shallow sulphides and a fault or alteration zone (Bishop, pers. comm.). Shales and altered tuffaceous rock outcropping in the vicinity of the anomaly have been correlated with the Tyndall Group (Sheppard, 1975 and Corbett, 1981).

Further north along the belt a weak IP response has been delineated between lines 18S and 6N (see Fig. 15). The response is strongest on

line 12S where a window in the cover exposes altered pyritic volcanics (the North East Pyrite Zone). The diminished response on lines to the north and south of 12S may reflect the effect of an increasing thickness in cover rather than a narrower, weaker zone. The lack of any Turam EM response over the pyritic zone, however, suggests that it is merely an area of weakly disseminated mineralization (Bishop, pers. comm.).

Agglomerate Hill lies mostly outside the Joint Venture area (see Fig. 15). The hill is made up of moderately chloritized hornblende andesite lavas with disseminated and veinlet pyrite and chalcopyrite. Flanking the hill are a series of strongly sericitized and chloritized ignimbrites, vitric tuffs and andesites. These rocks are commonly highly deformed and contain disseminated to semi-massive pyrite lenses. No significant base metals have been detected however (see Appendix C).

12.3.2 WESTERN WEST SEDGWICK

Mapping in this sector, generally to the west of the main grid base-line, has shown the rocks to be largely sub-aqueous in origin, possibly deposited in open-basin conditions off the flanks of the main belt of volcanics. Mt. Lyell's attention was directed towards the southwestern part of this area because of the strong IP responses over black shale and pyritic units, and an area of anomalous soil geochemistry around the No. 3 Dam. The area was probably followed up first because of the easier access relative to the eastern sector.

A 3m wide lens of highly pyritic quartz-sericite schist is exposed in a cutting on the old Lake Margaret Tramway, within a deeply weathered andesitic

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sequence just west of a line of shales and tuffs (see Fig.15). Two holes (WS1 and 2) were drilled to test the occurrence, the first hole being abandoned before reaching the target due to drilling problems. Hole WS2 drilled west through a sequence of dominantly sub-aqueous sediments and pyroclastics and ended in possible submarine, auto-brecciated, andesitic lavas and agglomerates. The pyrite appears to have lensed out 150m down dip. The only mineralization intersected was disseminated pyrite in black shales and tuffaceous sandstones with only a trace of pyrrhotite and chalcopyrite.

Hole WS3 was drilled to test co-incident chargeability and lead in soil (1250 ppm Pb) anomalies over a lens of pyritic black shale on line 84S. This unit was not intersected in the drill hole, although other thin black shales were encountered further down-hole within a predominantly open-basin sedimentary and ignimbritic sequence. Up to 10% pyrite and 3% pyrrhotite occurs within some of the shale interbeds but in general the rocks are only weakly sericitised and contain very minor base metals (best assay: 1.5m @ 93 ppm Cu, 420 ppm Pb and 1100 ppm Zn).

Hole WS3 was drilled east towards a stronger coincident IP and lead in soil (5300 ppm Pb) anomaly, but did not extend as far as this target. A costean was excavated over the anomaly and exposed manganiferous clay within deeply weathered intermediate tuffs (best assay: 315 ppm Cu, 5200 ppm Pb and 90 ppm Zn, - probable source of soil anomaly); and pyritic black shales and sericitised felsic tuffs (probable source of IP anomaly). Following the discouraging results in WS3 a second hole which was planned to test this target was not drilled.

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Other strong IP anomalies have been delineated over the western sector, in particular across the eastern shoulder of Crown Hill. No anomalous soil geochemistry values have been obtained from detailed sampling of these belts, confirming the mapping which indicates that the responses are due solely to pyritic, graphitic shales. Consequently these anomalies have not been further investigated.

A broad zone of anomalous soil geochemistry has been outlined NNW from the No. 3 Dam (max assays: 280 ppm Cu, 1882 ppm Pb and 465 ppm Zn, see Fig. 15). Geophysical responses over this anomaly are particularly weak. The area has a well developed soil cover but sparse outcrops suggest that it is underlain by andesitic tuffs. Repeat sampling has confirmed the geochemical values but the lack of geophysical response downgrades interest in the area.

12.4 ECONOMIC POTENTIAL

Most of the western part of West Sedgwick appears to have been deposited in open-marine conditions off the flanks of the main volcanic belt. Although some pyritic bodies have been identified here no significant base metal mineralization has been found. Drilling and costeaning of the best combined geophysical and geochemical anomalies did not give encouraging results, confirming the overall weak alteration and low base metal content of all lithologies. No significant precious metal mineralization has been identified in this area. The environment appears unfavourable for the development of an economic sulphide ore body.

In contrast, the eastern part of West Sedgwick appears to have formed under largely sub-aerial conditions. Minor restricted basins developed, particularly along the eastern margin of the volcanics close to the Owen Conglomerate contact. Favourable fine-grained host lithologies have been identified within this sequence often associated with strong hydrothermal alteration, shearing and pyritic mineralization. The most interesting parts of this belt are largely covered by glacial moraine and scree. However, geophysical surveys, which have responded to these pyritic zones indicate that the units are not necessarily continuous. The geophysics also suggest that the source of the anomalies is more likely to be disseminated rather than massive sulphides (Bishop, pers. comm.). Sampling of exposed outcrops has not yielded significant base metals.

The eastern sector retains some interest, however, because the pyritic alteration could form part of an envelope along strike or beneath a massive sulphide body. There is some evidence to suggest that this zone continues north beneath a thick cover of moraine to the zone of interest at Basin Lake.

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13. BEATRICE (R. Poltock)

13.1 CONCLUSIONS AND RECOMMENDATIONS

1. The NW sector of the Beatrice grid centred on Itat Creek, is the only area warranting further exploration. The geological setting, lithologies, style and tenor of mineralization shows some similarities to that at Red Hills.
2. Within this sector two zones of specific exploration potential are recognized:
 - a) the steeply dipping western mineralized shale in Itat Creek
 - b) the interpreted extensions of these shales and the previously drilled mineralized sequence of ashes-shales-ignimbrites, underlying the Mt Sedgwick Porphyry to the east and west of Itat Creek.
3. This potential is dependent on the geological interpretation applied to the porphyries intersected in MS1 and MS4, and of correlating shales in MS5 with those in Itat Creek 700m further to the east. It is recommended that detailed geological mapping in the area west of the baseline between lines 10N and 20N, be undertaken in conjunction with a geological reappraisal of all drillcore. The aim of this being to determine if the interpretations in Figs 18&19 can be substantiated. This field work and the subsequent data compilation would involve a geologist for approximately 4 weeks.

This work will enable a decision to be made as to whether further drilling should be undertaken at Beatrice.

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4. There has been little testing for gold at Beatrice, but the few samples assayed from the Itat Creek mineralization contain significant gold values (up to 0.9 g/t Au).

The potential to outline a body of gold mineralization (analogous to that at Red Hills), is very real. Systematic assaying for gold of existing rock and drill core pulps with elevated base metal values, is recommended.

13.2 INTRODUCTION

The Beatrice area lies on the northern side of the Comstock Valley and south of Mt. Sedgwick. Cambrian acid volcanics and sediments are exposed in a 4.8 x 1.4 km window surrounded by Dora and Owen Conglomerates.

Exploration dates from 1974 when Mt Lyell commenced work - no earlier exploration is known. The volcanics were gridded after reconnaissance geological mapping in 1974, and were subsequently covered by ground geophysics (including IP and magnetics), and soil and rock geochemistry. Several Pb-Zn anomalies were located, the major ones being in Itat Creek where dispersed sulphides are associated with ignimbrites, ashes and shales. This geological setting has similarities to that at Red Hills.

The Itat Creek anomalous zone has been evaluated by four diamond drill holes totalling 1308m. A fifth hole located 700m west tested an IP anomaly associated with pyritic shales. Basemetal values are generally less than 1% combined Pb-Zn. A limited number of gold assays obtained values as high as 0.9 g/t. The best drillhole intersection was 2m of 2.65% Pb, 5.05% Zn, 22 g/t Ag and 0.2 g/t Au. Other intersections are shown in Fig.

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13.3 GEOLOGICAL SETTING

The volcanics are dominated by rhyolitic lavas, pyroclastics, fine tuffaceous sediments and black shales (see Fig.). Lithologies can be broadly subdivided with difficulty. Mt. Lyell geologists have applied variable descriptions to the same units, and correlation between workers is poor. Major units with distinctive geophysical signatures include the Beatrice lava dome, Mt Sedgwick Porphyry plus associated shales, and chloritized feldspar porphyries (ignimbrites?).

13.3.1 Ignimbrites, Ashes and Shales

This is considered to be the basal unit, outcropping from Itat Creek to the eastern limit of the grid. The depositional environment is subaerial to shallow water, with frequent fluctuations and disruptions by influxes of ignimbritic material. (For petrological descriptions see Appendix B , samples 2575, 2578. Also photo).

The most extensive development of shales is at Itat Creek, where they are steeply dipping in the Itat Creek shear zone but may be nearly flat lying to the east and west (see Fig. 16). These shales appear to have a gradational contact with underlying ashes and ignimbrites, and are apparently conformably overlain and intercalated with porphyritic lavas and ignimbrites (Mt Sedgwick Porphyry). Fine grained tuffaceous sediments and shales elsewhere are restricted to lenses only a few metres thick (Fig. 16 . Also Appendix B , description 2589).

Base metal mineralization at Beatrice is hosted by this unit and is considered to be syngentic.

It occurs as disseminations and veinlets in the finer-grained rocks, and to a lesser extent in ignimbrites. Semi-massive sulphide clasts occur in ignimbrites at Itat Creek (see photo) and at 18N 1950E.

13.3.2 Mt Sedgwick Porphyry

To the west and (lesser extent) east of Itat Creek, prominent outcrops of rhyolitic quartz-feldspar-biotite porphyry dominate the topography. This unit is interpreted as an extrusive body, conformably overlying black shales (the latter are associated with anomalous IP responses one of which was drilled by hole MS5).

Contacts with the shales are of varying types:

- a zone of brecciation and folding (e.g.: MS 1 & 4)
- gradational, with shale and porphyry intercalations (e.g.: MS2).
- porphyry containing shale clasts e.g.: at 6N, 675W.

The porphyry is massive and frequently flow banded. It is described petrographically as a rhyolite lava (see Appendix B ,descriptions 2576-77), ignimbrite, and a minor intrusive phase (MS1 246.8m). Characteristic features in thin section include glass shards, fiamme and eutaxitic texture.

Similar porphyries with agglomerate layers outcrop immediately to the west of the main body, and a possible chloritized equivalent is located to the southwest. The latter is associated with a magnetic anomaly.

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Minor pyrite (<0.2%), occurs finely disseminated and associated with altered feldspar phenocrysts. Pb-Zn values average <200 ppm.

13.3.3 Western Flow Banded Rhyolite Lava

This unit is located at the western ends of Lines 8-18N. Fine grained siliceous lavas predominate, with possible ash layers. The lavas are typically flow banded, spherulitic and locally brecciated (see photo).

Pyrite and minor base metals are common and are associated with IP anomalies at 12N, 1980W (see Fig. 16). These sulphidic rocks were considered to have potential for gold but all samples taken by the Review Team assayed <0.1 g/t Au (see Appendix C).

13.3.4 Beatrice Rhyolite Lava Dome

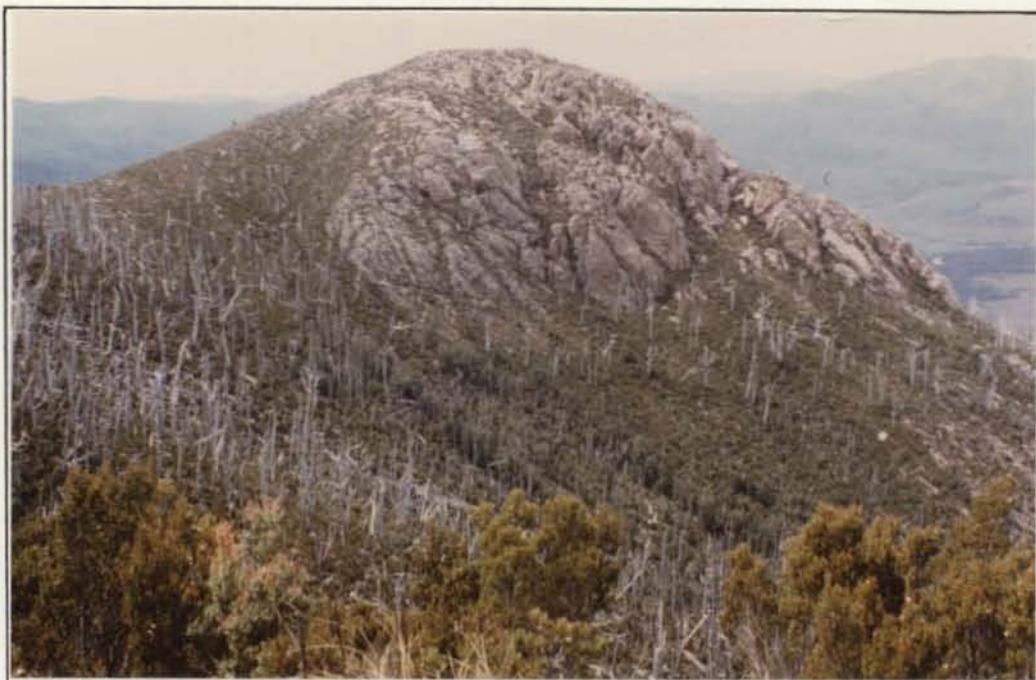
This dome is located in the centre of the grid (see photo), and appears to have been emplaced within the surrounding volcanics which are chloritized and silicified in proximity to the contact. The dome is composed of fine grained felsic lava, lacks phenocrysts and is rarely flow banded.

A central brecciated zone (see Fig. 16) occurs with hematite, magnetite, chlorite and quartz veining. These veins were sampled by the Review Team for gold but all assayed <0.1 g/t Au. (see Appendix C).

Ground and airborne magnetics define the extent of the dome, extending 600m north of the grid. A larger magnetic anomaly is located 3.5 km further north in an area of Owen Conglomerate

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BEATRICE

The Beatrice
rhyolite lava dome.



BEATRICE

Sulphidic shale
clast in ignim-
brite.

Itat Creek.



BEATRICE

Flow banding
in the western
rhyolite lava.

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outcrop. This may be due to a feature similar to the Beatrice Dome, and the two may be compared to the lava domes of the Jukes-Darwin Ridge (discussed further below).

The relationship between the Beatrice dome and the lavas and ignimbrites of the Mt Sedgwick Porphyry is unclear. They all appear to post-date the shale-ash-ignimbrite host horizon.

13.4 DISCUSSION OF ECONOMIC POTENTIAL

To date the Pb-Zn-Ag at Itat Creek is the only mineralization of potential economic significance detected. Further potential in this zone may exist for gold, as only very limited assaying has been done from some of the better basemetal intersections. Values are of the order 0.2-0.9 g/t. with few <0.1 g/t (see Fig. 18).

Rock and soil Pb-Zn anomalies also occur at 18N 1950E, and 8N 1530W. These are interpreted to be hosted by similar lithologies to those at Itat Creek.

13.4.1 Itat Creek

This area includes the Mt Sedgwick Anomaly Zone of Hutton (1979), and has been extended to cover the total possible extent of the prospective lithologies. (see Fig. 17).

The mineralization is deficient in pyrite (generally <2% with local maxima of 4%). The only reference to a possible footwall alteration zone is by Walter (1977), who mentions a sericite-silica-pyrite alteration zone with a 300m strike length, in tuffs at 18N 810W. Elsewhere sericite-

carbonate alteration is commonly associated with mineralization, particularly in vitric ashes.

Evaluation by drilling of the Itat Creek zone has focused on testing mineralization in ashes and ignimbrites exposed in the drill access roads between 14-18N (Fig. 17). Holes MS1-4 may have definitively tested the mineralization, severely restricting the room for a massive sulphide occurrence (see Fig. 17).

However, these holes aren't considered to be a very effective test because:

- holes were drilled at a low angle to the dip and strike
- there is incomplete coverage of the prospective lithologies, with shales/ashes occurring behind the collars of MS 2 & 3 (N.B. this southern area at Itat Creek is covered by glacials).

The thoroughness of this test is also dependent on the way in which the porphyritic lava/ignimbrite occurrences are interpreted in MS1, 2 and 4. This unit is intersected on the western side of the zone and may be continuous with the porphyry which outcrops west of Itat Creek (see Fig 18). The porphyry in this interpretation would dip east and be transgressive, cutting off the host horizons at depth and precluding any potential for this area.

Alternatively, if the porphyries are only isolated lenses within the shale (i.e. ignimbrites or lavas - see Fig. 19), it can be seen that this zone has only been partly tested. The shale/ash - hosted mineralization at the Itat Creek trench on 16N may not have been intersected

In MS1, this horizon dipping west beyond the end of the hole.

If this interpretation is valid it is essential to determine if these western shales warrant further testing. Rock chip samples assaying 0.5 - 1% combined Pb-Zn occur between 14-18N (see Fig.17), and anomalous shales have been intersected in MS5 700m further west. The latter shale is correlated with those at Itat Creek (see Fig. 16).

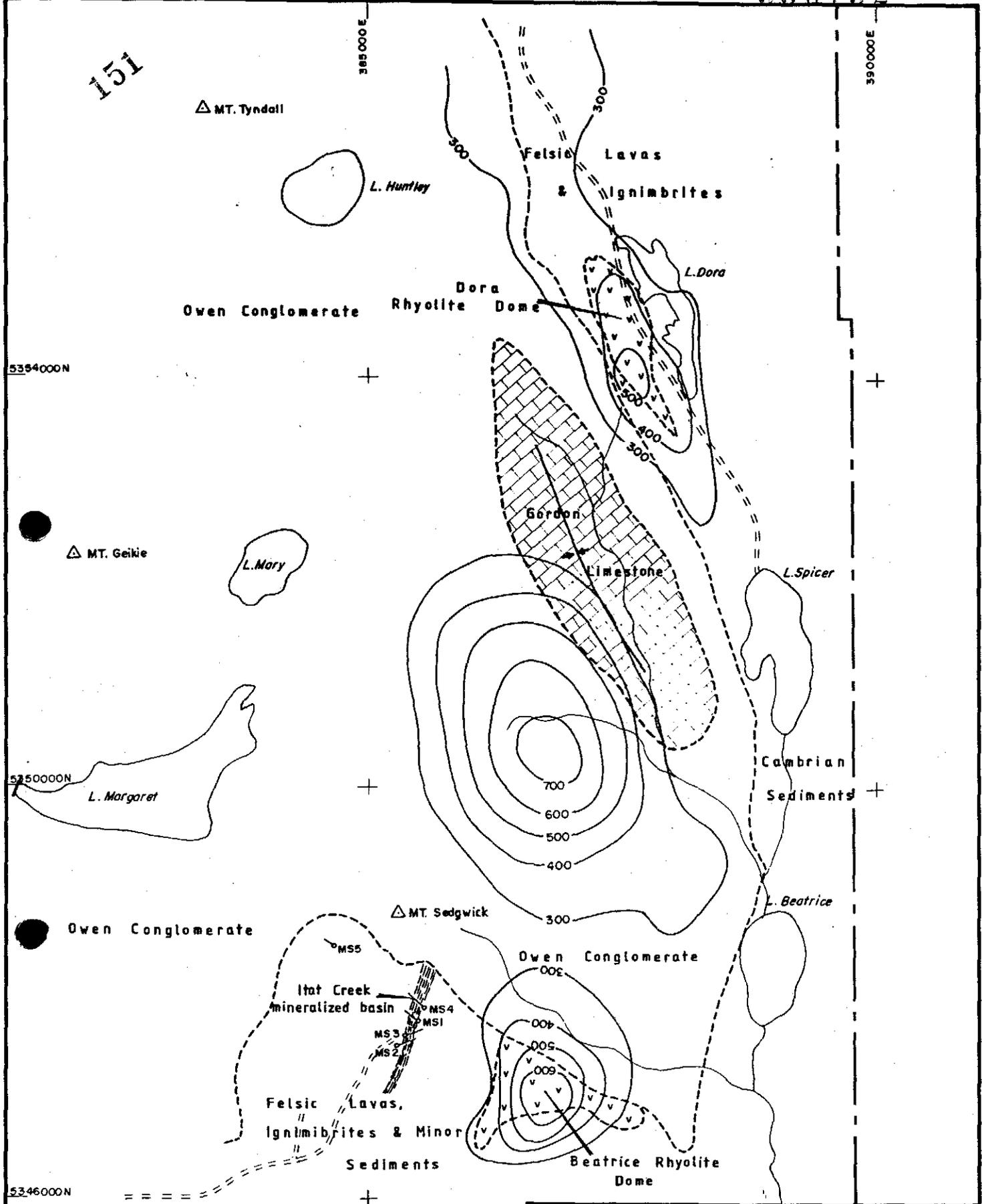
13.4.2 Geophysical Anomalies

An IP chargeability anomaly is located in the SE of the grid. It was initially detected by gradient array in 1977 and was further tested by dipole-dipole in 1979-80 on lines 4 and 6N. This survey showed distinct layering within the anomaly, which has been attributed to carbonaceous Gordon Limestone. This limestone produced similar anomalies in the Comstock Valley in the 1965 B.M.R. IP and EM surveys.

The anomalous area has extensive glacial cover and there is no certainty that the area is underlain by limestone. The only outcrops are to the south and west, and comprise Owen Conglomerate. Some of these outcrops strike towards the anomalous area.

The anomaly may be caused by limestone, but equally could be due to glacial clays, pyritic Owen Conglomerate, or a chargeable unit within Cambrian volcanics.

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GOLD FIELDS EXPLORATION PTY. LIMITED	
THE SEDGWICK	
AEROMAGNETIC ANOMALY	
magnetic contours n Tesla	
SCALE 1:50000	
DRAWN BY : F.G.F.	REVISIONS :
DRAFTSMAN: S.J.F.	FILE NO.
DATE : June, 83	FIG. 20

5 cm

The large, strong, circular aeromagnetic anomaly detected to the NE of Mt Sedgwick in the 1981 Department of Mines survey, was evaluated by J. Bishop (1983). The anomaly lies 3.5km north of the Beatrice lava dome, in an area of out-cropping Owen Conglomerate of unknown thickness. The magnetic anomaly is much larger and stronger than that over the Beatrice dome.(Fig. 20).

The magnetic response is not typical of Owen Conglomerate elsewhere, and it is probable that it is due to a buried magnetite-bearing cumulo-dome similar to Mt Darwin (Corbett et al 1982, also suggest a buried Cambrian volcanic source). With this in mind, Bishop was asked to interpret the Sedgwick anomaly using the response over Mt Darwin as a model.

Assuming a spherical shape for the causative body, Bishop calculates that it has a radius of 1600m (the Darwin anomaly has a radius of 1000m), with the top 250m to 800m below surface. Centre of the anomaly is calculated at 2000m below surface.

The most likely geological explanation for the Sedgwick magnetic anomaly is a buried rhyolitic lava dome. If this is the case, it is the largest and most strongly stockworked with magnetite-hematite veins, of any dome on the Tyndall EL. Such a large and strongly altered dome would be highly prospective for gold-copper mineralization within it (by analogy with Mt Darwin and Jukes Pty), and for a lead-zinc-gold massive sulphide body within the altered flanking basinal rocks (by analogy with Red Hills). However, at the present time exploration for these targets does not appear feasible through a 250m+ cover of Owen Conglomerate.

14. DORA-SPICER (F.G. FitzGerald)

14.1 CONCLUSIONS AND RECOMMENDATIONS

1. Despite the unusually good exposure of the Mt Read Volcanics in the Dora-Spicer area, the intense prospecting at the turn of the century and comprehensive exploration since the mid 1950's, no significant mineralization has been discovered here.
2. Geological considerations confirm the lack of prospectivity of the volcanics. The area is made up of a series of coalescing rhyolitic lava domes which appear to interfinger with coarse volcani-clastic conglomerates (the Dora Conglomerate), and ignimbrites. These may all be part of the Tyndall Group as they appear to be conformably and gradationally overlain by Owen Conglomerate. The setting is identical to that of the volcanics in the Selina area to the north, of which the Dora-Spicer volcanics would appear to be the lateral equivalents.
3. Apart from an older, pre-volcanism sedimentary sequence derived mainly from the Precambrian block (the Sticht Range Beds), no other fine-grained sedimentary units occur in the area. The abundance of coarse-grained high-energy lithologies within the volcanics suggest an environment unsuitable for the development of a massive sulphide deposit.
4. The known Cu + Pb, Zn, Ag, Au mineralization occurs exclusively as weak stockworking within the dome complex, and is accompanied by intense chloritic alteration. The extent of the old workings is not indicative of the strength of the mineralization as the prospecting appears to have been

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pursued beyond reasonable expectations of discovery. The mineralization is not economically significant.

5. No other mineral targets exist and no further work is warranted. It is recommended that the Dora-Spicer area be relinquished from E.L. 9/66.

14.2 INTRODUCTION

The Dora-Spicer area forms the southern part of the linear Selina Belt* of volcanic and related rocks, extending for approximately 20km along the eastern side of the Tyndall Range (see Fig.2). The geology in this belt is difficult to relate stratigraphically and structurally to other sequences within the Mt. Read Volcanics. Corbett (1982), has recently correlated lithologies in the Dora-Spicer area to those exposed in the Beatrice grid area. From the observations of the Review Team, such a correlation could be tenuous.

The volcanics have been explored intermittently since intense prospecting late last century but no drilling has been carried out in the area to date.

14.3 PREVIOUS WORK

Early attention was focused on the Lake Dora area following the discovery of mineralization in 1891. Prospecting was vigorous during the "copper boom" of the 1890's when adits were frequently driven beneath surface workings on only minor sulphides. Insufficient ore was found to maintain mining activity and the field was abandoned by 1908. Numerous investigations of these workings have since followed, but samples taken have given only low assays unless mineralization has been selectively picked (see Appendix C).

* name coined by the Review Team.

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Rio Tinto were the first to carry out detailed exploration in the area, during 1957-58. They followed-up an aeromagnetic anomaly by gridding, mapping, Turam EM, magnetic and soil geochemistry surveys. A strong EM anomaly was outlined to the west of Lake Dora over low-lying ground covered by glacial deposits (see Fig.21). However, a gravity survey delineated a gravity low over the EM anomaly. Rio Tinto concluded that the EM response could not be due to massive sulphides and terminated exploration.

Mt. Lyell covered the northern part of the area during regional exploration of E.L. 9/66 in 1969-70. The Lake Dora area was gridded, mapped and surveyed by pole-dipole IP, magnetics, SP and soil geochemistry. Follow-up investigations over zones of interest however, were deferred because of immediate evaluation of stronger anomalies outlined in the Selina area to the north. Following a re-evaluation of the data in 1979-80, further work was recommended over untested geophysical and geochemical anomalies. Apart from limited rock chip sampling this programme was not carried out.

The southern part of the area, around Lake Spicer, was initially pegged as part of E.L. 10/69. Prior to 1979, Mt. Lyell carried out little exploration here (apart from reconnaissance mapping by Brophy in 1976). Detailed exploration of the Spicer area was recently completed by Mt. Lyell (Hutton, 1979-81). The area was gridded, mapped, soil and rock sampled, and surveyed by gradient array IP and magnetics. Follow-up dipole-dipole IP, Sirotem EM and Genie EM surveys were carried out over specific areas but no significant results were obtained.

14.4 GEOLOGICAL SETTING

Extensive scouring by Pleistocene glaciation has exposed considerable outcrop in the Dora-Spicer area, and

as a consequence the local geology is quite well known. In broad terms the Selina Belt is here composed of a series of volcanics and sedimentary rocks which dip and face west, and unconformably overlie Precambrian basement rocks. Corbett (1982) has suggested that the Cambrian lithologies here outcrop on the eastern limb of a major NW-trending syncline, the western limb represented by a similar sequence in the Sedgwick (Beatrice grid) area.

However, the Review Team see few similarities between the rocks at Beatrice and those in the Selina Belt, specifically those in the Dora-Spicer area. The common factor seems to be the Dora Conglomerate, but whereas the conglomerate/volcanics contact is conformable at Dora-Spicer, at Beatrice it may well be unconformable. There are more similarities at Beatrice with the geology at Red Hills viz: pyrite-poor, basemetal-rich mineralization in black shale basinal rocks close to an altered lava dome.

The oldest Cambrian rocks exposed in the belt are the Sticht Range Beds. This sequence of sandstones, siltstones and shales was largely derived from the Precambrian block to the east, and appears to represent pre-volcanic deposition in a predominantly marine basin or trough. The upper (western) contact of the Sticht Range Beds with the overlying volcanoclastic sequence (the Dora Conglomerate), is marked by considerable disruption and soft sediment deformation. The contact zone may represent a fault scarp that formed the eastern margin of a major volcanic rift structure (Corbett, 1982), although a conformable relationship has been interpreted by earlier workers. (In the Selina area further north the contact between these sediments and the overlying volcanics is conformable and transitional.)

The Dora Conglomerate is a distinctive sequence of volcanoclastic conglomerates, sandstones and minor

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tuffs, and occupies a large part of the Spicer grid area. Further north the conglomerate appears to inter-finger with the mineralized rhyolitic lava domes around Lake Dora. The origin of the Dora Conglomerate is dominantly epiclastic but there may have been some direct pyroclastic (ignimbritic?) input. Although the conglomerate appears to be largely derived from the volcanics, the presence of significant clasts of Precambrian rocks indicates access was available to at least one other source of clastic material.

The volcanic rocks in the Dora-Spicer area are composed of quartz-feldspar-phyric lavas and minor intrusive bodies. In outcrop the volcanics form rounded ridges with a striking pink to brown colour typical of rhyolitic dome complexes seen elsewhere on the Tyndall EL. Flow banding and auto-brecciated margins, which are characteristic of these extrusive bodies, are also evident here. Minor units of associated pyroclastic and epiclastic rocks appear to have been caught up within these predominantly sub-aerial volcanics.

Minor stockwork mineralization occurs within this dome complex and was the focus of intense prospecting late last century. The style of the mineralization is similar to that occurring within the dome complexes on the Jukes-Darwin Ridge, viz: veinlet and disseminated pyrite with minor chalcopyrite (±gold), closely related to magnetite/hematite veins and intense chloritic alteration, possibly localised along shear zones. Unlike many other lavas in the Mt. Read Volcanics, minor lead-zinc mineralization of stockwork type occurs towards the northern and southern extremities of the dome complex.

Corbett (1982) has suggested that the volcanics in the Dora area represent a large volcanic centre which

is flanked by an apron of coarse epiclastic rocks. No fine-grained sedimentary units have been mapped within this belt of rocks within the Dora or Spicer areas.

The western margin of the belt is formed by Owen Conglomerate, which appears in places to conformably overlie the Dora Conglomerate. Elsewhere, the base of the Owen Conglomerate rests directly on the massive volcanic rocks. The conformable, gradational contact exposed west of Lake Dora is used as evidence that this volcanic-volcaniclastic sequence is part of the Tyndall Group.

14.5 DISCUSSION OF GEOPHYSICAL RESULTS

The Dora-Spicer area has been comprehensively covered by different EM, IP and magnetic surveys, as well limited SP and gravity investigations, during 25 years of exploration. This work was carried out to evaluate the depth extent of known mineralization and to locate other possible economic mineral occurrences. Bishop (1980 and 1981) has reviewed the results of these surveys and concluded that no significant sub-surface mineralization has been indicated within the area. The principal geophysical responses have been plotted on a plan of the interpreted geology (see Fig. 21).

Major magnetic anomalies occur in the northern and western parts of the grid and are related to near-surface magnetite-hematite veins within the altered lava complex. A prominent linear chargeability anomaly occurs along the western margin of the belt. This response has been attributed to a distinctive red hematitic sandstone unit at the base of the Owen Conglomerate. Graphitic shales within the underlying unprospective Sticht Range Beds give rise to a discontinuous IP anomaly to the east of Lakes Dora and Spicer. The only significant gradient array IP anomaly

occurs between lines 152S and 200S over altered volcanics with minor sulphide mineralization. A dipole-dipole IP survey over part of this zone showed that the response has no significant depth extent.

A strong Turam EM anomaly was delineated northwest of Lake Dora by Rio Tinto and is closely related to a resistivity low outlined later by Mt. Lyell. The area of the anomaly is low-lying and covered by glacial deposits. Extrapolation of geological boundaries from adjoining areas suggests that the underlying rocks occur off the flanks of the lava complex close to the Owen Conglomerate contact. By analogy with other prospects on the Tyndall EL, this environment is considered favourable for the development of economic sulphide mineralization. However, a gravity survey over the anomaly defined a prominent low indicating that the conductor was unlikely to be massive sulphides. A pole-dipole IP chargeability low over this zone supports the inferred non-sulphidic source for the EM anomaly, and it is concluded that the most likely explanation is a conductive layer within the glacial deposits.

Bishop considered that the IP surveys carried out over the Dora-Spicer grid would have been particularly effective for delineating sub-surface sulphide mineralization, because of the generally high resistivity of the volcanic rocks and the over-all absence of cover. No significant geophysical anomalies remain unexplained in this area.

14.6 ECONOMIC POTENTIAL

The geology of the Dora-Spicer area is better known than many other parts of the Mt. Read Volcanics on the Tyndall EL, because of comprehensive exploration and good bedrock exposure. Extensive prospecting at the turn of the century only located minor mineralization within a rhyolite lava complex. Detailed geochemical and geophysical programmes should have been particularly

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effective in the search for blind mineralization over this terrain, but no significant anomalies remain unexplained.

The most conclusive evidence for the poor prospectivity of the area comes from the geological setting. The Selina Belt in this area is made up of probably sub-aerially-formed, coalescing, rhyolite lava domes flanked by coarse volcanoclastic conglomerates and ignimbrites. No fine-grained lithologies indicative of quiet depositional conditions, occur within the volcanics. The only suitable host lithologies for massive sulphide deposits recognized in the area are minor shale lenses within the Sticht Range Beds, but this formation is interpreted as pre-volcanic in age.

The only known mineralization comprises minor sulphides, occurring as weak, patchy stockwork-style mineralization within the lava dome complex. Some gold and silver values have been obtained from hand-picked samples of this mineralization (see Appendix C). However, this mineralization is not a viable economic target. No further exploration is warranted in the Dora-Spicer area.

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15. WHITE SPUR (F.G. FitzGerald)15.1 CONCLUSIONS AND RECOMMENDATIONS

The Western and Central parts of the White Spur area appear unprospective from geological considerations. The main geophysical and geochemical anomalies have been tested and adequately explained, confirming the geological interpretation.

The Western and Central parts of White Spur should be relinquished.

The Eastern White Spur area contains favourable lithologies in a good geological setting (i.e: possible time equivalence with the deposition of Rosebery), but testing to date has failed to indicate significant alteration or mineralization. On present evidence further work on this area cannot be recommended.

15.2 INTRODUCTION

The White Spur area forms the north western corner of EL 9/66 (see Fig. 2). In the past the rocks in this area have been considered to be the extensions of the host lithologies at the Hercules and Rosebery deposits, and consequently have been extensively explored. Early prospectors scoured White Spur but no old workings are known in the area covered by the EL.

Rio Tinto carried out the first detailed exploration here between 1957 and 1962. They followed-up a helicopter-borne EM survey with Turam EM, magnetic and gravity surveys in the western part of the area. One hole (WSP 103) was drilled to test co-incident EM, SP and magnetic anomalies, and intersected a black shale-pyroclastic sequence containing minor disseminated pyrite but no significant base metals.

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Since 1971 Mt. Lyell has carried out detailed mapping, gradient array IP, magnetic and soil geochemical surveys over the whole area. One hole, (WSP 1) was drilled into Eastern White Spur and intersected minor lead-zinc mineralization in ignimbritic rocks and tuffaceous sediments. A second hole (WSP 2) was drilled into Western White Spur and encountered a weakly pyritic sedimentary and pyroclastic sequence without significant base metal mineralization, a similar result to that obtained by Rio Tinto.

15.3 DISCUSSION OF RESULTS

15.3.1 WESTERN WHITE SPUR

This area (see Fig. 22) is composed predominantly of sediments made up of black shales, tuffaceous sandstones and greywacke and conglomerate units. These sediments are inter-mixed with pyroclastics, some clearly ignimbritic in origin. The sequence appears to face west, but several north-trending fold axes have been mapped. Alteration is generally weak or absent and, although the shales contain disseminated pyrite and pyrrhotite, base metal mineralization is only minor.

The weak mineralization is confirmed by the soil geochemistry results. The few moderate anomalies (max. assay 1950 ppm Pb, 280 ppm Zn but average tenor <200 ppm Pb or Zn), delineated by comprehensive sampling, appear to be lithologically controlled. These values probably reflect a higher background metal content in black shales.

Mt. Lyell recognized that electrical and electromagnetic surveys would not be very useful geophysical methods to use because of the widespread graphitic shale units known in the area. This was later

shown by the gradient array IP survey which outlined numerous anomalies, generally co-incident with the Rio Tinto EM anomalies (see Fig. 22), and related to black shales. The main anomalous zone occurs over a belt of black shales at least 2500m long and up to 150m wide.

Magnetic surveys delineated distinct anomalies which are often co-incident with the IP and EM zones, and have been satisfactorily explained by disseminated pyrrhotite in the shale units. A Rio Tinto gravity anomaly associated with EM anomaly zone 2 was subsequently drilled (WSP 2) and explained by density contrasts in the shale-pyroclastic sequence.

Two drill holes have been completed in Western White Spur (WSP 2 and WSP 103). It appears that these may have tested the same main anomalous shale unit on the opposite limbs of a syncline. Both holes gave poor results (best assay: 1.7m @ 0.15% Zn and 0.04% Pb).

A third hole (DCP 235) drilled just north of the EL boundary by EZ, appears to be along strike in this same horizon. Apart from minor base metals related to a fault structure (best assay; 0.7m @ 2.2% Zn and 1.4% Pb) this hole intersected similarly poorly mineralized sediments and pyroclastics.

15.3.2 EASTERN WHITE SPUR

Lithologies here appear quite distinct from those in Western White Spur. They are composed of grey to brown, laminated, tuffaceous shales and siltstones, felsic ignimbrites and basaltic intrusives. True black shales are uncommon in

this area. Alteration is generally weak or absent and there is little evidence of mineralization in surface exposures.

Geochemically, the area is quite "noisy". Several small zones of co-incident base metal soil anomalies have been outlined (max assays: 1460 ppm Zn and 1850 ppm Pb). A costean on line 39N was cut over one of these zones and exposed tuffaceous shales and possible ignimbrites but no base metal sulphides were detected.

Moderate, but clearly anomalous, IP chargeability responses were delineated in the area. The strongest anomalies are co-incident with moderate magnetic and Pb-Zn soil anomalies and were tested by hole WSP 1. The hole intersected a sequence of fine-grained tuffaceous sediments apparently inter-bedded with coarser ignimbritic and reworked pyroclastic units. The sediments appear ideal host rocks for massive sulphide but contain only minor syngenetic mineralization (best assay: 2m @ 0.62% and 0.16% Pb). Narrow zones within possible ignimbrites contain slightly more mineralization (highest assays: 2m @ 0.76% Zn, 0.05% Pb and 2m @ 0.63% Zn, 0.13% Pb). The IP anomaly was explained by pyrite in fine-grained, vitric tuffs but in general most lithologies intersected were only weakly sulphidic and moderate to weakly altered.

The magnetic anomalies may be related to unaltered basic intrusives. However, logging of WSP 1 showed that both the tuffaceous sediments and the coarser pyroclastics are magnetic in part. These rocks contain visible pyrrhotite.

EZ have drilled two holes (JCP 211 and 216) north of the EL boundary and approximately

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2.5 km north of WSP 1. Both holes intersected ignimbrites with minor mineralized tuffaceous siltstone lenses (max. values: 0.65% Zn and 0.27% Pb). The lithologies, style of alteration and mineralization appears very similar to that intersected in WSP 1. Regional interpretation indicates that the two areas are part of the same depositional sequence.

Geophysical and geochemical surveys south of WSP 1 have failed to detect any continuation of the Eastern White Spur sedimentary zone towards the Henty Fault.

The area between Western and Eastern White Spur is composed of predominantly massive, sub aerial pyroclastics (ignimbrites and agglomerates), and possible felsic lavas. These form the main spine of White Spur. Little detailed exploration has been carried out over this area although it was covered by the IP survey and in part by the geochemical sampling.

A belt of very coarse lithic rocks has been mapped on the western side of White Spur and may represent mass debris-flow deposits or lahars. Clasts of massive pyrite occur within these rocks, the largest block being 60cm x 50cm (see Photo). *what photo?*

15.4 ECONOMIC POTENTIAL

The abundance of shales and greywackes suggest that the rocks in Western White Spur were formed in open basin or deeper marine conditions, probably off the flanks of the Central Volcanic Sequence. This observation concurs with mapping by Dr. K Corbett (Mines Dept.) who includes this area within his

Western Sequence, which is transitional to Dundas Trough sediments. EZ (I. McDonald pers. comm.) have concluded that the Hercules Host Horizon is terminated by a fold closure 1 km south of the mine and cannot be traced into the Dobson Creek (Western White Spur) area, and that the lithologies there are unprospective.

The interpreted stratigraphic position, the low geochemistry and the weak hydrothermal alteration all adversely affect the economic potential of Western White Spur. Similarly, the absence of suitable host lithologies within the high energy volcanic rocks and the negative geophysical and geochemical responses, all indicate the poor economic potential of the Central White Spur.

The Eastern White Spur area appears to have formed in a restricted basin within the Central Volcanic Sequence. The basin is possibly along strike from the Rosebery Host Horizon in the same time-stratigraphic position. It seems unlikely that the tuffaceous sediments are continuous with the Rosebery horizon but may be traceable to Rosebery along a series of disconnected sediment lenses.

Although the basinal rocks form suitable host lithologies, very little mineralization has been found in the area. This, coupled with the generally weak alteration and lack of significant untested geophysical anomalies, down-grades interest in Eastern White Spur.

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16. HENTY RIVER - WEST TYNDALL (F.G. FitzGerald)16.1 CONCLUSIONS AND RECOMMENDATIONS

1. The Henty River - West Tyndall area is made up of a fault-bounded wedge of Cambrian volcano-sedimentary lithologies not directly related to the main Mt. Read Volcanics.
2. The geological environment appears to have been largely marine with sedimentary lithologies predominating. However, a belt of andesitic volcanics, which are closely associated with lead-zinc (-silver) mineralization and small serpentized mafic-ultramafic bodies containing minor nickel mineralization, also occur in this area.
3. Exploration in the vicinity of old workings in the Henty River gorge (including 3 diamond drill holes), has indicated a maximum potential of 1.5 MMt of 6% Pb + Zn for the mineralization, which as such does not warrant further work.
4. Investigations, including 2 drill holes, along the 3km possible northern strike continuation of the Henty River sequence has failed to locate additional significant mineralization. This sequence has now been adequately evaluated.
5. The presence of carbonate units and strong magnetic anomalies in the West Tyndall area, led previous workers (Meares 1981), to suggest that the environment was favourable for tin mineralization. However, no anomalous tin values have been detected in sampling in this area and the thin dolomite and limestone beds that have been located are generally clean, thin and unmineralized.

6. The strong magnetic anomalies are apparently due to ultra-mafic bodies, basic volcanic intrusives and magnetite bearing sediments. Strong IP anomalies are thought due to graphitic and pyritic, silicified shales and siltstones. No significant base or precious metal values have been obtained from pitting, soil and rock-sampling over these anomalies.
7. No other mineral potential has been identified in the area. It is therefore recommended that the Henty River - West Tyndall area be relinquished from EL 9/66.

16.2 INTRODUCTION

The Henty River - West Tyndall area is outlined in Fig. 2 . The rocks which make up this part of EL 9/66 form a wedge of Cambrian volcano-sedimentary lithologies which are bounded by two major structures, parts of the Henty Fault Zone. These rocks appear to form a separate block within the Mt. Read Volcanic belt, as the units cannot be correlated with adjoining sequences across the faults.

16.3 PREVIOUS WORK

Old workings were located in the Henty River Gorge by Sheppard (1972) during a reconnaissance traverse in Mt. Lyell's EL 42/71. Little information is available about the prospecting activities in this area but 3 adits were driven into the north bank of the river on lead-zinc-silver mineralization apparently around the turn of the century. There is no record of any production from these adits and no other workings are known in the area.

The northern part of the area was first explored by Mt. Lyell who cut the West Tyndall grid in 1967

(lines 2N to 28N). The 1500 foot-spaced grid lines were surveyed by dipole-dipole IP, magnetics, soil geochemistry and limited geological mapping. Several moderate anomalies were located but only those related to ultra-mafic bodies were pursued (see Fig. 23). Detailed sampling over two serpentized bodies in 1971 confirmed weakly anomalous Ni and Cu values but showed the targets to be too small to warrant further investigation.

The IP results were re-evaluated by Irvine (1974), and a very strong response was highlighted on the eastern end of line 12N. This anomaly was not investigated however, until 1980-81 following work on the Henty River Grid immediately to the south. Lines 10N and 12N were extended and surveyed by detailed dipole-dipole IP. Comprehensive geochemical sampling and mapping over the main anomaly identified the probable IP source as graphitic siliceous shales carrying minor pyrite but lacking significant base or precious metal mineralization.

In 1977 the Henty River project was initiated to investigate the extent of the mineralization prospected in this area at the turn of the century. Grids were cut in the rugged Henty Gorge and surveyed by gradient array IP, magnetics and soil geochemistry. In addition, intensive rock chip sampling and geological mapping programmes were carried out. This work outlined a geochemically and geophysically anomalous zone at least 1.4km long, north-west of the Henty River and including the old workings. The strongest parts of this zone were detailed by pole-dipole IP prior to drilling.

A total of 5 diamond drill holes have been completed on the Henty River Grid. Although interesting lead-zinc mineralization was intersected in some of

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these holes, the potential grade and tonnage that was indicated was not economic and work on the prospect ceased in 1981.

16.4 GEOLOGICAL SETTING

Although no significant glacial or alluvial deposits occur in the Henty River - West Tyndall area, the inaccessibility and thick vegetation has hindered geological interpretation and correlation. The area has generally been marked on maps as undifferentiated Cambrian sediments and usually correlated with the Dundas Group. However, the recent detailed exploration over the Henty River Grid with the completion of 5 drill holes, has greatly improved the level of knowledge and the interpreted geological environment here can be extrapolated to the areas further north.

Meares, who ran the exploration programme at Henty River for Mt. Lyell, has prepared a comprehensive report on the geology as part of an M.Sc. thesis in 1980. He relates the volcano-sedimentary sequence west of the main Henty Fault Zone to the pre-Dundas Group Crimson Creek Formation. Based on sedimentary structures and bedding-cleavage relationships from the drill core, Meares postulates that this sequence dips and faces west. The Review Team feel that the depositional environment and stratigraphic relationships of the mineralization may indicate an east facing (see later discussion).

In broad terms the sequence is composed of an eastern sedimentary facies and a western volcanic facies, both of which strike NNW and are truncated by the NNE striking Henty Fault (see Fig. 23). Following Meares' interpreted stratigraphy, the oldest rocks within this belt would be a sequence of tuffaceous siltstones, sandstones, sedimentary breccias and

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silicified black shales (cherts), with minor lenses of dolomites and limestones. The graphitic cherts contain variable amounts of pyrite and give rise to strong IP anomalies in the West Tyndall area, but no significant mineralization has been identified here.

This sequence is succeeded by a thick unit of hematitic, tuffaceous siltstones and sandstones, which are often calcareous and contain minor thin andesitic tuff and lava lenses. These rocks are interpreted as being deposited in a shallow marine oxidizing environment. There appears to have been a transition to reducing conditions, as lenses of grey to black pyritic shales within a thin sequence of grey and light green tuffaceous siltstones and andesitic tuffs, conformably overlie the hematitic sediments.

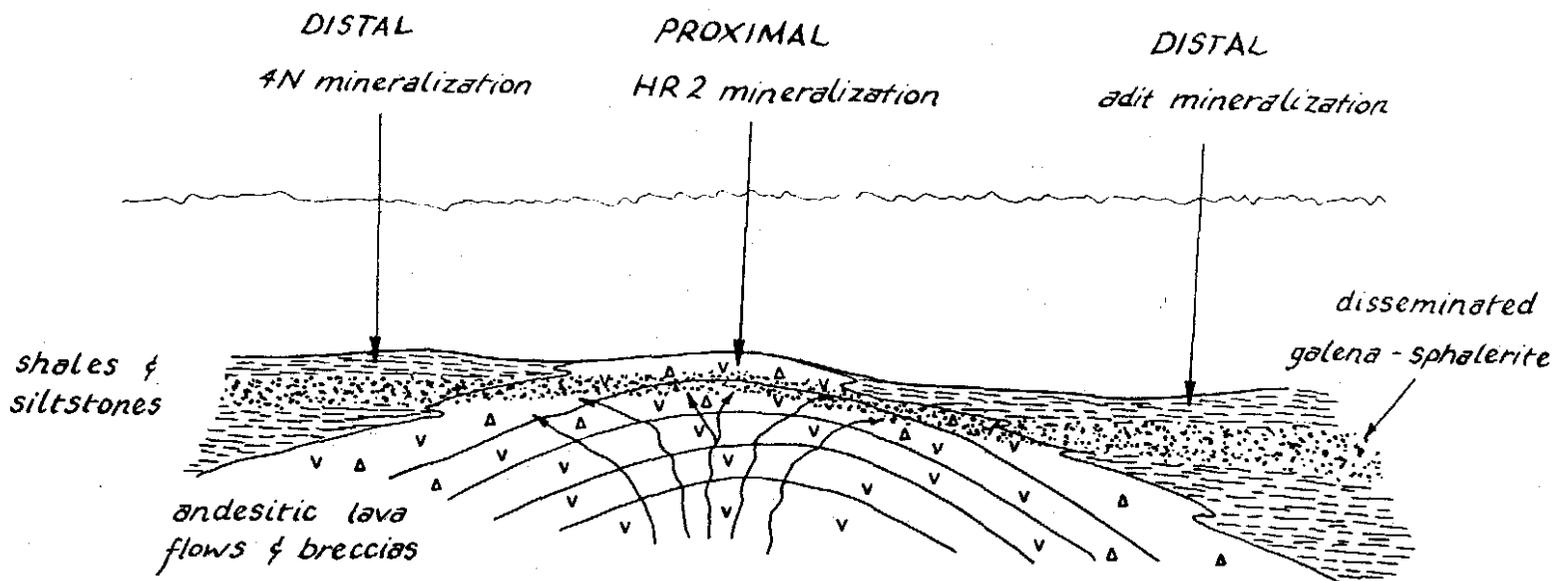
The tuffs mark an increase in the volcanic activity with prominent fragmental andesitic volcanics adjacent to the sediments, giving way to more massive lavas further west (up sequence). The interpretation of explosive volcanic breccias succeeded by pillow lavas suggests that the andesites may have been extruded into a subsiding trough (Meares 1980). However, local ignimbritic (sub-aerial?) flows have been recognized in some drill sections (see petrology sample 0503, Appendix B).

The intermediate volcanism appears to have been succeeded by a more felsic phase, as quartz-feldspar phyric tuffs overlie the andesites. The westernmost unit in the Henty River - West Tyndall area is an extensive sequence of greywackes and undifferentiated sediments.

16.5 DISCUSSION OF ECONOMIC POTENTIAL

The Henty River mineralization occurs close to the main sedimentary-volcanics transition. Four lenses of predominantly disseminated galena-sphalerite mineralization have been outlined along a strike length of 400m by surface exploration and drilling. The mineralization occurs both within the grey-green tuffaceous shale-siltstone sequence (i.e. East Bank, Adit and 4N lenses), and the andesitic volcanic sequence (i.e. HR2 lens) (see Fig. 23).

The exact nature of these mineral occurrences is unknown, particularly whether they form part of one horizon or whether they are separate en-echelon lenses. Meares favours the latter interpretation based on the grossly conformable and locally strata-bound nature of the mineralization, and the lack of apparent structural control on its emplacement. In contrast, the hypothesis put forward by the Review Team is that the mineralization occurred synchronously within a developing andesitic volcanic pile and the flanking laterally-equivalent sediments (see below). In this case a more direct, syn-volcanic origin for the mineralization is inferred.



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No clear evidence of a footwall alteration zone has been found to support one or other hypotheses. In fact, the overall weak alteration associated with the mineralization is dissimilar to the situation with other volcanogenic sulphide bodies known in the Mt. Read Volcanics. Although the Henty Fault is unrelated to this apparently syngenetic mineralization, later movements along this major structure may have partially remobilized and enhanced the grade of mineralization.

Using the hypothesis that the mineralization occurs as one continuous body along a single time-stratigraphic unit, then the drilling and surface work to date have indicated a maximum potential of 1.5 million tonnes of 6% Pb + Zn. This body carries up to 40 g/t Ag but no gold has been detected in any of the samples assayed, (which is unusual for this grade of mineralization within the Mt. Read Volcanic belt, and is further evidence that these rocks are not related to the main volcanic sequence.) Meares' interpretation of the mode of occurrence of the mineralized bodies would imply considerably less potential than 1.5 million tonnes.

The Henty River mineralized sequence has been traced for at least 1.4 km along strike to the north of the old workings. Interpretation of the sparse geological data further north suggests that the same sequence may extend for a total of 3 km to the northern part of the West Tyndall grid. Detailed exploration, including drill holes HR3, 4 and 5, has failed to locate significant mineralization within this sequence or elsewhere along the 1.4 km Henty River grid section. This area appears to have been adequately tested.

A moderate Zn in soil anomaly (240 ppm Zn), located on line 8N of the West Tyndall grid during the

1967-68 survey, appears to be a northern continuation of the linear geochemical anomaly associated with the Henty River mineralization. Although the line 8N anomaly was never followed up, its weakness and the discouraging results further south make it of academic interest only.

A very strong IP anomaly detected on the eastern end of line 12N (West Tyndall grid) during the 1967 survey, was re-evaluated in 1981 as a result of exploration on the Henty River grid immediately to the south. The anomaly appears to lie within a unit to the east of the Henty River mineralized sequence. Interpretation of the subsequent detailed dipole-dipole IP survey results suggest that the anomaly, which is marked by very high chargeability and very low resistivity values, is caused by a very shallow source (Bishop, pers. comm.). Detailed mapping and sampling along line 12N in 1981 and additional pitting and sampling by the Review Team, indicates that the IP source is probably graphitic siliceous shales carrying minor pyrite. No significant base or precious metal values were obtained from any of the samples (see Appendix C).

Although the IP anomaly may extend for 350m to line 10N, no further work is warranted because of the lack of mineralization associated with the response.

Tentative correlation of the sedimentary units with older Cambrian sequences, the occurrence of carbonate lenses and numerous strong aeromagnetic anomalies, led to speculation about the potential for tin deposits in the West Tyndall area (Meares, 1981). However, assaying of the most promising samples (including dolomitic pyritic black shales and cherts,) has not given any significant Sn, WO_3 , or As values (see Appendix C).

Dolomite and limestone units reported from the area are not common and generally occur as lenses less than one metre thick interbedded with shales, siltstones and greywackes (Corbett, pers. comm.). The carbonates are typically well bedded, clean and unmineralized.

The strong aeromagnetic anomalies (see Fig. 23) are related to intrusive mafic and ultra-mafic bodies, basic volcanics (dykes?) and magnetite-bearing sediments, none of which have been shown to have economic potential.

No other untested mineral targets are known within the Henty River - West Tyndall area and no further exploration is warranted.

17. HENTY-YOLANDE (F.G. FitzGerald)17.1 INTRODUCTION

The Henty-Yolande area is outlined on Fig. 2 . It forms a distinct geological entity lying to the west of the Mt. Read Volcanics, comprising volcanics and synchronous sediments deposited in the Cambrian Dundas Trough, and later Siluro-Devonian sediments (sandstones, siltstones and pyritic black shales) of the Eldon Group.

There are several small old workings for gold and barite in this area, but no records of any production. Previous exploration in this area was carried out by RTAE, Cyprus Mines, and Pickands Mather. Mt. Lyell has held the ground since 1971. Generally, the programmes have been of a reconnaissance nature without significant results.

The Mines Dept. investigated the Madam Howard Plains barite deposit and drilled three holes there in 1963. They concluded that the tonnage potential was too small to warrant further work. In 1971 Cyprus Mines cut a 23 line km grid over Eldon Group sediments around the airport, to follow up weak Cu/Pb anomalies obtained in a stream sediment survey. Mapping, soil sampling and partial coverage by magnetics, EM and IP, lead to the drilling of one hole to check a Cu/Pb soil anomaly. Results were poor- the Cu/Pb was attributed to mine dump material used to build the airstrip.

Mt. Lyell's work has comprised reconnaissance stream sediment sampling, a 344 line km Dighem Survey and mapping. Although the drainage sampling was not completed, the discouraging results confirmed the low economic potential recognized during the mapping in 1971. The Dighem survey recorded one weak genuine response - over the Eldon Group pyritic black shales. Apart from investigations of old workings, Mt. Lyell's only detailed work has been over the 6.5 line km Madam

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Howard Plains grid. Gradient array IP and magnetic surveys of this grid outlined six weak anomalies which were soil-sampled but gave insignificant geochemical responses. No further work was recommended on these anomalies.

17.2 DISCUSSION OF GEOLOGICAL POTENTIAL

Previous exploration has indicated that the Henty-Yolande area has little potential for economic base metal mineralization. The main emphasis of the Review was to evaluate the geological setting and to assess the largely untested gold potential.

Geologically the area is considered to have been unfavourable for the development of massive sulphides. Intrusive, unaltered and unmineralized quartz-feldspar porphyries and andesitic lava flows, occur within predominantly subaqueous volcanics and sediments. Sulphides are rare. These rocks appear to have formed in open-basin deep marine conditions outside any caldera margins and off the flanks of the central belt of Mt. Read volcanics.

Of the small gold workings within the area, the Madam Howard's (Airport), Diamond Hill and Princess Creek workings were examined and sampled. It appears that all workings were centred on quartz veins which trend east-west, parallel to the major Pearl Creek Fault. (The Madam Howard Plains barite-quartz vein has the same trend). The workings occur in rocks varying from Cambrian acid-intermediate porphyries to Siluro-Devonian sandstones, the unifying feature being the ability of the host lithology to form open fractures. Alteration of the host rocks around the veins is generally absent, apart from moderate sericitization at Diamond Hill.

This style of mineralization is not considered to have any economic potential, and no significant gold values were obtained from the 26 rock samples taken during the Review. Of the 122 drainage samples assayed for gold in 1982-83 only 3 widely scattered samples contained anomalous gold (see Fig. 24). One of the gold anomalies (1.6 ppm), occurs in the catchment of a tributary of the Yolande River known as Gold Creek, which has been worked for alluvial gold in the past. This creek was traversed and sampled but no significant gold assays were obtained from samples of the weakly pyritic, tuffaceous siltstones, cherts and andesitic porphyries outcropping here. Another anomalous sample (1.2 ppm) drains directly from the Madam Howard Plains barite vein.

Several base metal anomalies were located by the stream sediment surveys but most were attributed to contamination from old smelters or from Mt. Lyell ore trucks along the Zeehan Highway. Two unexplained anomalies were visited by the Review Team and re-sampled. In both cases the anomalous values could not be repeated and no evidence of mineralization was found. The Pearl Creek "Anomaly" was examined in some detail but only minor pyrite was evident even within the major east-west fault between Eldon Group black shales and Mt. Read Volcanics.

17.3 CONCLUSIONS AND RECOMMENDATIONS

Geological considerations suggest that the rocks of the Henty-Yolande area have little potential for hosting massive sulphide deposits.

Extensive reconnaissance geochemistry and examination of old workings, indicates that gold mineralization is economically unimportant. No other mineral potential is evident.

It is recommended that the whole area be relinquished.

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APPENDIX ASELINA

Lead isotope investigation
of the Lake Selina Pyrite Prospect, Tasmania -
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Division of Mineralogy

LEAD ISOTOPE INVESTIGATION OF THE LAKE SELINA PYRITE PROSPECT,
TASMANIA

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- Figure 1 Location of diamond drill holes in the Lake Selina prospect
- Figure 2 $^{207}\text{Pb}/^{204}\text{Pb}$ vs $^{206}\text{Pb}/^{204}\text{Pb}$ diagram for analyses from Lake Selina. Group 3 denote separated pyrites and Group 1 denote bulk samples. The dashed line is the average growth curve for massive sulfides. The bars in the upper left corner represent the 2 sigma errors given in the text. The boxes are the reference points from Rosebery and Que River.
- Figure 3 $^{208}\text{Pb}/^{204}\text{Pb}$ vs $^{206}\text{Pb}/^{204}\text{Pb}$ diagram for analyses from Lake Selina.

SUMMARY

Lead isotopic analyses have been completed of bulk samples and pyrite from seven diamond drill holes covering a strike length of about 6km from the Lake Selina pyrite prospect, Tasmania. The isotopic data for the bulk samples and separated pyrite are similar and so bulk samples are satisfactory for such investigations.

Two samples have radiogenic isotopic compositions with $^{206}\text{Pb}/^{204}\text{Pb}$ ratios of 18.56 and 18.86 and are probably the result of radioactive decay. A third sample has ratios which have closer isotopic affinities with later vein-style mineralization.

The remainder of the 31 samples have isotopic compositions which lie within the range for massive sulfide deposits in the Mt Read Volcanics, i.e. with $^{206}\text{Pb}/^{204}\text{Pb}$ ratios from 18.26-18.34. These results indicate that the Lake Selina mineralization forms part of a major hydrothermal system, similar to that which formed the massive sulfide deposits such as Rosebery and Mt Lyell.

The lead isotopic data are highly encouraging from an exploration viewpoint and it is disappointing, as it is for the companies, that no major base metal accumulations have been intersected.

Apart from the more radiogenic samples in the shallow parts of two diamond drill holes, no drilling vectors can be established, particularly in a lateral direction.

The lead isotopic data indicate that the ultimate source "age" of the volcanics and mineralization is more than 1000 Ma.

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1. INTRODUCTION

Our knowledge of the isotopic characteristics of massive iron sulfide and disseminated base metal sulfide systems is limited. Following a field trip to Mt Lyell and an AIMM meeting in 1981, it was suggested by Russell Meares and Peter Komysan of Mt Lyell Mining and Railway Co. that the Lake Selina prospect would constitute a worthwhile case history. It is part of the AMIRA project 78/P97A on behalf of the sponsors Goldfields Exploration and Getty Minerals. This prospect, 10km due east of the Hercules deposit was considered to be an extensive zone of disseminated and veinlet pyrite (700 x 150m) in strongly sheared and chloritized felsic lavas and tuff (Reid and Meares, 1981). The Selina zone occurs in a belt about 100m wide over a strike length of some 6 km. Its surface expression consisted of old workings on disseminated pyrite-chalcopyrite and veinlet pyrite-magnetite mineralization. The mineralization produced a strong I.P. anomaly but a weak soil geochemical anomaly (Reid and Meares, 1981). Eight diamond holes, to depths of about 300m, were drilled into this prospect.

Ten samples were initially analysed, but upon finding that six contained a Rosebery-type isotopic signature, it was considered necessary to do a follow-up investigation of the interesting holes. This was achieved by analysing three samples from each hole to check the isotopic homogeneity over a wider interval. The reasoning behind the additional study was that even though isolated galena-rich mineralization of the Rosebery-style would produce the target signature, the signature obtained from disseminated base-metal mineralization should be different, reflecting the variable U/Pb ratios in chalcopyrite, pyrite, iron oxides and the host rocks.

This investigation now assumes a more important role in view of the necessity of the Goldfields-Getty Joint Venture to relinquish about 75% of their exploration licence.

2. SAMPLING/TECHNIQUES

Seven pyrite-rich samples from diamond drill holes and 3 surface rock chip samples over a strike length of about 6 km were initially investigated. Because of the nature, and our limited knowledge of this style of mineralization we analysed both pyrite separates and the bulk samples. Additional samples from the interesting holes were kindly supplied by Gerald Purvis; only bulk samples were analysed as little difference was noted between the isotopic ratios in the bulk sample and pyrite in most cases.

Lead from pyrite was separated using our standard techniques of ion exchange and electrodeposition. The whole rocks were leached using 7N HNO₃/7N HCl and separated as for pyrite.

All isotope ratios were measured on the Isomass 54E and a precision of $\pm 0.1\%$ (2σ) for the $^{208}\text{Pb}/^{206}\text{Pb}$ and $^{206}\text{Pb}/^{204}\text{Pb}$, and $\pm 0.05\%$ (2σ) for the $^{207}\text{Pb}/^{206}\text{Pb}$ ratios has been assigned to the data based on over 400 measurements of the international standards NBS SRM 981 and Pb 18 and natural samples. The 2 sigma error bars are given in the ratio plots. The data given in Table 1 have been normalized to "absolute" using a correction of + 0.08% a.m.u. Lead concentrations were obtained by A.A.S. and uranium by delayed neutron activation analysis.

3. RESULTS

3.1. Initial Study

Except for samples 27393 and 27398, the isotopic ratios in pyrite and the bulk sample are similar, and consequently it is not worthwhile separating pyrite for this type of study. The discrepancy in 27393 may be due to contamination of the bulk sample during crushing as it only contains 20 ppm Pb and the ratios for the pyrite are similar to the target signature.

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For purposes of discussion, the samples are grouped into two belts, an easterly one incorporating 27403-27393-27347-27384 and a westerly one covering 27401-27400-27399-27402-27397-27398.

Three of the four samples (27347, 27384, 27393) from the easterly belt are surface rock chip samples and have isotope ratios which lie within the range we have measured for Rosebery-style mineralization including Que River, Rosebery, Hercules and the Lyell-Comstock lode. In view of the low Pb concentrations in 27347 (50 ppm) and 27393 (20 ppm), the high Pb concentrations in 27384 (1900 ppm), the overall isotopic homogeneity, and the fact that three of the four samples are surface chips, indicates that this belt warrants further exploration.

The deviating sample, 27403, has significantly more radiogenic isotope ratios and in view of its high Pb concentration is unlikely to be the result of radioactive decay.

The isotopic pattern for the westerly belt is more complex. Samples 27397-27398-27400 have the target isotopic signatures even in the case of 27398 which contains only 20 ppm Pb and 4.2 ppm U. Samples 27397 and 27398 are the most southerly samples and are located more than 1km from 27402. With their target signatures, these samples from the Rolleston sheet form an interesting group.

Sample 27402 contains 1700 ppm Pb and its isotopic ratios are much more radiogenic than those of the target. With $^{206}\text{Pb}/^{204}\text{Pb}$ ratios of 18.42 in both pyrite (3400 ppm Pb) and the bulk sample (1700 ppm Pb), the mineralization in this intersection has closer isotopic affinities with vein-style mineralization we have measured in the Mt Read volcanic belt.

Samples 27399 and 27401 have even more radiogenic isotopic compositions with $^{206}\text{Pb}/^{204}\text{Pb}$ ratios of 18.56 and 18.86. However, they contain significant amounts of U relative to Pb and their radiogenic nature may be due to radioactive decay.

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3.2 Later Study

Confronted with a number of samples with isotopic compositions within the range of the target signature of Rosebery-style mineralization, further high-Pb samples from the interesting holes were requested and analysed.

Most of the new samples have isotopic compositions which lie within the target range from 18.26 to 18.34, including the "fill-in" samples (259...series) between LS1 and LS7. It is of interest that in each hole one sample has the most radiogenic ratios (e.g. highest $^{206}\text{Pb}/^{204}\text{Pb}$ ratio). However, no correlation with depth in the holes, mineralization or Pb concentration could be deduced.

A single sample of baryte ore from Rosebery has isotope ratios which are similar to the more radiogenic samples ($^{206}\text{Pb}/^{204}\text{Pb}$ 18.34) in the Selina holes. All new samples were analysed for Ba and P (Table 2) in order to establish if the Selina samples were associated with a Ba-rich or apatite-rich horizon, but no correlation between Ba-P-isotopic composition was obvious.

It was stated above that three of the initial samples contained radiogenic isotope ratios; 27401 from LS 6, 27399 from LS 4 and 27402 from LS 7. The low Pb and relatively high U concentrations in 27401 and 27399 may explain the radiogenic nature of these two samples but it is highly unlikely that the ratios in 27402 could be affected by radioactive decay. 27402 is possibly later vein-style mineralization as we have found radiogenic veins in a massive sulfide deposit in Tasmania. That the radiogenic nature of 27401 and 27399 results from radioactive decay is supported by the additional drill core samples from LS 4 and LS 6, whose isotopic compositions lie within the target range.

Although the data are limited, it would seem that the higher U/Pb samples with their more radiogenic ratios are found in the shallower parts of the drill holes.

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4. DISCUSSION

4.1 Exploration Aspects

Except for 27402 from LS 7 (? possibly vein-style) and the two samples (27401, 27399) whose ratios may be explained by radioactive decay, the isotopic compositions of the drill core and the surface samples from the eastern pyrite belt lie within the target range for Rosebery-style mineralization. This indicates that the Selina mineralization forms part of a major hydrothermal system, similar to that which gave rise to the massive sulfide deposits but different to that of the later vein mineralization such as Mt Farrell, Murchison River and Queen Hill.

Even though the isotopic compositions are highly encouraging and are indicative of a large-scale hydrothermal system, no major base-metal accumulation has been intersected to date. If future exploration is similarly negative, it would appear that the limitation of the Pb isotope technique has been reached as at Harnet and Breadalbane. Apart from the less interesting isotopic compositions in the shallower parts of the drill holes, it is not possible to establish other drilling vectors, particularly in a lateral direction.

4.2 Genesis

It has been suggested that the mineralization at Selina was derived by groundwater circulation in the host rocks in response to granitic intrusion (M. Hutton, pers. comm., 1982). Because of the similarity in isotopic composition of the Selina mineralization and Rosebery-style, it is necessary that any hydrothermal system involves Cambrian granites rather than Devonian granites or a post Cambrian metamorphism, as in the latter two cases the leads could be expected to be more radiogenic and different to those of the massive sulfide ores in the Mt Read Volcanics.

4.3 Isotope Systematics

When plotted on the conventional $^{207}\text{Pb}/^{204}\text{Pb} - ^{206}\text{Pb}/^{204}\text{Pb}$ diagram (Fig. 2a) representing the U-Pb system, the data define a linear trend. This may be interpreted to indicate that all samples were formed within the same limited time interval (probably at least 50 Ma). An apparent "age" can be calculated from the slope of this array or from the intercept on a $^{207}\text{Pb}/^{206}\text{Pb} - ^{204}\text{Pb}/^{206}\text{Pb}$ plot. On the latter plot, the apparent "age" is ~ 1100 Ma (MSWD 0.4). This is, of course, not the stratigraphic age, which should be Cambrian, but represents a minimum estimate of the ultimate source "age" of the Pb. We have determined similar estimates at Que River and Elliott Bay.

On diagrams representing the Th-U-Pb system such as the $^{208}\text{Pb}/^{204}\text{Pb} - ^{206}\text{Pb}/^{204}\text{Pb}$ plot (Fig. 2b), both the pyrite and bulk samples for 27399 and 27401 do not lie on the same linear trends as the other samples. This may be interpreted to mean that these samples were derived from sources with different Th/U ratios or that there was differential mobility of Th and U between the extraction from source material and emplacement. In both cases, these samples are from the shallowest depths and it may be that the rocks and inherent pyrite were derived from a different source to that mineralization occurring in deeper parts of the pile.

5. FUTURE WORK

Little can be achieved by further Pb isotopic analyses from Selina at the present time. It may be worthwhile to analyse some of the pyrites for S isotopes.

The analyses of sulfide separates from Mt Lyell are nearing completion and should permit valuable comparisons with prospects such as Selina.

Other studies at Red Hills, Henty Fault zone and Clarke Valley are proposed.

6. ACKNOWLEDGEMENTS

We wish to thank G. Hansen and his group for the mineral separations and rock crushing; J. Eames and his group for the Pb, Ba, and P determinations; Michael Korsch for maintenance of the mass spectrometer and excellent software developments; and Russell Meares, Murray Hutton, Gerald Purvis, Peter Komysan and Mel Jones for the samples and geological discussions.

7. REFERENCE

Reid, K.O. and Meares, R.M.D., 1981. Exploration for volcanic-hosted sulfide deposits in Western Tasmania. *Econ. Geol.* 76, 350-364.

Lead isotopic analyses have been completed of bulk samples and pyrite from seven diamond drill holes covering a strike length of about 6km from a massive pyrite prospect, in the Goldfields-Getty Joint Venture area, Tasmania. The isotopic data for the bulk samples and separated pyrite are similar and so bulk samples are satisfactory for such investigations.

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TABLE 1: ISOTOPIC PARAMETERS FOR SAMPLES FROM LAKE SELINA

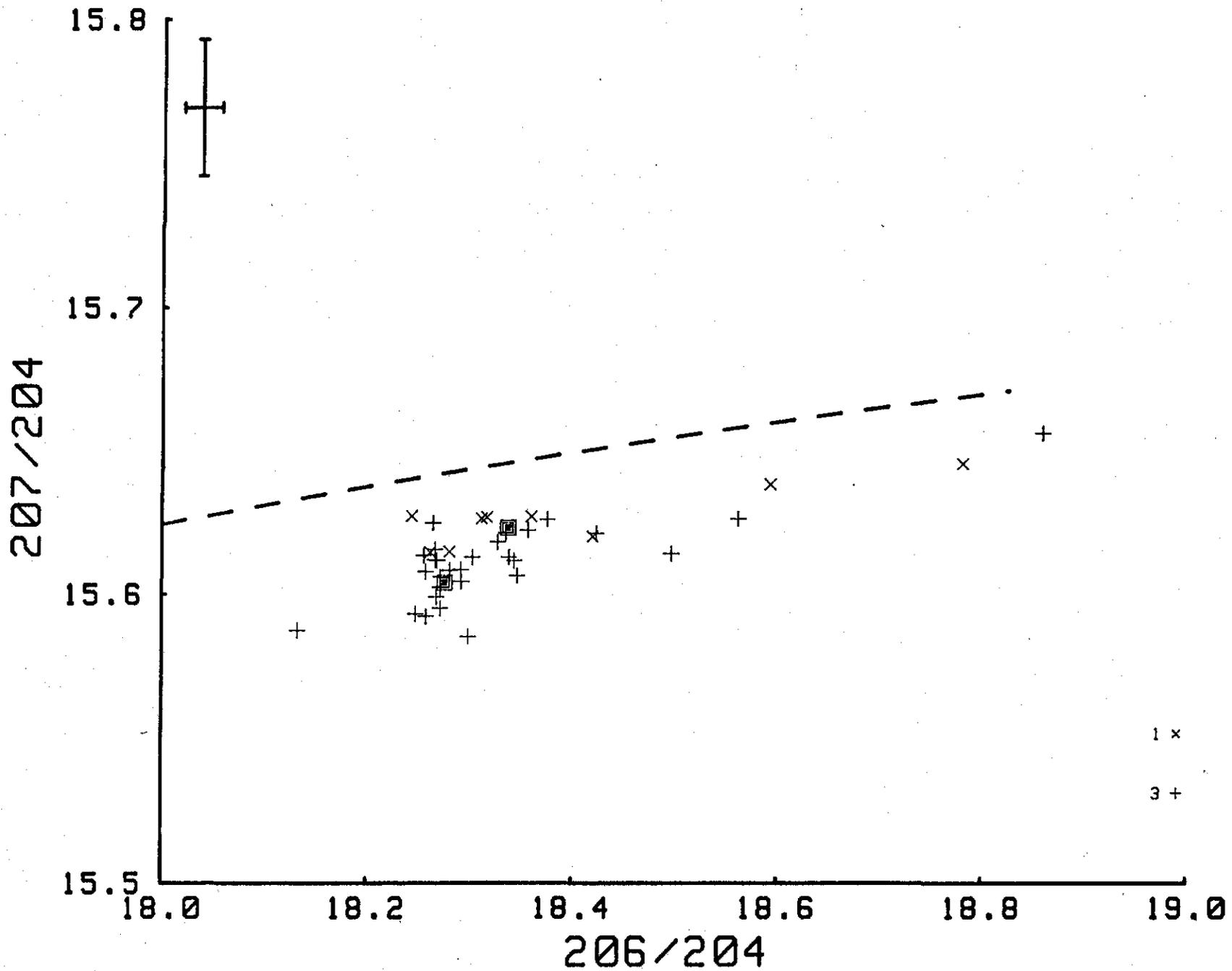
Sample	208/206	207/206	206/204	207/204	208/204	Pb(ppm)
LAKE SELINA PYRITE						
27347	2.0872	0.8534	18.311	15.626	38.219	10
27393	2.0886	0.8551	18.261	15.615	38.140	10
27397	2.0857	0.8532	18.316	15.627	38.203	1,000
27398	2.0904	0.8566	18.243	15.627	38.135	190
27399	2.1042	0.8411	18.592	15.638	39.121	10
27400	2.0867	0.8542	18.280	15.615	38.145	1,700
27401	2.0332	0.8331	18.780	15.646	38.183	420
27402	2.0833	0.8512	18.360	15.627	38.248	3,400
27403	2.0794	0.8480	18.419	15.620	38.302	2,260
LAKE SELINA WHOLE ROCKS						
27347	2.0876	0.8531	18.292	15.604	38.186	50
27384	2.0863	0.8545	18.248	15.593	38.071	1,900
27393	2.0945	0.8596	18.133	15.587	37.978	20
27397	2.0845	0.8531	18.302	15.613	38.152	390
27398	2.0826	0.8507	18.346	15.607	38.207	20
27399	2.1414	0.8419	18.561	15.626	39.747	20
27400	2.0865	0.8541	18.272	15.606	38.125	850
27401	2.0267	0.8302	18.058	15.656	38.219	550
27402	2.0788	0.8479	18.423	15.621	38.297	1,700
27403	2.0827	0.8511	18.356	15.622	38.230	3,900
LS2 600'	2.0822	0.8522	18.327	15.618	38.160	500
LS2 665'	2.0868	0.8546	18.268	15.612	38.122	500
LS2 680'	2.0873	0.8549	18.266	15.616	38.127	900
LS3 265'	2.0851	0.8539	18.268	15.599	38.091	11,600
LS3 275'	2.0868	0.8547	18.266	15.612	38.117	21,300
LS3 360'	2.0811	0.8511	18.343	15.612	38.174	10,100
LS4 790'	2.0705	0.8442	18.496	15.614	38.296	300
LS4 975'	2.0800	0.8517	18.299	15.585	38.062	500
LS5 480'	2.0844	0.8535	18.272	15.595	38.086	3,100
LS5 655'	2.0819	0.8520	18.335	15.621	38.172	960
LS5 835'	2.0856	0.8539	18.272	15.602	38.108	1,600
LS6 275'	2.0816	0.8514	18.338	15.613	38.172	700
LS6 915'	2.0852	0.8533	18.292	15.609	38.142	800
LS6 920'	2.0862	0.8540	18.258	15.592	38.090	1,100
LS8 21.0m	2.0859	0.8539	18.272	15.602	38.114	840
LS8 225m	2.0815	0.8504	18.375	15.626	38.248	1,150
LS8 345m	2.0870	0.8538	18.281	15.608	38.152	920
2590	2.0888	0.8555	18.264	15.625	38.150	
2591	2.0867	0.8549	18.257	15.608	38.097	
2592 Gn	2.0885	0.8553	18.255	15.614	38.126	
MT READ MIN REF PTS						
QUE RIVER	2.0820	0.8520	18.337	15.623	38.178	
ROSEBURY	2.0842	0.8538	18.276	15.604	38.091	

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TABLE 2 Pb, U, Ba and P concentrations for whole rock samples from Lake Selina

Sample No.	Pb ppm	U ppm	Ba ppm	P ppm
27347	50	0.3		
27384	1900	6.6		
27393	20	0.7		
27397	390	2.2		
27398	20	4.2		
27399	20	3.1		
27400	850	4.8		
27401	550	35.1		
27402	1700	4.9		
27403	3900	2.3		
LS 2 600'-605'	500		2280	305
LS 2 665'-670'	500		417	462
LS 2 680'-685'	900		832	471
LS 3 265'-270'	1.16%		2780	140
LS 3 275'-280'	2.13%		1690	227
LS 3 360'-365'	1.01%		1520	157
LS 4 680'-685'	400		1190	209
LS 4 790'-795'	300		1940	593
LS 4 975'-980'	500		3530	279
LS 5 480'-485'	3100			
LS 5 655'-660'	960		3570	166
LS 5 835'-840'	1600			
LS 6 275'-280'	700		1030	148
LS 6 915'-920'	800		970	977
LS 6 920'-925'	1100		1390	567
LS 8 21.0-23.6m	840		2490	524
LS 8 225-226m	1150		875	628
LS 8 345-350m	920		513	52



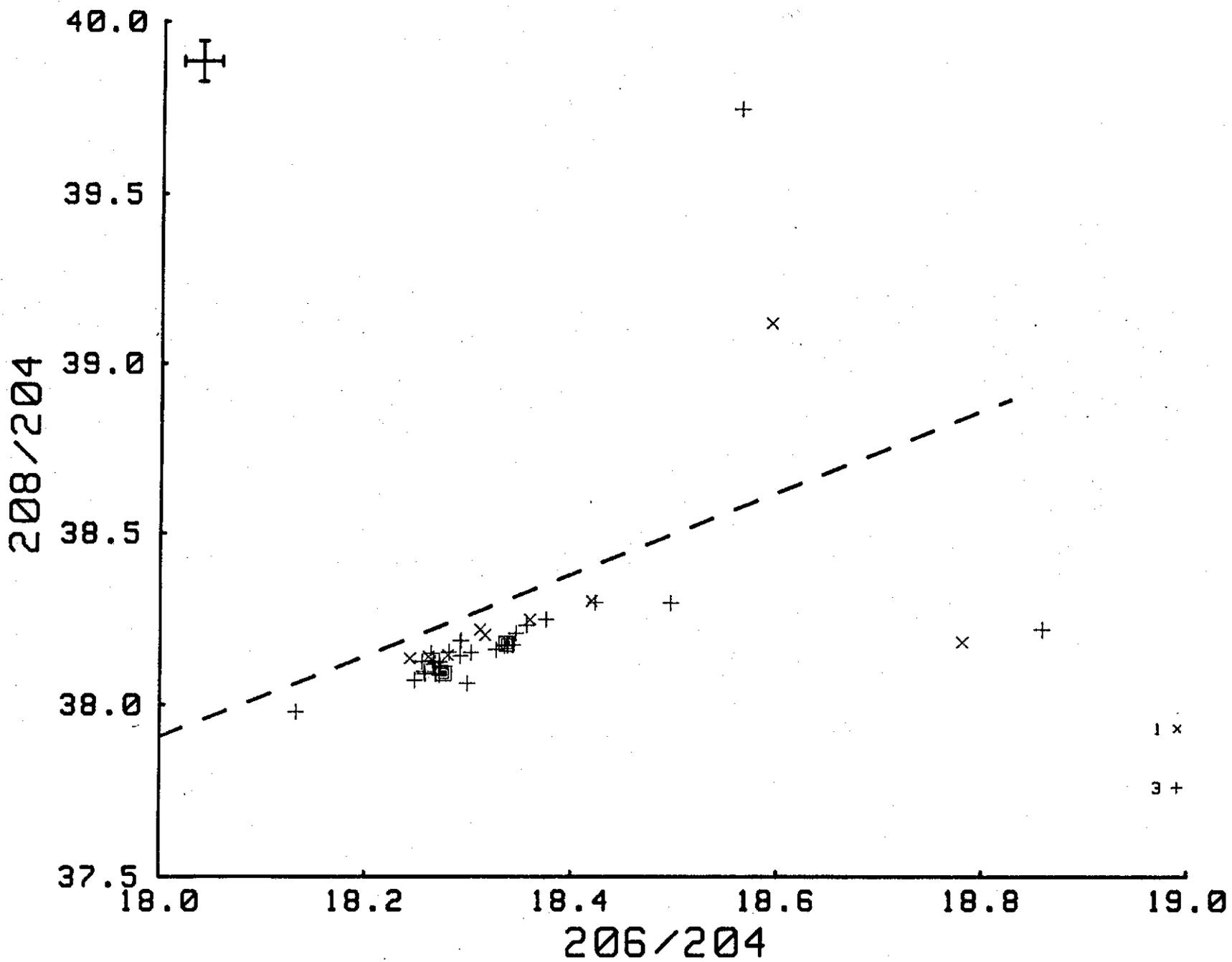


Figure 3

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INTERPRETATIVE PETROGRAPHY
OF A SUITE OF SAMPLES
FROM THE MT. READ VOLCANICS -
TYNDALL E.L. 9/66

Mel Jones

Canberra

May, 1983

Introduction

A suite of approximately sixty samples was collected in January and February for petrographic examination in an attempt to resolve problems of rock identification encountered in the field.

The report attempts to assign essentially genetic names to a variety of volcanic rocks despite the realisation that textural interpretations of altered and deformed rocks are unlikely to find universal acceptance. I have drawn on a number of published works for guidance, notably:

Moorehouse, W.W. 1970 A comparative atlas of textures of
Archaean and younger volcanic rocks.

Geol. Assoc. Canada. Spec. Paper 8.

Ross, C.S. and Smith R.L. 1961. Ash-flow tuffs; their
origin, geologic relations and identification.

U.S.G.S. Prof. Paper. 366.

The dominantly ignimbritic character of the Mt. Read volcanics does not have to imply drastic sea-level changes consequent on caldera collapse and subsequent uplift. Rather we are probably looking at an essentially shallow sub-aqueous to sub-aerial environment. Ignimbrites, generated subaerially, may maintain their identity when emplaced under water (cf. Sparks et al. 1980) and in at least one instance there is evidence for possibly sedimentary retexturing of an ignimbritic unit within a sequence of welded ignimbrites (samples 2622-2625).

Increasingly there seems to be a recognition of an association of ignimbrites with massive sulphide deposits e.g. Golden Grove. However, the general apparent lack of

massive sulphide mineralisation in the Tyndall E.L. suggests an overall shallow sub-aqueous environment and Sillitoe's suggestion that the ore fluids may have boiled and the mineralisation dissipated could well be accurate.

It would be worth looking further at this possibility from a study of fluid inclusions, albeit preliminary qualitative attempts at this have not proved encouraging due probably to recrystallisation destroying primary inclusions.

Possible epithermal styles of mineralisation (e.g. Howards Anomaly Ag, Mt. Darwin Au) may be better characterised by fluid inclusion studies.

- Ref. Sparks, R.S.J. et al. 1980 The entrance of pyroclastic flows into the sea I & II.
J. Volc. Geotherm. Res. v.7. p.87 - 105.

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JUKES - DARWIN

2551 JP 1 - 116m

Most of the slide is taken up by a clast of quartz-phyric, chloritically altered rhyolitic lava. Minor carbonate alteration is also evident.

The matrix shows what I interpret as a relict eutaxitic texture. The rock is altered to a chlorite - sericite assemblage with epidote developed in pressure shadows around disseminated cubic pyrite.

On the basis of the matrix texture the rock is considered to be an ignimbrite containing cognate lithic fragments.

2553 JP 2 - 69.5m

The texture does not appear to support an epiclastic origin. A relict eutaxite texture is evident in the chloritised matrix (see photo). The relatively delicate textures of the corroded quartz phenocrysts may not have been preserved during epiclastic reworking, but this could depend on the process operating. A sedimentary mass flow or density current may preserve these features in the same manner as an ash-flow.

2554 JP 2 - 83m

Essentially similar to 2553 and again a relict eutaxitic texture is taken to indicate an ignimbritic origin.

2555 JP 2 - 97.4m

Ignimbrite - chloritised pumice (fiamme) containing minor quartz (see photo) occur together with

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separate quartz phenocrysts in a sericitised fine grained matrix with what is possibly a relict eutaxitic texture. Lesser, partly sericitised, feldspar phenocrysts and minor rounded, chloritically altered fine grained lava fragments are also evident in the thin section, but not illustrated.

2556 JP 2 - 131.6m

A porphyritic lava with a matrix now essentially chlorite and sericite. Distinct spherulitic ("snowflake") texture is evident.

1136 Hydes - upper adit

Field identification: gritty, chloritic volcanic - lava (?).

In thin section the rock shows a clearly epiclastic texture with siliceous volcanic grains up to 2mm. in diameter in a chloritic matrix. The grains are angular to sub-rounded and even include what looks like a fragmented spherulite: volcanoclastic sandstone would be a preferred name.

1137 Clarke Valley: 43N 3900E

A clear spherulitic texture is evident in thin section, as indeed it is in the hand specimen. The lava contains phenocrysts of feldspar (up to 4mm) and rather angular quartzes, some partly corroded and some with a secondary quartz overgrowth. The matrix is pervasively chloritised.

1139 Clarke Valley: 80m south of 40N 432SE

Field name: andesite or volcanoclastic sandstone.

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In thin section the rock shows a clearly igneous texture and is best described as a propylitised andesite. Interlocking lath-like plagioclases, now largely epidotised, comprise some 50% of the rock and occur in a chloritised matrix. Minor quartz is present. The texture is somewhat micro-dioritic and it is not possible to be dogmatic about a flow vs. intrusive origin.

WEST SEDGEWICK - BASIN LAKE

2573 WS 3 198.5m

The thin section shows a clear eutaxitic texture and on this basis the rock would be accurately called an ignimbrite. Quartz phenocrysts are present, partly resorbed; relict feldspars, now almost completely sericitised are also visible. The rock has suffered extensive sericite - carbonate alteration.

2606 BL 4 179m

A feldspar-phyric, amygdaloidal, hornblende andesite.

Ovoid amygdules are now infilled either by carbonate or chlorite.

Finely crystalline hornblende and plagioclase in a chloritic matrix make up the groundmass within which larger plagioclase phenocrysts are set. Minor corroded quartz phenocrysts are also present.

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2607 BL 4 270m

A clast of a relatively coarsely porphyritic hornblende andesite occurs in a compositionally similar but finer-grained matrix. The coarser phase may have been an earlier flow, fragmented and caught up in a second eruption from the same magma chamber.

The rock shows weak propylitic alteration to a chlorite-carbonate-epidote assemblage.

BEATRICE

2575 MS 1 186m

The rock is fairly intensely altered to a sericite carbonate assemblage with minor chlorite. Large irregular sericitised bodies occur throughout the slide and may represent pumice fragments - on this basis the rock is interpreted to be of ignimbritic origin.

2576 MS 5 102.9m

Quartz-felspar phenocrysts - the quartz frequently corroded, the plagioclase commonly partly altered to carbonate - are ^{set?} ~~not~~ in a sericitised quartzo-felspathic groundmass.

The texture under low relief has something of the appearance of a relict eutaxitic texture (see photo) but continues across some of the altered phenocrysts - in fact it outlines the sericitic alteration.

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Pyrite and sphalerite appear to replace the feldspars, frequently rimming altered phenocrysts and are also disseminated through the rock.

The rock is a quartz-plagioclase phyric altered, mineralised rhyolitic lava.

2577 MS 5 96.7m

The sample book shows the annotation "ignimbrite or epiclastic". The thin section shows it is certainly not epiclastic in texture, but neither does it support an ignimbritic derivation.

In fact the rock appears to be a somewhat less carbonate-sericite altered version of 2576 - i.e. a quartz-plagioclase phyric rhyolitic lava.

2578 MS 2 91.5m

Large irregular sericitised fragments (cf. 2575) occur throughout and many represent pumice. There is nothing in the texture to support an epiclastic derivation and the rock is probably an ignimbrite.

2589 1800N 1950E

A definite epiclastic texture (see photo) - rounded quartz grains av. 200 μ in a chlorite-sericite matrix, with a crude stratification. Note, however, that there are some chloritised fragments with an irregular appearance-these may have been pumice fragments incorporated in the volcanically-derived sediments.

Sphalerite and lesser pyrite occur in close association with the chloritic matrix and occasional

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fill interstices between quartz grains.

SELINA

2594 LS 3 - 530

Sericite-chlorite altered quartz-phyric ignimbrite; quartzes are frequently corroded and commonly show secondary quartz overgrowths. Streaky; irregular, sericitised fragments may represent pumice.

2595 LS 3 - 657

Texturally similar to 2594; no evidence of epiclastic derivation. Pyrite-sericite alteration of a quartz-felspar phyric acid volcanic of probable ignimbritic origin.

2596 Ls 3 - 910

Oxidised and sericitised biotite phenocrysts in a pervasively sericitised ignimbrite. Interpreted sericitised pumice fragments and a possible eutaxitic texture within the matrix support the ignimbritic origin.

2598 LS 3 334

This was described in the sample book as a layered (water-lain?) chloritic tuff.

Thin section examination suggests that the layering may be more the result of deformation than a primary sedimentary texture.

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Irregular, corroded quartz phenocrysts and sericitised, ovoid areas possibly representing pumice fragments occur within a pervasively chloritised matrix (see photo). The rock is probably a deformed ignimbrite.

2599 LS 4 - 530

A specimen of pyritic, brecciated, silicified lava was sectioned in the hope that fluid inclusions may throw some light on the style of mineralisation (e.g. granite related mineralisation may show an association with saline fluids which would not be the case with Kuroko-style ores). Numerous very small inclusions are present but these are thought to be of secondary origin possibly formed during metamorphic recrystallization. Some appear to have halite daughter minerals implying high salinity but this may be more a reflection of the metamorphic fluid rather than the primary hydrothermal fluid.

2600 LS 4 673

Fine grained siliceous equigranular rhyolite - few quartz phenocrysts. Moderately strong sericite-pyrite alteration.

2601 LS 4 - 873

Autobrecciated, equigranular rhyolite - chloritic matrix to the fragmented quartz-felspathic grains. Pervasive sericite-pyrite alteration; minor leucoxene.

2602 LS 4 - 765

Sedimentary layering is clearly illustrated in the accompanying photomicrograph. Quartz grains and bands of finer material now altered to chlorite and sericite define a possible repetitive grading. Minor pyritic bands are also present.

2603 48N

This is interpreted as a hydrothermal breccia. Angular to sub-rounded quartz-felspar fragments, possibly of rhyolitic lava origin occur in a pervasively chloritised matrix within which minor sulphides, including galena, are disseminated.

2604 LS 5 - 157.2m

Corroded quartz phenocrysts and partly sericitised plagioclase phenocrysts occur in a sericitised matrix which display a possible relict eutaxitic texture. Irregular grains, now largely sericitised, may represent pumice fragments.

The field description of an ignimbrite incorporating accessory lithics (shale fragments) would appear to be correct.

1191 betw. 152-160N on road.

A siliceous, fine-grained volcanic ash - thin section examination shows clear shards (see photo). No evidence of the suspected hornfelsing. Sericite-chlorite alteration is evident throughout.

211

HOWARD'S ANOMALY

2610 TYN 3 - 165

A fine-grained siliceous rock which in thin section can be seen to contain abundant shards suggesting it originated as a volcanic ash, presumably of subaerial origin since there is no evidence of sedimentary retexturing.

2611 TYN 3 - 268

Similar to 2610 although shards are fewer and less obvious - they are however, visible at higher magnification.

2616 HA 1 - 374

Strongly propylitised andesitic flow. Plagioclase phenocrysts, partly altered to carbonate and sericite in a matrix of chlorite-epidote-carbonate within which a possible relict flow texture can be discerned.

2619 HA 4 191.8m

Ignimbrite - strongly sericitised and carrying minor disseminated pyrite. Large pumice fragments have been altered to a hematite-sericite assemblage and contain ovoids (formerly vesicles?) filled by quartz. The sericitised matrix shows a possible eutaxitic texture.

2621 HA 4 212.5m

Ignimbrite - intense carbonate-sericite-(chlorite) alteration. Flattened ovoids made up of carbonate and sericite occur in hematite-replaced pumice fragments and may represent original felspar phenocrysts within the pumice.

212

2622 HA 3 194

Intensely sericitised ignimbrite (?) containing large wispy relict pumice (?) fragments, quartz-felspar fragments (cognate lithics?) and quartz phenocrysts, some with secondary quartz overgrowths. Minor carbonate, disseminated pyrite and leucoxene.

2623 HA 3 200

The texture appears to be epiclastic even to the extent of displaying a possible load structure. Given the interpreted ignimbritic character of samples from the same hole (2622, 2624-25) this could be an example of epiclastic reworking of a subaqueous ignimbrite.

2624 HA 3 255

Quite similar to 2622 - intense sericite (carbonate) alteration of a probable ignimbrite.

2625 HA 3 342

Ignimbrite - intensely sericitised. Large pumice fragments, in part replaced by hematite, contained flattened quartz-sericite ovoids probably representing former phenocrysts within the pumice. The pumice fragments are now dominantly chlorite-hematite and occur in a sericite-carbonate matrix (see photo).

213

2626 Newton Creek - north of 23.7N
Hydrothermal (?) breccia - quartz and plagioclase
fragments in a siliceous chlorite-sericite matrix.

Classification of breccias is not straight forward
and given the monomineralic nature of the clasts,
the possibility that the rock is a crystal tuff
cannot be ruled out. The designation 'hydrothermal
breccia' relies as much on hand specimen interpretation
as thin section.

Significant disseminated pyrite is present.

2646 HA 5 68m
Irregular lenticular chloritic bodies are interpreted
as fiamme and occur in a predominantly chloritic
matrix which shows a possible eutaxitic texture.
Sericite-pyrite alteration is notable.

2647 HA 5 71.2m
The rock contains chloritised pumice fragments,
plagioclase and quartz phenocrysts and quartzite
pebbles (accidental lithics?). The overall
texture however has an 'epiclastic appearance' and
perhaps this is another example of sedimentary
retexturing (?).

2650 HA 6 76m
Intense carbonate-sericite alteration an ignimbrite.
Relict pumice fragments are replaced by a hematite
-carbonate-sericite assemblage. The carbonate
preserves occasional spherulitic textures (devitrification?)

214

0537

HA 6 100m

Again intense carbonate-sericite-(chlorite) alteration of a probable ignimbrite. The photo shows a sericitised and partly hematitised pumice fragment in a carbonate matrix.

HENTY FAULT ZONE

2628

HFZ 10 - 225.5m

Altered rhyolite-pyrite sericite, carbonate alteration of a quartz-felspar phyrlic volcanic. Several rounded areas may represent poorly developed devitrification texture.

2629

HFZ 10 - 219.7m

The coarser phase in the section shows an epiclastic texture and is possibly a carbonate-sericite altered water-lain (?) tuff. It is in contact with a finer grained unit within which probable shards can be distinguished suggesting an origin as a volcanic ash.

2632

HFZ 3 - 490'6"

Coarser phase is a volcanoclastic arkose, with angular to rounded quartz and altered feldspars in a chlorite matrix; at least one streaky chloritic fragment may represent an altered pumice fragment.

The finer, sericitically altered material contains very small possible shards (<20 μ) and may therefore have formed as a volcanic ash deposit in water.

2633 HFZ 4 - 609

Rhyolitic lava; strong carbonate-sericite alteration. Clear devitrification (spherulitic) texture is present.

2644 HFZ 7 - 95

Fine grained, porphyritic rhyolite lava again showing strong carbonate-sericite alteration. Chloritic veining but no evidence of an auto-brecciated texture as suggested in the field description.

2645 HFZ 1 - 302

Essentially a carbonate-chlorite assemblage representing extreme propylitisation of an andesite. Rare relict igneous texture can be seen suggesting the rock was either a flow or intrusive of andesitic composition rather than a tuff.

Fabric is probably deformational rather than primary.

RED HILLS

0538 RH 11 - 193m

Fine grained acid volcanic showing strong carbonate - sericite-chlorite alteration and what is interpreted as a relict eutaxitic texture, which if correct, would be supportive of an ignimbritic origin.

0539 RH 11 - 275m

Fine grained sericitically altered acid volcanic. The rock displays a fine layering and shard texture which suggests it formed as a volcanic ash.

0540 RH 11 - 283.5m

Ignimbrite - felspar phyric (plagioclase phenocrysts to 4mm.); lithics include carbonate altered, felspathic rhyolite fragments with occasional spherulitic textures preserved.

The matrix shows relict shards and supports the welded tuff interpretation (see photo).

0578 RH 9 - 336m

Pyrite, sphalerite and galena mineralisation in a strongly carbonate-sericite-(chlorite) altered acid volcanic. Irregular, streaky, sericitic aggregates with the 'feathery' appearance of fiamme suggest a probable ignimbritic origin (see photo).

HUXLEY

0579 Mountain Maid Gold Prospect

Field identification: pyrophyllite (?) X.R.D. scan shows that it is a mica and certainly not pyrophyllite, so speculation about possible advanced argillic alteration associated with the Mountain Maid mineralisation is unsupported.

0582 ca. 100m. south of Nasty Knob

The lath-like metallic mineral seen in hand-specimen is arsenopyrite. It occurs together with minor chalcopyrite, sphalerite and galena.

Disseminated pyrite, both cubic and framboidal, and minor sphalerite are also present.

HENTY RIVER

0583 HR 1 346.4

Logged as a welded tuff and with eutaxitic texture visible in hand specimen.

The photomicrograph was taken simply to show a good example of this texture in thin section.

0584 HR 3 491.8m

Rounded quartz grains in a strongly carbonate-sericite altered fine grained matrix suggest a water-lain origin for this unit. No evidence (e.g. shards) of volcanic ash component. Clasts include fine grained intensely carbonate altered sediments (?) Rhombic carbonate grains occur throughout: an altered, water-lain tuff.

218

556219

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PHOTOMICROGRAPHS

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Plate 1

2551 JP1 - 116m.

Relict eutaxitic texture supportive of an ignimbritic origin. Mineralogy is essentially chlorite-sericite with minor epidote developed in pressure shadows adjacent to pyrite cubes. Ordinary light.

2553 JP2 - 69.5m

Corroded quartz phenocrysts in a chloritic matrix in which a relict eutaxitic texture is evident. Ordinary light.

2555 JP2 - 97.4m

Chloritised pumice fragment and quartz phenocrysts in a fine - grained sericitized matrix which shows a possible relict eutaxitic texture. Ordinary light.

2556 JP2 - 131.6m

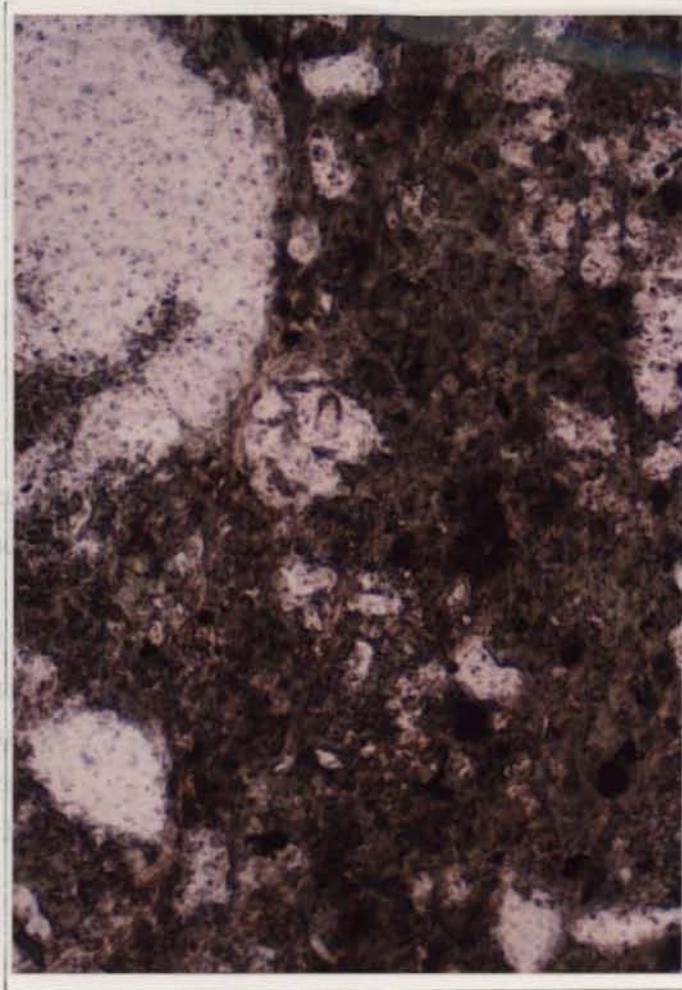
Spherulitic ("snowflake") texture in a matrix largely altered to chlorite and sericite. Crossed polars.

556220 219



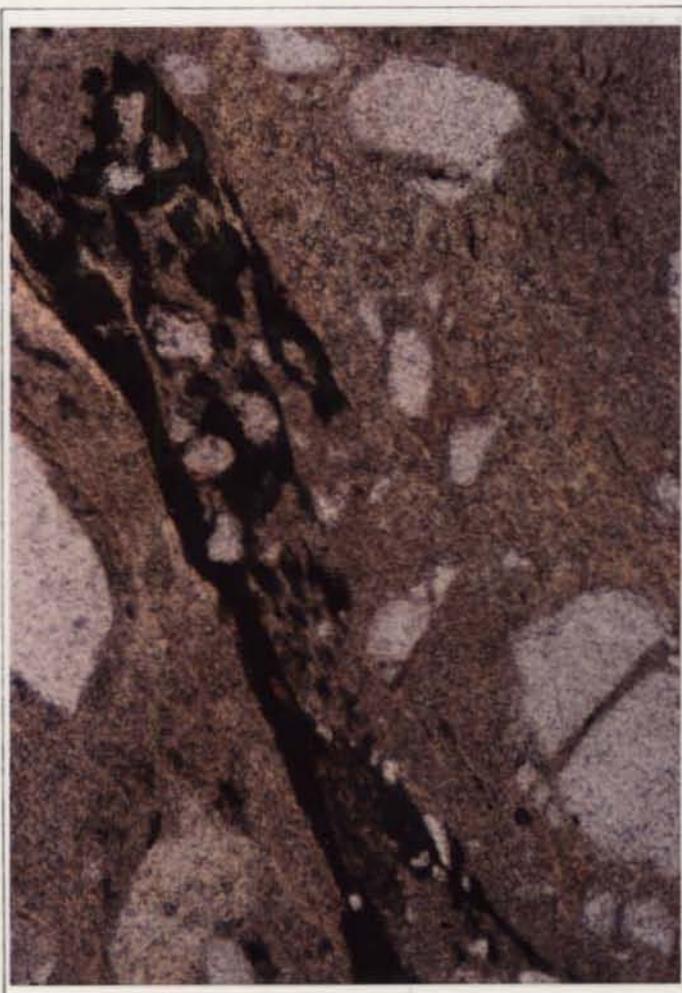
2551

100 μ



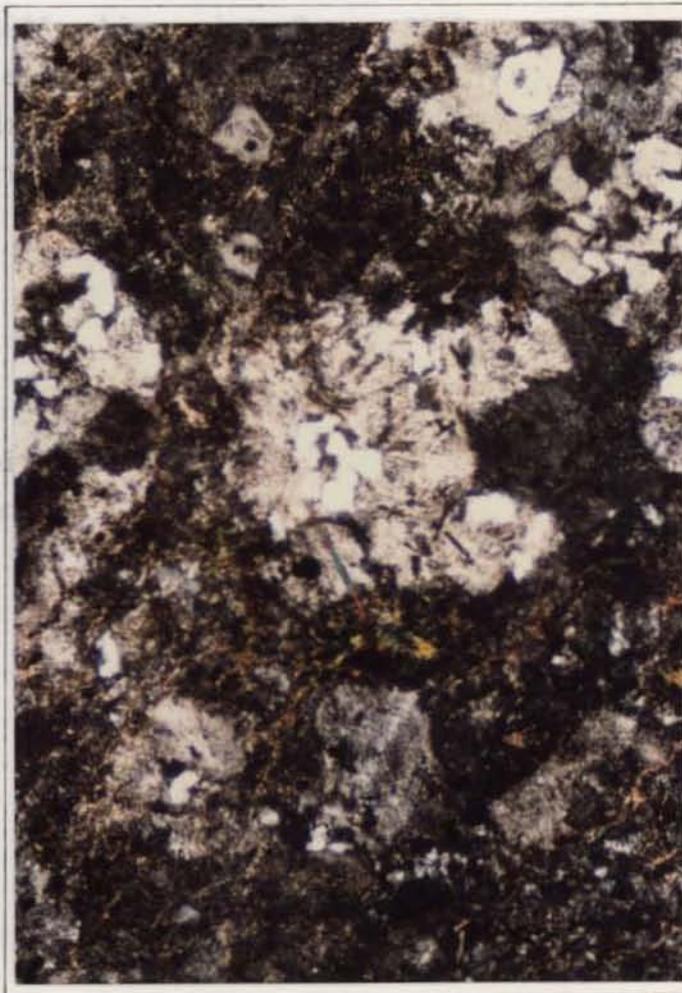
2553

200 μ



2555

200 μ



2556

200 μ

Plate II

2575 MS1 - 186.

2576 MS5 - 102.9m

This pair of photos illustrates the problem of identifying diagnostic textures in altered volcanics.

2575 shows what appears to be a relict eutaxitic texture and the rock also contains irregular, sericitised probable pumice fragments which supports an ignimbritic origin. However, in 2576, a superficially similar texture outlines sericitic alteration and continues across phenocrysts. Ordinary light.

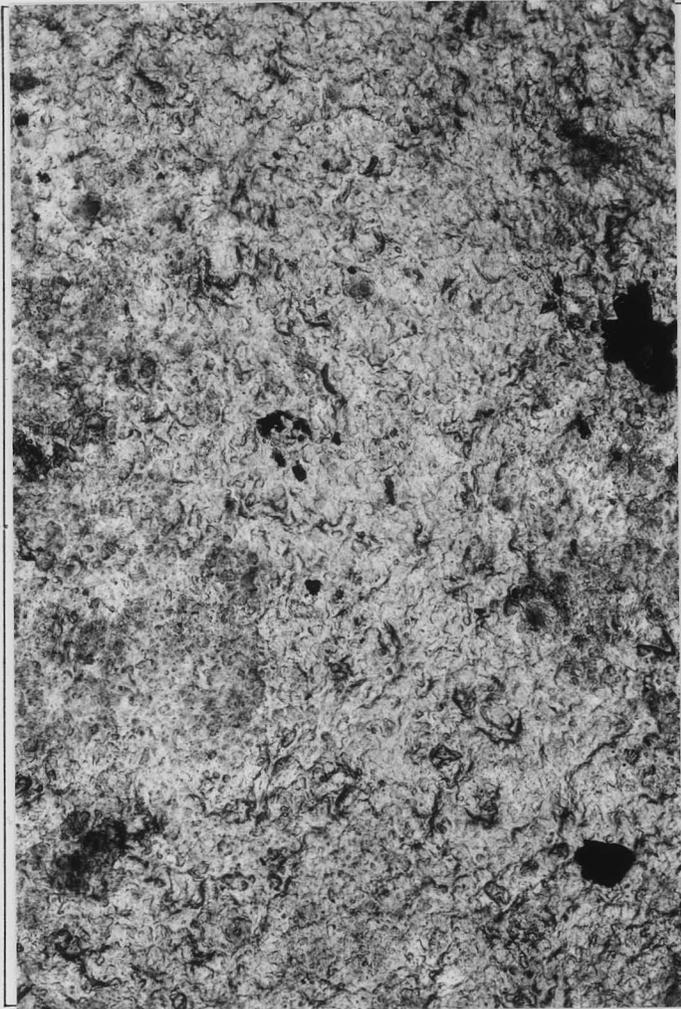
2589 Beatrice grid. 1800N 1950E

Volcaniclastic sandstone - quartz grains in a chlorite, sericite matrix: note the dark irregular chloritised pumice fragment at top right. Ordinary light.

2595 LS 3 - 657

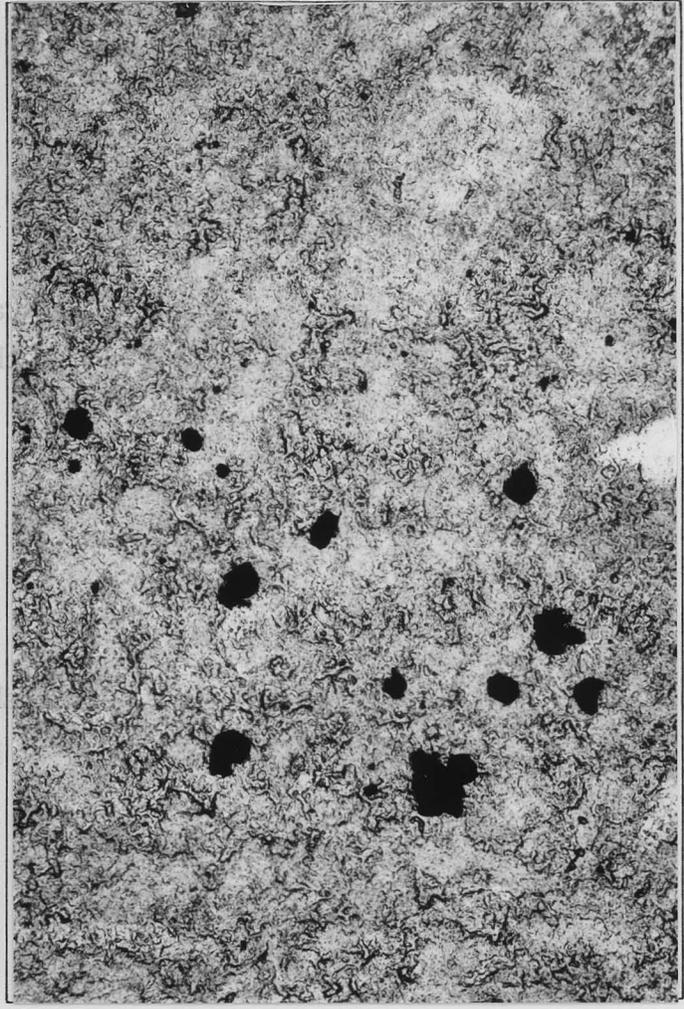
Possible relict eutaxitic texture; quartz (lower) and plagioclase (upper) phenocrysts. Ordinary light.

556222 220



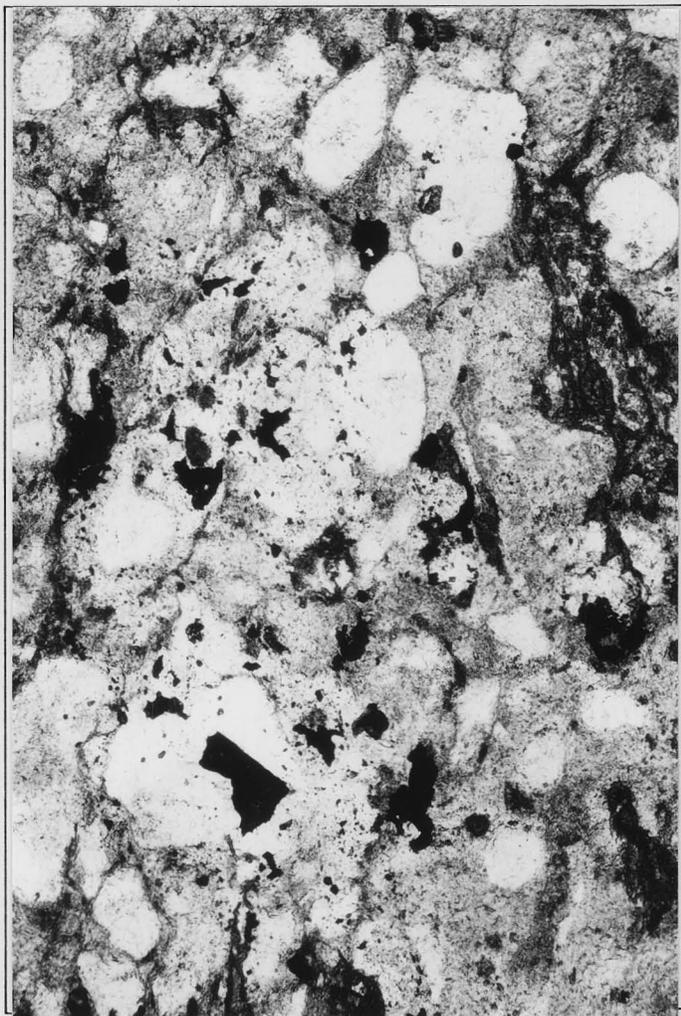
2575

100 μ



2576

200 μ



2589

200 μ



2595

200 μ

Hydrothermally (?) precipitated rhyolitic lava.

Rollston grid 2503

2598. LS 1 - 334

Sericitised pumice (?) fragment and corroded quartz phenocrysts in a chlorite matrix. Ordinary light.

2602. LS 4 - 765

Volcaniclastic sediment showing possible graded bedding. Dark band is a pyrite layer. Ordinary light.

2603 Rolleston grid. 48N

Hydrothermally (?) brecciated rhyolitic lava. Fragments of quartz and felspar in a chlorite matrix; minor sulphides include galena. Ordinary light.

1191 Selina grid. Approx 160N on road.

Shards within this fine-grained siliceous rock indicate a probable volcanic ash origin. Crossed polars.

556224 221



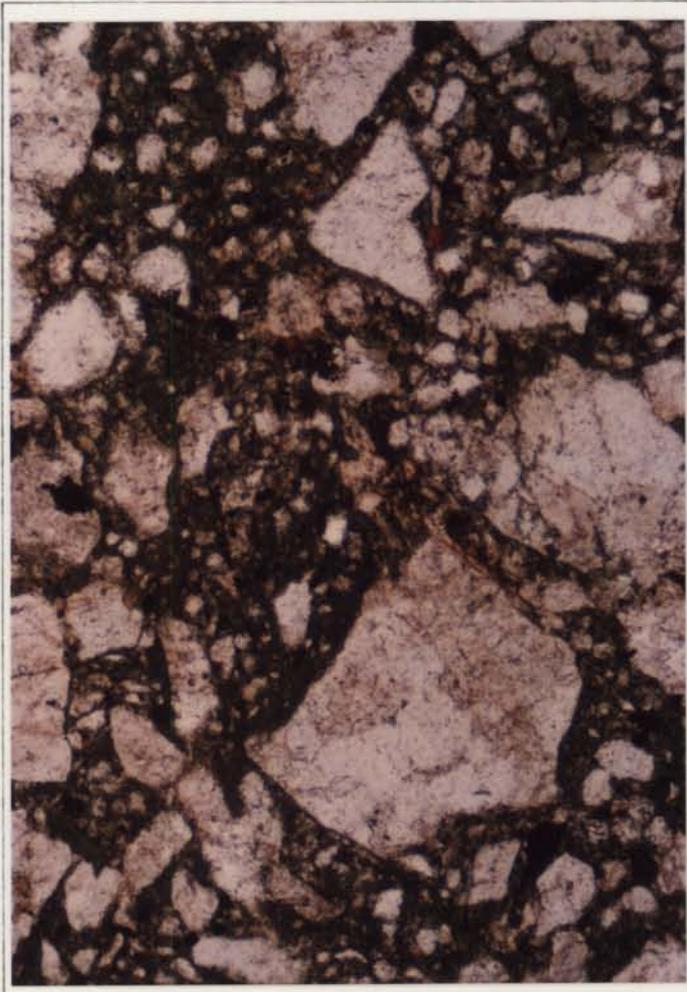
2598

200 μ



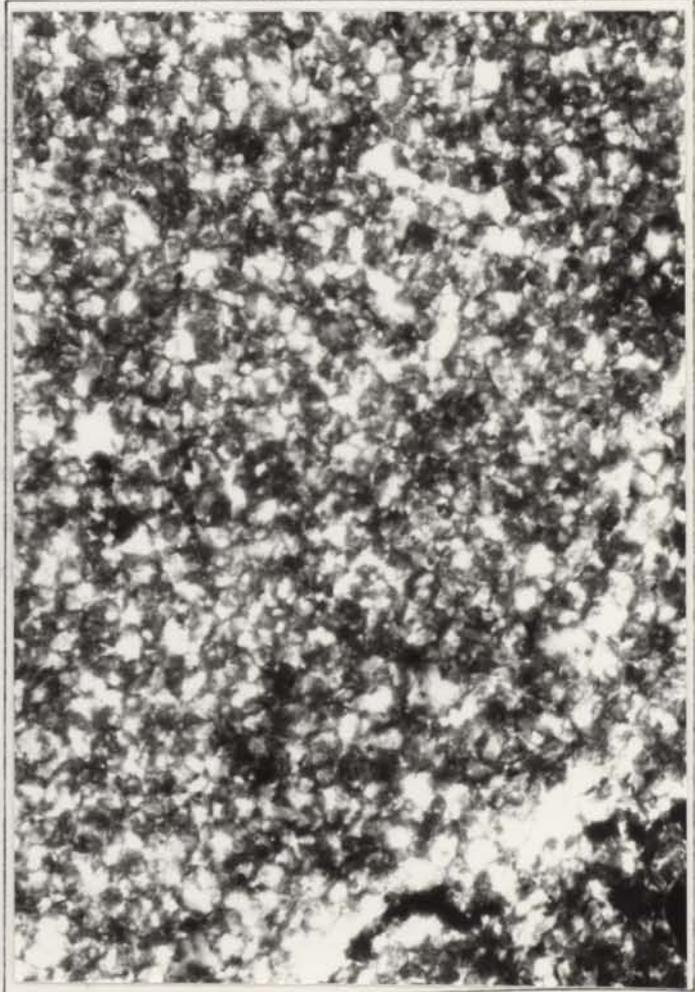
2602

200 μ



2603

200 μ



1191

50 μ

Plate IV

2610 . TYN 3 - 165

Shards dispersed in a fine grained siliceous matrix - a texture supportive of a volcanic ash origin. Ordinary light.

2625 HA 3 - 342

Fiamme, largely chlorite but partly replaced by hematite in a carbonate - sericite matrix. Crossed polars.

2626 Newton Ck.

Possible hydrothermal breccia; quartz and plagioclase fragments in a siliceous, sericitised matrix - disseminated pyrite throughout. Crossed polars.

2650 HA 6 - 76m.

Spherulitic texture preserved in carbonate from a rock which appears to be an intensely carbonate-sericite altered ignimbrite. Ordinary light.

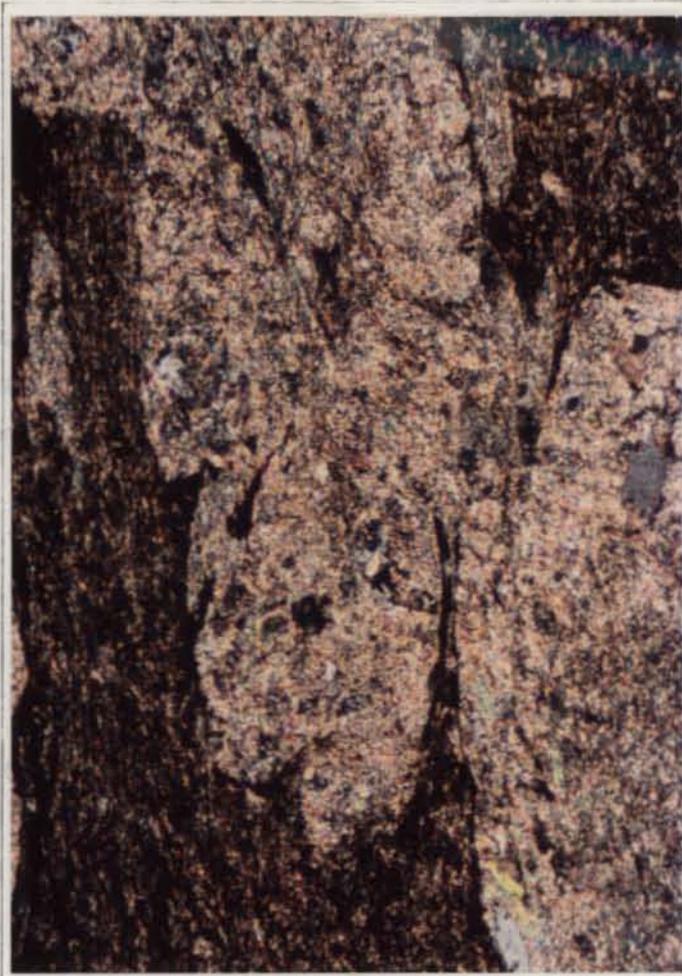
222

556226



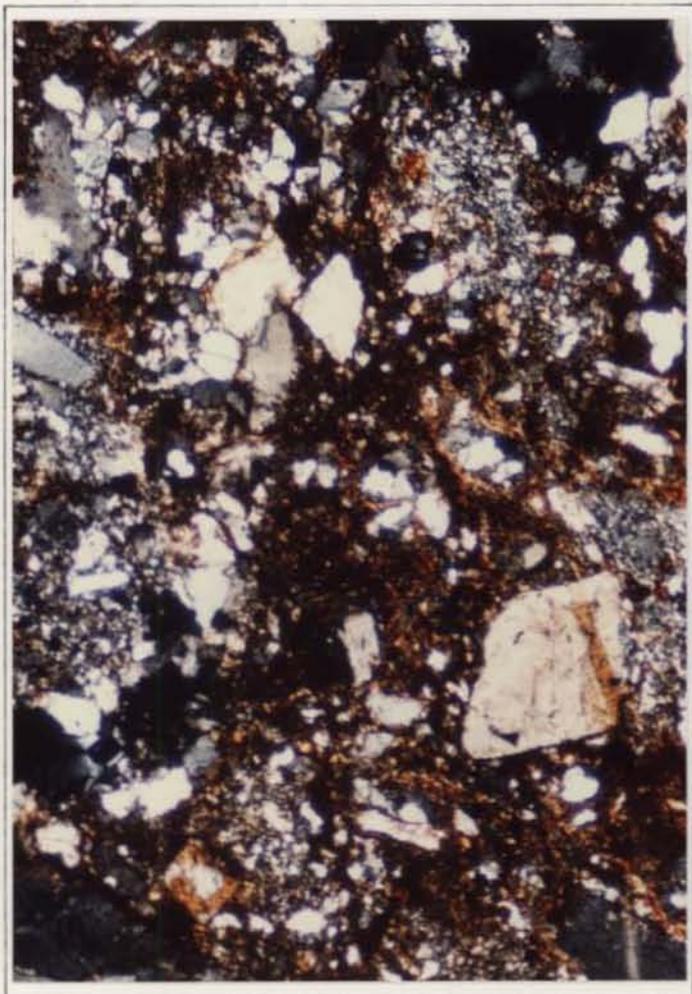
2610

200 μ m



2625

200 μ m



2626

200 μ m



2650

200 μ m

0537 HA 6 100m

Intense carbonate - sericite alteration of an ignimbrite - photo shows a sericitised and partly hematitised pumice fragment in a carbonate matrix.

0540 RH 11 - 283.5m

Relict eutaxitic texture. Ordinary light, low relief.

0578 RH 9 - 336m

Sericitised fiamme (?) - partly outlined in ink in a mineralised a strongly carbonate-sericite-(chlorite) altered ignimbrite.

0583 HR 1 - 346.4m

Eutaxitic texture

556228

223



0537

200 μ



0540

200 μ



0578

200 μ



0583

200 μ

APPENDIX CE.L. 9/66

Geochemical results
- listed in order of Review areas.

5 cm

225

GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVIEW TEAM 1983.

PROJECT: TYNDALL EL 9/66 PROSPECT: SELINA

SAMPLE STORAGE REQ'D:

LABORATORY: REVISION/LYELL

DATE DISPATCHED:

1:250,000 SHEET:

TYPE OF SAMPLE: Rock, CORE
SOIL

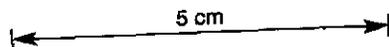
SAMPLE PREP. REQ'D:

ANALYSIS REQ'D: 0176, 0211

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * = check analysis								
			Cu	Pb	Zn	Ag	Au (FA)	S (%)	As (FA)	Sn	WO ₃
1168	B1 TRENCH - LINE 80S.	cf. 5% py, minor gn in 5mm band // foliation in chlorite qtz-phyric volcanic with lithic fragments.	990	1100	1000	12	<0.1	4.7	9		
1169	NORTH BERA ADIT - LINE 72S	cf. 10% magnetite and minor py in chlorite + sericitic qtz-phyric volcanic with lithic fragments < 50mm.	2400	440	490	13	0.2	8.2	10		
1170	DRILLHOLE LS 1 - LINE 72N	pyritic rhyolitic volcanic (core left at drillsite)	1800	400	790	10	<0.1	5.2	9		
1171	LAKE SELINA ADIT - LINE 80N	Dump float. fine gr. qtz-chlorite schist with silvery pyrite lenses. Schist possibly a shaly tuff.	1200	90	160	10	<0.1	17.9	7		
1172	SDM NW OF 1171 (80N/100E)	cf. 5mm magnetite-hematite vein? with minor qtz, within massive volcanoclastic.	150	30	80	2	<0.1	0.3	0.4		
1173	ADIT SDM S OF LINE 96N.	Dump float. Fine gr chlorite v. r. ± pink lava fragments pyritic, with minor gn.	260	7500	260	9	<0.1	1.9	8		
1174	ADIT W OF ROAD S OF 128N.	Dump float. Massive pyrite-magnetite.	250	80	200	4	NIL	5.3	0.7	<10	<10
1175	ROAD - VICINITY 152N.	cf. Bedded, chloritic friable silty ash with disseminated and vein magnetite-hematite	500	60	330	2	<0.1	<0.1	2		
1176	SELINA ROAD VICINITY 32N	Gossanous limonite from soil pan in moraine	30	40	60	4	NIL	<0.1	0.1		
2597	DRILLHOLE LS 2 - 257'	Core. Broad Owen Conglomerate? Silicified, hematitic weakly magnetic grit.	40	60	40	3	<0.1	<0.1			
1177	LINE 128N, 00E	Float. Mn veining in rock fragments.	190	390	490	1	<0.1	0.1			
1178	LINE 128N, 00E	Float. Qtz-albite-chlorite veining in granite or volcanic	20	140	370	<1	<0.1	<0.1			
1179	BASELINE 70m S of 128N.	Soil sample. B horizon. Red-brown loam. 20cm depth	40	1830	330	9	<0.1	0.4			
1180	BASELINE 50m S of 116N.	Sub cf. Igneobrite? Sericitic volcanic ± minor magalimite	20	230	340	<1	<0.1	<0.1			

556230



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVIEW TEAM 1983.

PROJECT: TYNDALL EL 9/66 PROSPECT: SELINA

SAMPLE STORAGE REQ'D:

LABORATORY: RENISON/LYELL

DATE DISPATCHED:

1:250,000 SHEET:

TYPE OF SAMPLE:

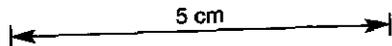
SAMPLE PREP. REQ'D:

ANALYSIS REQ'D: D176

DATE RECEIVED:

SAMPLE NUMBER	LOCATION		DESCRIPTION	ANALYSES * = check analysis.								
				Cu	Pb	Zn	Ag	Au (FA)	S (%)	As (FA)	Sn	WO ₃
1181	LINE 112 N	850' W	cf. Igneimbrite? Sericitic, qtz-phypic volcanic ± minor limonite	160	190	80	1	<0.1	0.2			
1182	LINE 120 N	470' W	cf. fine gr chloritic dome lava (?) ± 1-2% py.	50	1170	190	2	<0.1	<0.1			
1183	LINE 120 N	600' W	cf. As above. 2% py.	100	1250	640	9	<0.1	<0.1			
1184	LINE 116 N	20-120' W	cf. Chips through geochron anomaly zone. Qtz-phypic ignimbrite - weakly magnetic, moderately chloritic	60	790	910	24	<0.1	0.2			
1185	LINE 116 N	365' W	cf. Med gr equigranular qtz-phypic rhyolite (lava?)	10	200	460	1	<0.1	<0.1			
1186	LINE 124 N	60m W	cf. chloritic qtz-phypic ignimbrite (?). Dissem py + gn	840	3370	135%	18	<0.1	0.8			
1187	LINE 124 N	80m W	cf. Chloritic volcanic ± minor lithic frags. Pyritic	20	250	380	10	<0.1	0.2			
1188	PROSPECT - LINE 152 N		cf. Brecciated, fine gr cherty or honeycombed sediment	60	80	300	<1	<0.1	<0.1			
1189	10m north of 1188		cf. Chemical sediment with magnetite-hematite beds. 4mm thick	460	40	720	1	<0.1	<0.1		<10	100
1190	100m north of 1188		cf. Minor cp, bornite, gn and magnetite in chloritic fine-med gr volcanoclastic (?).	5400	4810	1330	23	<0.1	3.4			
1192	100m W of BKS S ROAD JOIN JUST NORTH OF 176 N		cf. Chloritic, fine gr tuffaceous volcanic. Weakly magnetic.	620	200	320	5	<0.1	0.2			
1193	50m S OF ZS & COLLAR		cf. Massive magnetite and minor py in chloritic lava?	90	100	200	10	<0.1	0.3			
1194	AS ABOVE		cf. Py, minor magnetite in volcanic ± pink lava frags	30	100	140	3	<0.1	1.2			
1195	AS ABOVE		cf. Pyritic vitric tuffaceous siltstone ± minor qtz	30	340	260	1	<0.1	0.8			

556231



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: 1983 REVIEW TEAM

PROJECT: TYNDALL EL 9/66 PROSPECT: SELINA

SAMPLE STORAGE REQ'D:

LABORATORY: RENISON

DATE DISPATCHED:

1:250,000 SHEET

TYPE OF SAMPLE: DRILLCORE

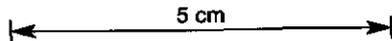
SAMPLE PREP. REQ'D:

ANALYSIS REQ'D: D184

DATE RECEIVED:

SAMPLE NUMBER	LOCATION		DESCRIPTION	ANALYSES * Check Analysis.								
				Cu	Pb	Zn	Ag	Au	Sn	WO ₃		
	DRILLHOLE	LS 8, 184N										
230-235m			PYRITE - MAGNETITE MINERALISATION IN ALTERED						10	30		
240-245m			RHYOLITIC VOLCANICS - SEE DRILL DRILL						20	30		
250-255m			LOG FOR DETAILS.						10	30		
260-265m									10	20		
270-275m									<10	30		
280-285m									<10	10		
290-295m									<10	10		
300-305m									10	20		
310-315m									10	20		
320-325m									10	20		
330-335m									<10	20		
340-345m									<10	20		
350-355-2m									10	30		

556232



GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: *REVIEW TEAM*
1983
DATE DISPATCHED:
DATE RECEIVED:

PROJECT *TYNDALL EA 9/66*
1:250,000 SHEET:

PROSPECT: *RED HILLS*
TYPE OF SAMPLE *ROCK, DRILL CORE*

SAMPLE STORAGE REQ'D:

LABORATORY: *LYELL/REALISON*

SAMPLE PREP. REQ'D: *REQ Nos. ?, 018, 014* ANALYSIS REQ'D:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES							
			Cu	Pb	Zn	Ag	Au (PP)	S%	Sn	NO ₃
1101	<i>RH9 drill site</i>	<i>sebc: Highly manganeseiferous altered vitric tuff</i>	360*	70	450	<2				
1102	<i>Unused drill site ≈ 200m SW RH13</i>	<i>o/c: pyritic (5-10%) black tuff-shale</i>	330*	1080	650	<2				
1103	<i>approx. 80m NE of 1102</i>	<i>o/c: Black shale with 2-3% bedded pyrite</i>	250*	1600	480	4				
1104	<i>same site as 1103</i>	<i>o/c: Leached altered tuff with 5% black specks</i>	220*	70	60	2				
1105	<i>No. 1 N adit, dump</i>	<i>adit dump: semi massive pyrrho in chlorite</i>	11.1%				2.4			
1111	<i>RH5 F6 D-198.8m</i>	<i>sawn drillcore (80% of half core) Massive sulphide</i>	3200	11.35%	34.5%	250	6.55		<10	
0531	<i>L72S 2000' m costean</i>	<i>o/c: Chip sample ≈ 3m. Black graphitic pyritic shale</i>	300	6300	3740	5	<0.1	1.7		
0532	<i>L72S 2000' m costean</i>	<i>o/c: Chip sample ≈ 2m. Green tuffaceous siltstone</i>	20	420	90	1	<0.1	<0.1		
0535	<i>L8S ≈ 3000' m, 40m N road</i>	<i>dump sample, old shaft. Qtz vein in rhyolite lava, sp. gn. py</i>	5800	1040	130	43	*1.9 1.1	1.4		
0536	<i>L5S ≈ 100m W RH2 on road</i>	<i>o/c: MnOx zone in ignimbrites?, tr. gn</i>	210	2130	2420	1	<0.1	<0.1		
2682	<i>tranch ≈ 300m ESE No. 1 N adit</i>	<i>o/c: Fine grained lava (?) with mag. chlorite, py.</i>	100	110	120	1	<0.1	3.4	<10	<10
2683	<i>75m N of L20N/150E</i>	<i>o/c: Fine grained volcanics with dissem mag.</i>	10	1400	40	1	<0.1	0.2	10	20
2684	<i>75m N of L20N E side of dump</i>	<i>o/c: Lava with qtz, chl, mag stockwork</i>	50	730	130	1	0.2	<0.1	10	70
2685	<i>End L20N, small open cut</i>	<i>o/c Chloritized lava with py, mag.</i>	160	890	120	2	<0.1	6.0	<10	<10
2759	<i>No. 1 N adit, dump</i>	<i>adit dump: chl-mag rhyolitic lava - vein/dissem pyrrho</i>	1.09%	340	150	4	<0.1	1.7	<10	60
RH5 COSTEAN	320' - 330'	<i>Re assay old pulps</i>				<2	<0.1			
	330' - 340'	"				4	<0.1			
	340' - 350'	"				<2	<0.1			
	410' - 420'	"				<2	<0.1			
	420' - 430'	"				<2	<0.1			
	430' - 440'	"				<2	<0.1			

* Probable contamination in Mt Lyell lab.

2220

556233

5 cm

229

GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: *Review Team 1983*
 DATE DISPATCHED:
 DATE RECEIVED:

PROJECT: *TINDALL EL 9/66*
 1:250,000 SHEET:

PROSPECT: *RED HILLS*
 TYPE OF SAMPLE: *Rock, Drill Core*

SAMPLE STORAGE REQ'D:
 SAMPLE PREP. REQ'D: *Req. Nos. 091, 093*

LABORATORY: *LYELL*
 ANALYSIS REQ'D:

SAMPLE NUMBER	LOCATION		DESCRIPTION	ANALYSES											
				Cu	Pb	Zn	Ag	Au(PPM)	3%						
	<i>RH5</i>	<i>440'-450'</i>	<i>Re assay old pulps</i>				<i><2</i>	<i><0.1</i>							
		<i>450'-460'</i>	<i>"</i>				<i><2</i>	<i><0.1</i>							
		<i>460'-470'</i>	<i>"</i>				<i><2</i>	<i><0.1</i>							
		<i>470'-480'</i>	<i>"</i>				<i><2</i>	<i><0.1</i>							
		<i>480'-490'</i>	<i>"</i>				<i><2</i>	<i><0.1</i>							
		<i>490'-500'</i>	<i>"</i>				<i><2</i>	<i><0.1</i>							
		<i>500'-510'</i>	<i>"</i>				<i><2</i>	<i><0.1</i>							
	<i>RH2</i>	<i>245'-250'</i>	<i>Drill core pulps Red Hills Lane</i>					<i><0.1</i>	<i>4.3</i>						
		<i>300'-305'</i>	<i>"</i>					<i><0.1</i>	<i>2.1</i>						
	<i>RH4</i>	<i>249.0 - 250.5m</i>	<i>"</i>					<i>0.1</i>	<i>9.5</i>						
		<i>250.5 - 252.0m</i>	<i>"</i>					<i>0.3</i>	<i>9.7</i>						
		<i>252.0 - 253.5m</i>	<i>"</i>					<i><0.1</i>	<i>1.8</i>						
		<i>266.5 - 265.5m</i>	<i>"</i>					<i><0.1</i>	<i>0.5</i>						
		<i>265.5 - 267.0m</i>	<i>"</i>					<i><0.1</i>	<i>1.4</i>						
		<i>267.0 - 268.5m</i>	<i>"</i>					<i><0.1</i>	<i>1.3</i>						
		<i>268.5 - 270.0m</i>	<i>"</i>					<i><0.1</i>	<i>1.3</i>						

556234

5 cm

230

GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: C.P./FF/MJ/R.P.

PROJECT: TYNDALL EL 9/66 PROSPECT JUKES-DARWIN AREA. SAMPLE STORAGE REQ'D:

LABORATORY: MT LYELL RENISON.

DATE DISPATCHED: 1983.

1:250,000 SHEET:

TYPE OF SAMPLE:

SAMPLE PREP. REQ'D:

ANALYSIS REQ'D: 0207, 0210, 0191.

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * = Check Assay.								
			Cu	Pb	Zn	Ag (ppm)	Au (g/t)	S (%)	As (g/t)	Sn	Ba
EAST DARWIN PROSPECT:											
1120	Dump of Pearce's Adit.	Float: Highly sulphidic quartzose tuff (py > cp > 79m)	24.9%	500	100	13	0.2	18.2	8.8	< 10	70 WC ₃ 300
1121	Dump of Jorkens Adit.	Rock float: Semi-massive sulphides in siliceous tuff.	10.3%	1500	3300	30	0.3	15.2	26	< 10	340 WC ₃ < 100
1122	Dump of Darwin Fly Adit.	Rock float: Silic, chloritic tuff ± py > cp + magnetite.	2.13%	< 100	100	15	9.6	13.0	11	< 100	550 WC ₃ < 100
SNAKE PEAK IRON BODY:											
1119	Near southern margin.	cf: 60% hematite ± lava fragments in it.	90	370	20	1	< 0.1	< 0.1		< 10	70
1128	" " "	cf: Near-massive hematite	270	60	40	1	< 0.1	< 0.1		< 10	90
0522	Near northern margin	cf: Milled, brecciated lava dome with hematite. <small>OK - specimens</small>	10	50	10	1	< 0.1	< 0.1		< 10	30
CLARK VALLEY:											
0523	L 32 N 4200E	cf: Silic, bluish rocks, some qtz xyls, weak chlorite. Trace py	20	20	30	< 1	< 0.1	< 0.1			
0524	East trib 40m S of L 32 N 4200E	Stream sediment: adjacent to old alluvial gold workings.	30	< 10	10	< 2	< 0.1				
0525	Same as above	Rock float: Hematite-magnetite pebbles from old Au workings.	10	60	40	2	< 0.1	< 0.1		< 10	90
1138	Main Creek at L 40 N 4325E	Stream sediment: float-dome lavas with hematite + magnetite.	35	70	30	< 2	< 0.1				
1140	Main Creek 30m S of 38 N.	cf: Cherty siliceous sediment with pyrite + black pyritic shales.	1250	210	70	1	< 0.1	0.5			
1141	Main Creek 60m S of 38 N.	cf: Cherty black and grey shales with 10% py.	120	150	50	1	< 0.1	5.9			
1142	Main Creek approx line 36 N.	cf: Massive white chert with limonite patches.	90	440	90	1	< 0.1	< 0.1			
FINDONS:											
1129	Nº 3 trench.	Dump float: chlorite schist with 5% py + cp - after sediment	2.3%	70	170	8	< 0.1	2.7			
ALLANS CREEK WORKINGS:											
2557	Centre of altered area	cf: vein stockwork of hematite and minor py in lava.	60	70	80	2	< 0.1	1.4		30	360
1130	Same area, 25m S of above.	cf: Vein stockwork of hematite and magnetite.	810	30	30	2	< 0.1	0.5		< 10	160

556235

5 cm

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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: G.P./FF/MJ/R.P. 1983.

PROJECT: TYNDALL EL 9/66 PROSPECT: JUKES-DARWIN AREA SAMPLE STORAGE REQ'D.

LABORATORY: RENISON, MTLYELL DATE DISPATCHED:

1:250,000 SHEET

TYPE OF SAMPLE:

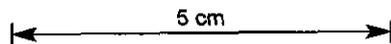
SAMPLE PREP REQ'D.

ANALYSIS REQ'D:

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * = check analysis						
			Cu	Pb	Zn	Ag	Au/ppm	S%	Sn
<u>ALLANS CREEK WORKINGS</u>									
1131	From main sluicing workings	Sp: Ordinary dense lava. Weak chloritisation, trace hematite	170	180	30	1	<0.1	<0.1	
1132	" " "	Rock float: Volcaniclastic breccia-conglomerate	110	20	30	1	<0.1	<0.1	
1133	Northern slopes of Mt Daminin	Rock float: Pink, chloritic, lava with veins of hematite-limonite	220	170	50	1	<0.1	<0.1	20 20
<u>HYDES</u>									
1134	At mouth of Hydes Adit	Rock float: Chlorite schist ± 5% ep. Some fine py.	3.43%	150	240	11	<0.1	3.7	
1135	30m upstream	Rock float: Chloritic lava ± 5-10% ep.	1.87%	650	280	10	0.4	2.2	
<u>CLARK VALLEY</u>									
2558	L 42 N 4200 E Stream	Sp: Black shale - minor pyrite on joints	30	70	110	1	<0.1	0.4	
2559	25 above	Sp: Bedded pyrite in shale: bands 1-5cm	100	70	170	1	<0.1	2.0	
2560	Stream L 42 N - L 40 N	Sp: Random chips sample of black shale	90	180	170	1	<0.1	1.7	
2561	Stream 50m below L 42 N	Dense py. trace gr. in ignimbrite float	40	100	830	1	<0.1	1.6	
2562	Stream approx. L 40 N	Float - hem. mt. matrix to dense lava breccia	30	40	80	1	<0.1	1.0	<10 20
2564	as above	Float - massive magnetite	30	50	30	1	<0.1	<0.1	70 20
2565	L 40 N 4350 E	Sp: Black shale, minor py. in contact & dense lava	60	230	310	2	<0.1	0.3	
2566	L 40 N + 30m downstream	Sp: Pyritic cherty buff interbed in black shale	30	140	460	1	<0.1	0.6	
2567	L 38 N + 20m downstream	Sp: Black shale - v. minor pyrite	20	40	40	1	<0.1	0.3	
2568	L 34 N " " stream	Sp: Shale - 2-3% pyrite	50	50	30	1	<0.1	0.7	
2569	L 30 N " " stream	Sp: Shale and interbedded buff - pyrite 3-5%	40	280	110	1	<0.1	2.0	
2570	L 30 N + 40m downstream	Sp: Chert	20	70	40	1	<0.1	<0.1	

256236



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY:

PROJECT TYNDALL EL 9/66 PROSPECT: JUKES DARWIN AREA SAMPLE STORAGE REQ'D:

LABORATORY: REVISION & MT LYELL

DATE DISPATCHED:

1:250,000 SHEET:

TYPE OF SAMPLE:

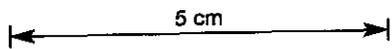
SAMPLE PREP. REQ'D: REQ N° 017,

ANALYSIS REQ'D:

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * = Check analysis.							
			Cu	Pb	Zn	Ag	Al(FA)	Sn	LiO ₂	S %
<u>CLARK VALLEY</u>										
2672	Line 12N, creek west of base line	sp. Black pyritic shale (1-2% pyrite).	150	270	80	2	<0.1	10	10	0.1
2673	Clark River, 80m S of L10N, 2925	sp. Fine grained sericite schist ± minor limonite after pyrite	<10	55	40	<1	<0.1	10	10	0.2
2675	Clark River, 40m S of L4N	sp. Fine grained sericite schist (tuff?) ± limonite boxworks	<10	35	144	1	<0.1	10	20	<0.1
2674	Clark River, 40m S of 2673.	sp. Sandy acid volcanic - ignimbrite or clastic sediment?	<10	60	50	1	<0.1	10	20	<0.1
<u>MT DARWIN SUMMIT</u>										
2691	Beside trig.	sp. Rhyolite lava ± 10% haematite streaks. Minor lim.	30	110	20	2	<0.1	300	290	0.4
2692	20m south of trig.	sp. Chlorite lava ± 5% pyrite + 5% haematite streaks	850	40	30	2	<0.1	10	50	2.8
2693	100m south of trig.	sp. 25cm E-W vein of black hematite in lava.	30	100	10	1	<0.1	240	100	<0.1
2694	250m south of trig.	Float. Massive wuggy hematite. Block 60cm x 30cm.	140	180	10	2	*5.6 5.9	1040	6810	0.1
2695	250m south of trig.	sp. Normal lava - 5% hematite in veinlets. Minor pyrite Lava is chlorited and altered. Quartz-phyric.	40	150	50	1	<0.1	30	70	0.2
2696	50m north of trig.	sub sp. Vein quartz ± 1-2% patchy hematite. 20m thick	20	70	<10	<1	<0.1	10	10	<0.1
2697	100m north of trig.	sub sp. Granite gossam - cellular, light weight. Minor qtz veins	860	370	40	2	*3.2 2.3	10	30	0.1
<u>GARFIELD VALLEY</u>										
2698	Garfield River, 100m above Flanagan	sp. Siliceous sediment ± minor pyrite.	90	90	40	1	<0.1	10	10	<0.1
2699	Garfield River, 300m above Flana.	sp. Massive, siliceous + vitric tuffaceous sandstone. 1% py	10	100	20	1	<0.1	10	10	0.2
2700	50m above 2699	sp. Massive tuffaceous chert and sandstone. Minor pyrite	10	160	10	<1	<0.1	10	10	<0.1
2701	100m above 2700	sp. Massive sulphide (pyrite) 2cm thick in cherty tuffs	10	185	210	2	<0.1	10	30	25.6
2702	15m above 2701	sp. Chloritic, sericite shale ± 2-5% bedded py. Trace sp. py.	170	130	160	<1	<0.1	10	30	0.5
2703	50m above 2702	Float. Quartz sericite schist after tuffs, ± 5-7% py.	<10	1250	20	<1	<0.1	20	20	1.7

556237



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVIEW TEAM

PROJECT: TYNDALL EL 9/66 PROSPECT: JUKES DRAWN AREA SAMPLE STORAGE REQ'D:

LABORATORY: RENISON + MT CYELL

DATE DISPATCHED: 1983

1:250,000 SHEET

TYPE OF SAMPLE: ROCKS

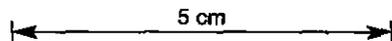
SAMPLE PREP. REQ'D: REQ NO: 0179

ANALYSIS REQ'D:

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES									
			Cu	Pb	Zn	Ag	Au	Sn	LiO ₂	S %		
	<u>GARFIELD VALLEY</u>											
2704	60m above 2703	etc. Bedded tuffaceous sandstone, sericitic, ± 3% py.	20	5900	50	3.5	<0.1	60	10	0.1		
2705	Same loc as 2702	etc. Siliceous, sericitic, tuffaceous sediment ± 1% py. trace sp. gn.	130	90	130	<1	<0.1	10	30	<0.1		
2706	Same loc as 2701	etc. Cherty tuffaceous sediment, 1-2% dissemin + vein pyrite	20	240	230	<1	<0.1	10	20	0.9		
2707	Run above confluence of Flanagan Crk in Garfield River.	Floated. Strongly altered gr - argen schist (after ignimbrite?). 5% fine grained dissemin pyrite	10	220	10	<1	<0.1	10	20	0.6		
2708	Same loc as 2707	Floated. Strongly sericitic v. fine grained vitric tuff ± 5-10% v. fine grained disseminated pyrite.	50	1630	40	<1	<0.1	30	30	8.2		
2709	Line F, creek at 1750m.	Floated. Mod altered felsic - vitric tuff ± 2-3% pyrite.	6	60	40	<1	<0.1	10	10	0.2		
2710	Line F, 1475m.	etc. v. fine grained vitric volcanic (tuff?) ± 1-2% sp (?)	10	20	<10	<1	<0.1	<10	<10	<0.1		
2711	Line F, 1305m.	etc. Black shale - soft - weathered. (1-2m wide of c.)	10	260	10	1	<0.1	10	20	<0.1		
2712	Garfield River, west of bar camp	etc. Mod alt gr - phytic ignimbrite ± minor py, sp, gn.	10	260	250	1	<0.1	<10	20	<0.1		

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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVELO TEAM 1983

PROJECT: TYNDALL EL 9/66 PROSPECT: JUKES-DARWIN

SAMPLE STORAGE REQ'D:

LABORATORY: MT LYELL

DATE DISPATCHED:

1 250.000 SHEET

TYPE OF SAMPLE: ROCK CHIPS

SAMPLE PREP. REQ'D:

ANALYSIS REQ'D: D190

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * Check analyses							
			Cu	Pb	Zn	Ag	Au/FIN	5%		
2764	DARWIN PTY ADIT - EAST DARWIN	2M CHIPS ALTERED RHYOLITIC VOLCANICS WITH	120	20	80	<2	<0.1	0.3		
2765	" " " " " "	PYRITE-CHALCOPYRITE ± MAGNETITE MINERALISATION	240	20	30	<2	<0.1	0.3		
2766	" " " " " "	ALL SAMPLES WITHIN OR ADJACENT TO ZONES	1200	20	90	<2	<0.1	0.2		
2767	" " " " " "	>0.5% Cu IN PREVIOUS INCC OR LYELL	840	20	140	<2	<0.1	0.3		
2768	" " " " " "	SAMPLING. EXACT LOCALITIES SHOWN IN	1250	30	90	<2	<0.1	0.5		
2769	" " " " " "	FIGURE	110	80	90	<2	<0.1	0.3		
2770	PEARCE'S ADIT - EAST DARWIN		2600	40	140	<2	<0.1	3.5		
2771	" " " " " "		440	20	130	<2	<0.1	1.5		
2772	" " " " " "		640	60	80	<2	<0.1	1.7		
2773	" " " " " "		860	40	80	<2	<0.1	2.3		
2774	" " " " " "		290	40	100	<2	<0.1	1.0		
2775	" " " " " "		2700	100	140	<2	<0.1	2.4		
2776	SOUTER'S TOP ADIT - EAST DARWIN		140	360	20	<2	<0.1	1.3		
2777	" " " " " "		50	480	10	<2	<0.1	1.4		
2778	" " " " " "		110	70	10	<2	<0.1	1.2		
2779	" " " " " "		40	340	30	<2	<0.1	1.4		
2780	" " " " " "		40	1500	500	2	<0.1	0.5		
2781	" " " " " "		50	2900	1400	3	<0.1	3.0		
2782	" " " " " "		130	4100	2100	<2	<0.1	1.1		
2783	DILLEN'S LOWER ADIT - EAST DARWIN		4600	500	1500	3	<0.1	3.8		
2784	" " " " " "		680	150	280	<2	<0.1	4.9		
2785	" " " " " "		480	30	180	<2	<0.1	2.2		

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5 cm

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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVIEW TEAM 1983

PROJECT: TYNDALL E.L. 9/66 PROSPECT: HUXLEY

SAMPLE STORAGE REQ'D:

LABORATORY: REVISION & MT LYELL

DATE DISPATCHED:

1:250,000 SHEET:

TYPE OF SAMPLE: Rock.

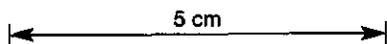
SAMPLE PREP. REQ'D: Reg. N° 0179.

ANALYSIS REQ'D:

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * check analysis							
			Cu	Pb	Zn	Ag	Au	Sn	WO ₃	15%
2651	Breche, 150m d (1974) 1550 ppm Pb.	Sensitized, qtz. phrys. unvelled ignimbrite (?) - grey mineral. ^{trace}	<10	80	30	<1	<0.1	<10	20	<0.1
2652	Mountain - Main south trench	Chert breccia - pyrite.	10	400	970	6	<0.1	<10	20	1.6
2653	- " - main trench	- " -	130	40	10	2	0.1	10	40	6.0
2654	Transverse south of North Knob - ca. 80m south.	Flint - siliceous, sensitized buff. a bit pyrite	70	500	40	8	<0.1	20	20	3.1
2655	- ca. 100m south.	Ocrop - laminated chert buff	100	1180	4660	13	<0.1	20	40	1.4
2656	45 325 # Ag anomaly.	Sensitized schistose buff. hematite after pyrite	30	160	70	1	<0.1	20	20	<0.1
2657	- " - " -	Hematite fine-grained chert buff. - sample band.	70	190	80	8	<0.1	10	30	0.6
2658	West sequence Diglen anomaly.	Ferrous iron gnt.	105	26	430	2	<0.1	40	30	<0.1
2659	Mt. Ellen Au mine	Argillically altered interbed. lava - qtz. vein	10	10	20	1	<0.1	20	30	<0.1
2660	- " -	- " - - - limonite veining	<10	300	40	1	0.2	20	20	<0.1
2661	- " -	25m chip sample along wall of open cut.	<10	160	30	1	<0.1	20	30	<0.1
2662	185 # 2725 # King River Au mine.	Red-orange clay after oxidation. Mn parting.	10	60	40	2	<0.1	10	20	0.2
2663	- " - cut wall of open cut.	- " -	120	30	70	2	<0.1	<10	10	<0.1
2664	300m north Lynch Ch. ^{much}	Silic. hematite, bx. minor lim. after pyrite.	260	50	10	1	<0.1	10	40	<0.1
2665	- " - - pit	Hematite gossam.								

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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

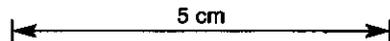
COLLECTED BY: REVIEW TEAM 1983

PROJECT: *FINDLAY EL 9/66* PROSPECT: *HOWARD'S ANOMALY* SAMPLE STORAGE REQ'D:
 1:250,000 SHEET TYPE OF SAMPLE: *Rock & CORE* SAMPLE PREP. REQ'D:

LABORATORY: *LYELL, RENISON* DATE DISPATCHED:
 ANALYSIS REQ: *0190, 0189, 0176* DATE RECEIVED:

SAMPLE NUMBER	LOCATION		DESCRIPTION	ANALYSES * Check analysis.							
				Cu	Pb	Zn	Ag (mg)	Au (FA)	S%	Hg	
2634	<i>Cotter 3 below 21N/20-6N</i>		<i>Flot - grey siliceous 'matrix'</i>	20	40	20	<1	<0.1	<0.1		
2635	<i>'30N pit'</i>	<i>296N 3200'</i>	<i>Pyrite (c. 5%) in ch. fine grained intrusive ag. to sericitised buffaceous sed.</i>	60	490	930	3	<0.1	1.5		
1196	<i>279' in drillhole TYN 3</i>		<i>Light grey hard, siliceous sediment. Trace pe, py.</i>	50	90	40	1	<0.1	<0.1		
1197	<i>At old Tyndall Mine.</i>		<i>Manganese-rich gossanous limonite. West side of creek</i>	40	60	70	2	<0.1	<0.1		
1198	<i>Line 24N, 2955W-3650W in Newton Creek</i>		<i>Qz - sericite - pyrite schist - brecciated with minor chalcocite quartz veining.</i>	30	40	20	<1	<0.1	2.4		
1199	<i>Same location as 1198</i>		<i>Qz - sericite - pyrite schist - highly altered and pyritic, brecciated volcanic.</i>	140	160	260	2	<0.1	3.0		
1200	<i>Line 197N 1350W</i>		<i>Flot. Hematite-silica rock (matrix-like)</i>	20	70	160	<1	<0.1	0.2	<1	
2686	<i>DELLUCE HA2</i>		<i>Pyrite, chloritized sphalerite and top.</i>	60	150	270	<2	<0.1	0.8		
2687	"	"	"	60	70	250	<2	<0.1	0.9		
2688	"	"	"	70	110	400	<2	<0.1	1.1		
2689	"	"	"	60	200	850	<2	<0.1	2.7		
2690	"	"	"	120	70	240	<2	<0.1	1.8		

556242



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVIEW TEAM 1983

PROJECT: TYNDALL EL 9/66 PROSPECT: HOWARD'S ANOMALY.

SAMPLE STORAGE REQ'D:

LABORATORY: FOX (SYDNEY)

DATE DISPATCHED:

1:250,000 SHEET:

TYPE OF SAMPLE: CORE

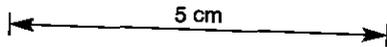
SAMPLE PREP. REQ'D:

ANALYSIS REQ 0186, 0187

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * Check analysis.									
			Cu	Pb	Zn	Ag	Au	(ACID DIGESTION + DCP FINISH)				
185-190'	DRILLHOLE HA 3							0.013				
190-195'	" "							0.031				
195-200'	" "							<.005				
335-340'	" "							<.005				
196-198m	DRILLHOLE HA 4							<.005				
198-200m	" "							<.005				
204-206m	" "							<.005				
206-208m	" "							<.005				
66-68m	DRILLHOLE HA 5							<.005				
68-70m	" "							0.060				
70-72.2m	" "							0.063				
72.2-74.6m	" "							0.048				
92.5-94.4m	DRILLHOLE HA 6							0.033				
94.4-97m	" "							0.044				
97-98.5m	" "							0.044				
98.5-100m	" "							0.009				

556243



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVIEW TEAM 1983

PROJECT: TYNDALL EL 9/66 PROSPECT: HOWARD'S ANOMALY

SAMPLE STORAGE REQ'D:

LABORATORY: FOX, SYDNEY

DATE DISPATCHED:

1:250,000 SHEET:

TYPE OF SAMPLE: ROCKS

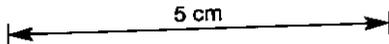
SAMPLE PREP. REQ'D:

ANALYSIS REQ: 0186,

DATE RECEIVED:

SAMPLE NUMBER	LOCATION			DESCRIPTION	ANALYSES * Check analysis				
					Cu	Pb	Zn	Ag	Au (acid digestion + ICP Finish)
30719	LINE 20-2N	P1T							<0.005
30720	"	"	"						<.005
30721	"	"	"						0.008
30774	"	"	"						<.005
30775	"	"	"						<.005
30776	"	"	"						0.006
30905	"	"	"						<.005
30906	"	"	"						0.007
30907	"	"	"						0.008
30908	"	"	"						0.005
30909	"	"	"						<.005
30910	"	"	"						0.007

556244



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: *REVIEW TEAM*
 DATE DISPATCHED: *1983*
 DATE RECEIVED:

PROJECT: *TYNDALL EL 9/66*
 1:250,000 SHEET:

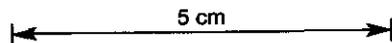
PROSPECT: *BAKIN LAKE*
 TYPE OF SAMPLE: *ROCK, DRILL CORE*

SAMPLE STORAGE REQ'D:
 SAMPLE PREP. REQ'D: *REQ Nos. 0176, 0186*

LABORATORY: *RENISON, LYELL FOX (NSW)*
 ANALYSIS REQ'D:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES							
			Cu	Pb	Zn	Ag (ppm)	Au (Pt)	S %		
0528	L30S 3550E	float: pyritic hornblende felsic(?) volc. lt gm	50	260	50	1	<0.1	0.3		
0529	≈ L30S 1500E rd to coast	of black shale est 2% vein/frac py	90	860	1880	1	<0.1	1.7		
0530	just N TYN 2m Brookshaw's Rd	of qtz-ser py schists (ignimbrite?) 3-5% dissem py chip sample selected over ≈ 20m	90	130	410	1	<0.1	4.1		
BL4	63.3 - 70.0m	reassay core pulps pyritic andesites & epiclastics						0.041		
	70.0 - 71.6m	"						0.014		
	71.6 - 72.9m	"						0.005		
	72.9 - 74.5m	"						0.012		
	214.6 - 216.5m	" pyritic shales & tuffaceous sediments						0.005		
	216.5 - 218.5m	"						<0.005		
	218.5 - 221.0m	"						<0.005		
	221.0 - 223.0m	"						0.051		
	223.0 - 225.6m	"						0.012		
	241.0 - 244.0m	" hornblende porphyry, minor fgd kiffs						<0.005		
	244.0 - 247.0m	"						<0.005		
	247.0 - 250.0m	"						<0.005		

556245



GOLD FIELDS EXPLORATION PTY. LTD.

PROJECT *TYNDALL EA 9/66* PROSPECT: *BEATRICE*
 1:250,000 SHEET: TYPE OF SAMPLE:

SAMPLE RECORD AND ANALYTICAL DATA SHEET

SAMPLE STORAGE REQ'D:
 SAMPLE PREP. REQ'D: *REQ N° D181*

LABORATORY: *MT. LYELL + RENISON*
 ANALYSIS REQ'D:

COLLECTED BY: *G.P. M.J. FF. R.P.*

DATE DISPATCHED:

DATE RECEIVED:

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SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES								
			Cu	Pb	Zn	Ag (Au)	Au (Ag)	S	Ag (FA)	Sn	WO ₃
0527	L18N 1920E S.M. cl to S 250m	massive chloritized fgd volcanic with minor py blebs assoc. with qtz-chl veins	60	80	230	NIL	NIL	1.4%	0.3		
2582	L18N ~ 1100W	Quartz veins with hem. limonite, in qtz-porphyr.	190	20	40	NIL	<0.1	<0.1%	0.1		
2583	L18N ~ 300W	Charly tuffaceous sediment 1-2% py.	90	40	70	NIL	<0.1	1.3%	0.2		
2584	Beatrice dome L18N -150E	Hem.-mt. veins - chip sample	190	40	40	NIL	<0.1	<0.1%	0.3		
2585	as above	Fracture controlled chlorite zones in dome	280	30	220	NIL	<0.1	0.3%	0.6		
2586	12.50N / 2000W	Flow banded rhyolite - trace py, sp, gn.	70	540	1100	NIL	<0.1	1.6%	1.6		
2587	L18N 1950E	Med. gr. s.l. ch. and volc 1-2% sp + py	90	380	5900	NIL	<0.1	1%	1.0		
2588	L18N 1950E	as above but with disc. + fact. py + sp.	100	820	3100	2	<0.1	2.6%	1.7		
2713	1250N / 2000W chopper pad	qtz siliceous lava (rhyolite) ± 1-2% sp-gn, minor py	20	7000	930	6	<0.1	1.2%		40	10
2714	10m from above	qtz siliceous rhyolite ± 2-3% py + minor sp-gn.	<10	600	90	2	<0.1	0.9%		10	10
2715	100m west of pad	qtz flow banded rhyolite ± gossans hematite qtz sulphides	10	60	90	1	<0.1	<0.1%		10	20
2716	150m north of pad.	qtz quartz veins up to 15cm in rhyolite	<10	40	20	<1	<0.1	<0.1%		<10	<10
2717	the creek 250m north of pad	qtz. Hard, v. fine grained vitric ash or lava. Chlorite 'sp'.	<10	1300	130	1	<0.1	<0.1%		<10	20
2718	60m east of pad.	qtz. Quartz veins in dome lava - veins have 'comb' structure and are wiggly.	20	90	20	<1	<0.1	<0.1%		10	<10
2719	At chopper pad 1250N / 2000W.	qtz v. fine grained vitric + silic. rhyolite lava (?) ± 1-2% pyrite	<10	110	20	<1	<0.1	0.3%		10	<10

556246

5 cm

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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: REVIEW TEAM 1983

PROJECT: TYNDALL EL 9/66. PROSPECT: WEST SEDGWICK

SAMPLE STORAGE REQ'D:

LABORATORY: MT LYELL

DATE DISPATCHED:

1:250,000 SHEET:

TYPE OF SAMPLE: ROCK, STREAM SED, SOIL, DRILL CORE

SAMPLE PREP. REQ'D: REQ Nos 0207, 0208, 0210

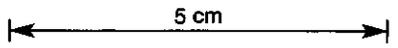
ANALYSIS REQ'D:

DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES						
			Cu	Pb	Zn	Ag(ppm)	Au(g/t)	S	As(g/t)
0526	L 96S 900E (3NGRID EXTN)	red-brown heavily oxidized rock with much MnO ₂ /Fe ox of: probable original rock: andesitic tuff (soil geochem anomaly)	150	890	460	NIL	NIL	<0.1%	0.1
1151	100m E 81600E 46925N (Lyell Mine Grid)	of: Black MnO ₂ wash coating Devon Conglomerate boulders in creek	50	70	230	NIL	<0.1	0.3%	<0.1
1152	81600E 46750N - upstream 25m	of: schistose, felsic, sericitic waterlain tuff with 1-2% py.	30	180	60	NIL	NIL	0.4%	<0.1
1153	81600E 46750N - 30m downstream	Stream sediment: below junction of several small creeks here	30	120	180	<2	<0.1		
1154	81600E 46750N	of: Pyritic brecciated volcanic & pyritic matrix. 10% py	150	460	50	5	NIL	12.3%	5.7
1155	81600E 46500N	Rock float: Banded gossanous siliceous rock	70	30	100	NIL	NIL	0.4%	0.2
1156	Spur 300m east of Agglomerate Hill	of: Ultrabasic, limonitic, schistose ignimbrite (?) block stockwork	50	20	140	NIL	NIL	0.4%	<0.1
1157	Spur 200m east of Agglomerate Hill	of: Mod. sericitic, schistose vitric tuff. Minor pyrite.	80	40	60	NIL	NIL	1%	0.2
1158	Spur 150m east of Agglomerate Hill	of: Pyritic fine grained, possible ignimbrite. Py eyes	40	20	20	NIL	NIL	0.5%	<0.1
1159	Spur 50m east of Agglomerate Hill	of: Semi-massive pyrite, incl fragments of qtz-eye volcanics	360	290	90	2	NIL	19.8%	0.7
1160	Agglomerate Hill summit	of: Andesite - minor disseminated and veined py. Trace up	50	20	40	NIL	<0.1	1.7%	<0.1
2579	Line 96S 1000E (SW GRID)	Soil: B horizon, 20cm, yellow-brown. Rock float: Cherty tuff	90	1150	180	<2	<0.1		
2580	Line 96S 950E (" ")	Soil: B horizon, 25cm, yellow-brown. Rock float: Siliceous	60	550	130	<2	<0.1		
1143	Progressed (unmarked) drill site ca. 845 950E	of: Shale - sericitic alt., minor py	30	130	30	1	<0.1	0.5%	
1144	84N adj. to Hwy road	of: Black shale - no alteration - trace py	90	100	20	2	<0.1	0.5%	
1145	NE pyrite zone ca. 10N	of: Sericitic schistose tuff. pyrite ~ 2%	220	30	20	1	0.2	0.3%	
1146	" "	of: as above. pyrite ~ 5%	40	110	90	1	<0.1	3.0%	
1147	" "	of: as above. 2-3% pyrite	90	70	120	1	<0.1	0.6%	
1148	750N UPPER HULLAGE pyrite zone	of: Siliceous seric. pyritic schistose tuff	10	30	110	1	<0.1	0.8%	
1149	" 100-1000N	of: Composition random chip - pyritic tuff	30	110	180	1	<0.1	1.6%	
1150	HULLAGE ROAD	of: Bx - carbonate fragments. trace py. Sn	80	380	1760	1	<0.1	0.2%	
2572	NS 3 192.8 - 100m	of: Volcaniclastic rock. ~ 2-3% dissemin. py.	1700	140	190	3	<0.1	2.1%	2.7

556247

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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: *Review Team 1983*
 DATE DISPATCHED:
 DATE RECEIVED:

PROJECT: *TYNDALL EL 9/66* PROSPECT: *DORA-SPICER*
 1:250,000 SHEET TYPE OF SAMPLE: *ROCK*

SAMPLE STORAGE REQ'D: LABORATORY: *LYELL, RENISON*
 SAMPLE PREP. REQ'D: *REQ Nos. 0176, 0186* ANALYSIS REQ'D: *For (NSW)*

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * check assay								
			Cu	Pb	Zn	Ag(AAS)	Au(AA)	S	Sn	WO ₂	As(AA)
1161	80m N L12S / 2320m E	o/c: Qtz-phyric volcanics with mag-hem-gn-chlorite	7800	2300	920	7	<0.1	0.1%			5
1162	trench 80m S of 1685/2240m E	o/c: Massive, locally brx fgd lava dome with dissem- massive py-asp-chalocite, veins chlorite minor gn.	2100	560	180	15	0.1	15%			11
1163	shaft/trench 50m S 144S/2040 E	o/c: Chloritic Qtz-phyric lava - 3% py, minor sp, covellite	9100	170	380	11	0.3	2.1%			8
1164	shaft 30m S 140S/2080m E	o/c: Qtz-phyric lava, crumble brx 1-2% py-cpy chloritic, foliated	6500	560	1100	9	0.3	0.9%			6
1165	shaft/trench 30m S 136S/2060m E	o/c: Qtz-phyric lava? minor lithics, minor py-cpy-mag possible thalocrosite	1.03%	770	1800	21	0.4	1.3%	30	490	17
1166	trench L120S 1800' W	o/c: Qtz-phyric lava, northedge flow dome, 3% py-gn- sp-malachite, chloritic	5000	2.3%	5.5%	115	0.8	17.7%			97
1167	workings L114S 1000' W	o/c: Chloritic lava, 5-10% py	6.23%	4900	3800	149	2.0	13.7%			152
27324	trench 148S/2040 E } same loc	o/c: chloritic Qtz-phyric lava, py-cpy					0.065				
27342	1163	o/c: high graded above mineralization					0.066				

556249

5 cm

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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: ROYEN TEAM 1983

PROJECT: TYNDALL EL 9/66

PROSPECT: WEST TYNDALL

SAMPLE STORAGE REQ'D:

LABORATORY: RENISON, LYELL

DATE DISPATCHED:

1:250,000 SHEET:

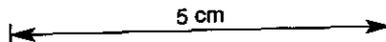
TYPE OF SAMPLE: ROCKS + SOILS

SAMPLE PREP. REQ'D: REG Nos 179, 191, 192 ANALYSIS REQ'D:

DATE RECEIVED:

SAMPLE NUMBER	LOCATION		DESCRIPTION	ANALYSES							
				Cu	Pb	Zn	Ag	Au	S %	Sn	WO ₂
0545	L12N 1150E	(rect) rd	ofc: basic tuff, med mag, py, slightly calcareous	290	420	160	2	<0.1	<0.1	20	20
0546	L12N 1305E	"	ofc: dark fgd sed. minor tuff bands, sl. graphitic	100	40	110	1	<0.1	<0.1	10	20
0547	L12N 1400E	8m. ck "	float: mica sandst, interbedded shale, minor py	40	1100	70	2	<0.1	0.2	20	20
0548	L12N 1460E	"	ofc: dark siliceous brx (chert?) qtz+Feox veins (Au?)	60	90	70	1	<0.1	0.3	20	20
0549	L12N 1460E	"	ofc: dark cherty shale? med py (Au?)	110	50	150	1	<0.1	<0.1	10	40
0550	L12N 1510E	"	float: MnOx gossanous shale	110	60	150	2	<0.1	<0.1	<10	20
0567	L12N 1500-1540E	"	float: white blk shale + dk cherty rock, common FeOx	40	110	60	1	<0.1	0.1	10	20
0568	L16N ≈ 5000'E	(no page)	float: basic igneous (dolerite?) contact fgd sed - str mag	30	50	50	1	<0.1	0.2	30	10
0569	L16N ≈ 5100'E	"	float: dk fgd sed. med-str mag, much MnOx wood	60	100	70	1	<0.1	0.2	10	30
0570	L16N ≈ 4925'E	"	float: gray fgd sed. med mag, dk qtz + ? dk min veins (Au?)	50	40	90	2	<0.1	0.2	10	20
2760	L12N 1375E		ofc: micaceous siltst, tuff greywacke, minor dk chert, sl. py	195	140	130	1			90	10
2761	L12N 1525E		ofc: dk gray chert, siltst, dissem/frac py <1%	80	50	140	1			<10	<10
2763	L12N 1550E	small pits	ofc: interbedded chert-black siltst, up to 10% py veinlets	120	450	140	2			<10	20
2762	L12N 1525E		soil: B horizon, Mn rich							10	20

556252



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GOLD FIELDS EXPLORATION PTY. LTD.

SAMPLE RECORD AND ANALYTICAL DATA SHEET

COLLECTED BY: 1983 REVIEW TEAM

PROJECT TYNDALE EL 9/86
1:250,000 SHEET:

PROSPECT HENTY-YOLANDE
TYPE OF SAMPLE EXCS, STREAM
SEDIMENTS

SAMPLE STORAGE REQ'D:
SAMPLE PREP REQ'D: REP N°: 0179, 0180

LABORATORY RENISON,
MT LYELL
ANALYSIS REQ'D:

DATE DISPATCHED:
DATE RECEIVED:

SAMPLE NUMBER	LOCATION	DESCRIPTION	ANALYSES * Check analysis							
			Cu	Pb	Zn	Ag	Au	Sn	WO ₃	S
0587	E shaft Madam Howards (airport) Au workings	o/c qtz vein + Feox along min. structure in siltst.	<10	20	<10	1	<0.1	<10	10	<0.1
0588	track to N (= 300m) from Madam Howards Au workings	chip sample 20m blk shale - grey siltst	30	50	60	1	<0.1	30	20	0.1
0589	Quarry ≈ 500m NE Stn airport	o/c qtz veins + Feox in Siluro-Devonian fossil siltst.	<10	20	<10	1	<0.1	<10	<10	<0.1
0590	Madam Howards Plains Ba vein.	o/c barite vein (minor qtz) - Au min?	<10	<10	<10	1	<0.1	40	290	10.7
0591	Powerline Porph - L Margaret Rd	chip sample 15m weath. qtz-feld intermed(?) porph.	20	140	40	2	<0.1	<10	10	<0.1
0592	Powerline Porph - Km 3 0591	chip sample 3 pale alteration zones in porph.	20	20	50	1	<0.1	10	10	<0.1
0593	stream 90m N Yolande bridge	check stream sed 2779 for 300ppm Zn o/c sed	<10	10	10	<1	<0.1			
0594	Pearl Creek abt 2528 site (trib)	stream sed: float 30% veins, 60% shale/siltst. 10% qtz	<10	50	<10	<1	<0.1			
0595	Pearl Creek above 27528 main	stream sed: float 75% siltst 25% vein qtz	20	40	20	<1	1.6			
0596	Pearl Creek 100m down 0595	o/c graphitic fossil. siltst. (Eldon) minor py	20	40	40	1	<0.1	20	10	0.3
0597	Pearl Creek at 0595 site	o/c 25m chip across strike grey siltstone	20	40	40	1	<0.1	<10	30	<0.1
0598	Pearl Creek ≈ 300m down 0596	o/c chip sample Pearl Cr fault: contact siltst./veins no veins qtz in fault, minor qtz in veins with py	30	160	30	<1	<0.1	<10	10	<0.1
0599	Pearl Creek ≈ 25m down 0595	o/c blk siltst., scattered carb. sandst. 1% py	30	50	70	1	<0.1	<10	20	0.3
0600	Pearl Creek at 27586 site	stream sed: over dk shales/siltstones	100	40	40	<1	<0.1			
2665A	Pearl Creek near 27585 site trib	stream sed: float 50% qtz vein, 10% veins, 10% sed	60	<10	20	<1	<0.1			
2666	Pearl Creek 100-300m down 0600	o/c chip samples 30-60m apart; blk siltst/feld	50	60	60	<1	<0.1	10	10	0.1
2668	Princess Creek Au workings adit portal	o/c Sericite shale - mudstone	<10	430	20	1	<0.1	<10	10	<0.1
2667	Princess Creek Ba open cut ridge top	o/c qtz vein in Eldon Gp sandstone	30	10	<10	<1	<0.1	10	<10	<0.1
2669	Diamond Hill Au adit 2 dump	qtz vein minor Feox	23	60	<10	<1	0.1	10	10	<0.1
2670	Diamond Hill Au adit 1 dump	qtz vein material	<10	55	10	<1	<0.1	<10	<10	0.3
2671	Diamond Hill Au adit 2 portal	qtz vein 5-10cm thick in qtz-feld porphyry	<10	100	20	4	<0.1	10	<10	<0.1

256253

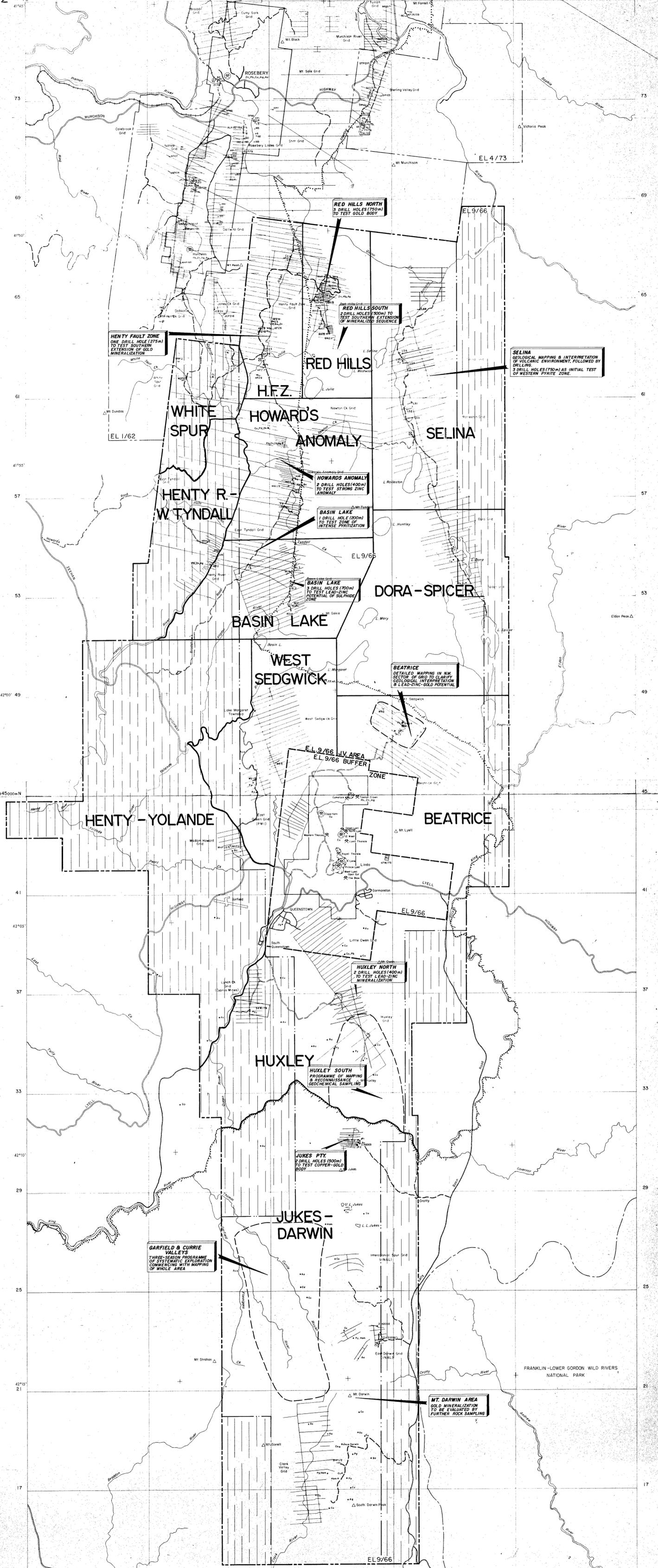
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21.	DORA-SPICER	Interpretted Geology	1:5,000
22.	WHITE SPUR	Anomaly Compilation	1:6,000
23.	HENTY RIVER - WEST TYNDALL	Interpretative Geology and Geophysical Anomalies	1:5,000
24.	HENTY-YOLANDE	Stream Sediments: Cu,Pb,Zn,Au	1:5,000

Index card at Back of Report



LEGEND

- Main Road
- Vehicular Track
- River, Creek
- Railway, (abandoned)
- E.L. Boundary
- M.L. Boundary
- Prominent Peak
- Major Mine Working
- Major Mine Abandoned
- Old Workings, Mineral Occurrence
- Alluvial Workings
- Drill Hole
- Exploration Camp

Scale: 1:50,000

556256

GOLDFIELDS - G.O.D.L. JV

TYNDALL E.L.9/66

REVIEW AREAS 1983

SHOWING RECOMMENDED FURTHER WORK & PROPOSED REDUCED E.L.

Drawn J.P. May 1983

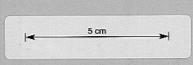
6312

FIG. 2

GRID DENOTES 1:50000 MAP SERIES BASED ON 1000 METRE INTERVALS OF AUSTRALIAN MAP GRID ZONE 55



- LEGEND**
- Geographical Boundary - Definite
 - - - Geographical Boundary - Uncertain
 - - - Fault
 - - - Fault inferred
 - - - Boundary of Glacial Cover
 - - - Shoreline of proposed hydro lake
 - ▨ IP Anomalies North of 104N - Gradient Array Anomalies as defined by 30m sec contour
 - ▨ IP Anomalies South of 104N - Pole-Dipole Anomalies as defined by 25m sec contour
 - Pb Isotope Rock Sample Location
 - x 172 Rock Samples taken by 1983 Review Team



Geology: from 1983 Review Team observations and modifications of earlier Mt Selina mapping.

556257 390000mE

GOLD FIELDS EXPLORATION PTY. LIMITED

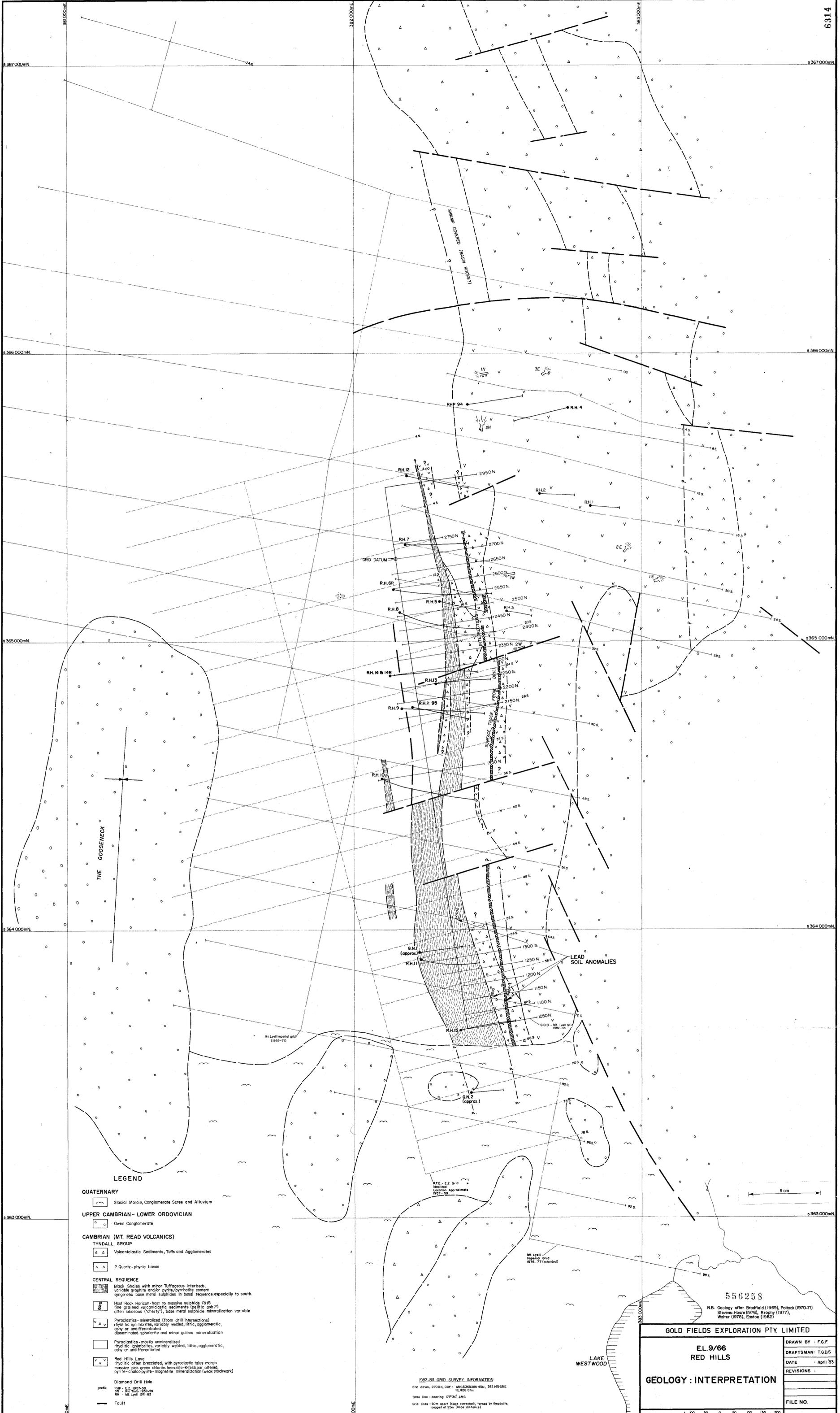
E.L. 9/66
SELINA

**INTERPRETATIVE GEOLOGY
SHOWING MINERALIZED ZONES**

SCALE 1:10000

DRAWN BY: J.G.P.
DRAFTSMAN: T.G.D.S.
DATE: June 93
REVISIONS:
FILE NO.
FIG. 3

EL 9/66



- LEGEND**
- QUATERNARY**
- Glacial Morain, Conglomerate Scree and Alluvium
- UPPER CAMBRIAN - LOWER ORDOVICIAN**
- Owen Conglomerate
- CAMBRIAN (MT. READ VOLCANICS)**
- TYNDALL GROUP**
- Volcaniclastic Sediments, Tufts and Agglomerates
 - ? Quartz - phytic Lavas
- CENTRAL SEQUENCE**
- Black Shales with minor Turfaceous Interbeds, variable graphite and/or pyrite/cyrrhite content syngenetic base metal sulphides in basal sequence, especially to south.
 - Heat Rock Horizon - host to massive sulphide RH5 (fine grained volcanoclastic sediments (pelitic ash?) often siliceous (cherty), base metal sulphide mineralization variable)
 - Pyroclastics - mineralized (from drill intersections) rhyolitic ignimbrites, variably welded, lithic, agglomeratic, sandy or undifferentiated disseminated sphalerite and minor galena mineralization
 - Pyroclastics - mostly unmineralized rhyolitic ignimbrites, variably welded, lithic, agglomeratic, sandy or undifferentiated.
 - Red Hills Lava rhyolitic often brecciated, with pyroclastic talus margin massive pink-green chlorite-hematite-K-feldspar altered, pyrite - chalcocopyrite - magnetite mineralization (weak stockwork)
- Diamond Drill Hole**
- pref. - E.Z. 1967-69
 - RH - Mt. Read 1958-69
 - RH - Mt. Read 1971-83
- Fault**

R82-83 GRID SURVEY INFORMATION

Grid datum, 2700N, 00E; AMG 200320-45N, 382 145-08E
 N 32.2 07m

Base line bearing 177°30' AMG

Grid lines 50m apart (slope corrected), turned by theodolite, staked at 25m (slope distance)

556258

N.B. Geology after Bradford (1969), Pollock (1970-71) Stevens-Hoare (1976), Stophy (1977), Walter (1978), Eastoe (1982)

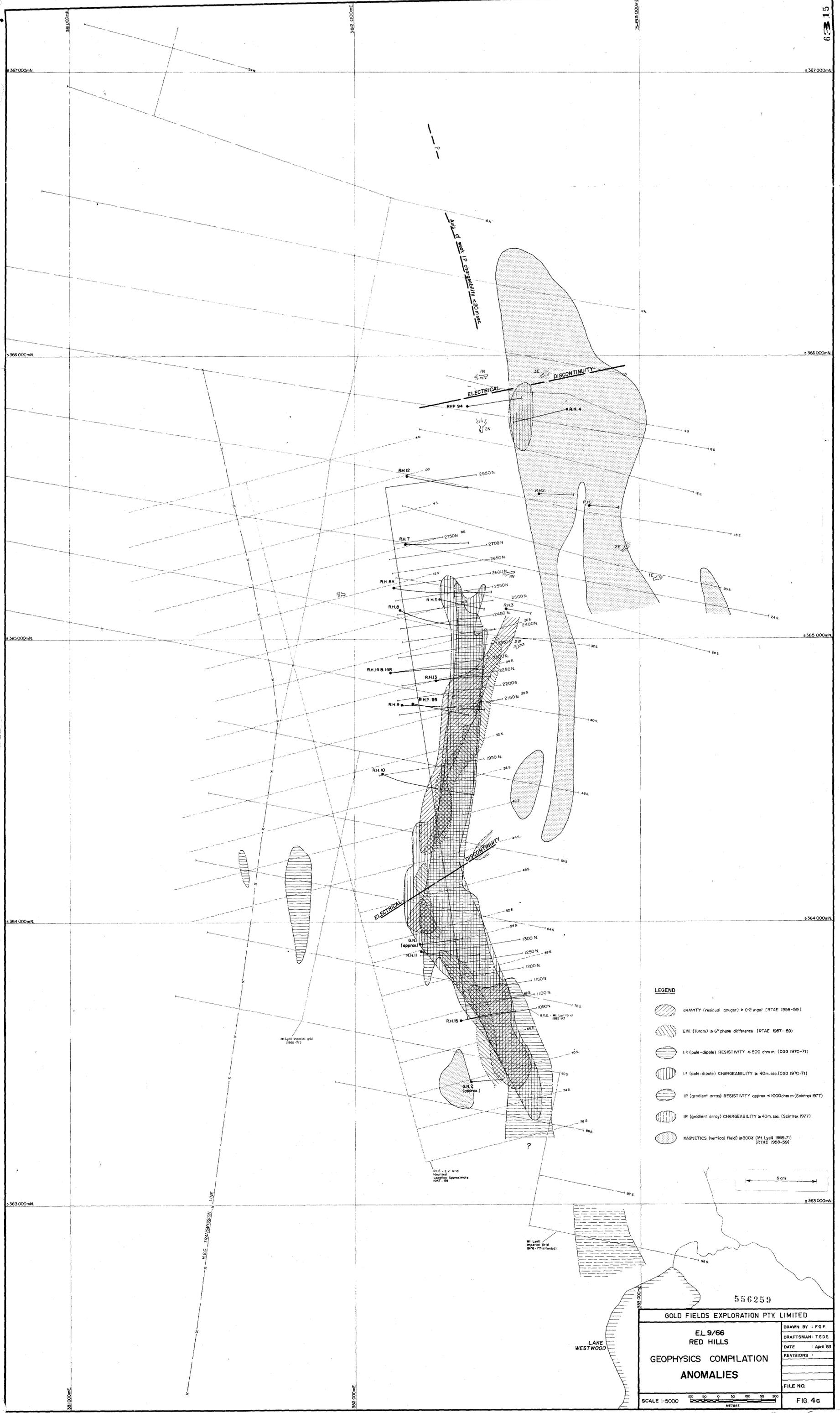
GOLD FIELDS EXPLORATION PTY. LIMITED

**EL.9/66
RED HILLS**

GEOLOGY: INTERPRETATION

SCALE 1:5000

DRAWN BY: F.G.F.
 DRAFTSMAN: T.G.D.S.
 DATE: April 83
 REVISIONS:
 FILE NO.
 FIG. 4



- LEGEND**
- GRAVITY (residual bouger) $\geq 0.2 \text{ mgal}$ (RTAE 1958-59)
 - EM (Turam) $\geq 6^\circ$ phase difference (RTAE 1957-59)
 - IP (pole-dipole) RESISTIVITY $\leq 500 \text{ ohm m.}$ (CGG 1970-71)
 - IP (pole-dipole) CHARGEABILITY $\geq 40 \text{ m. sec.}$ (CGG 1970-71)
 - IP (gradient array) RESISTIVITY approx. = 1000 ohm m (Scintrex 1977)
 - IP (gradient array) CHARGEABILITY $\geq 40 \text{ m. sec.}$ (Scintrex 1977)
 - MAGNETICS (vertical field) $\geq 800 \gamma$ (Mt. Lyell 1969-71) (RTAE 1958-59)

556259

GOLD FIELDS EXPLORATION PTY. LIMITED

EL. 9/66
RED HILLS

GEOPHYSICS COMPILATION
ANOMALIES

SCALE 1:5000

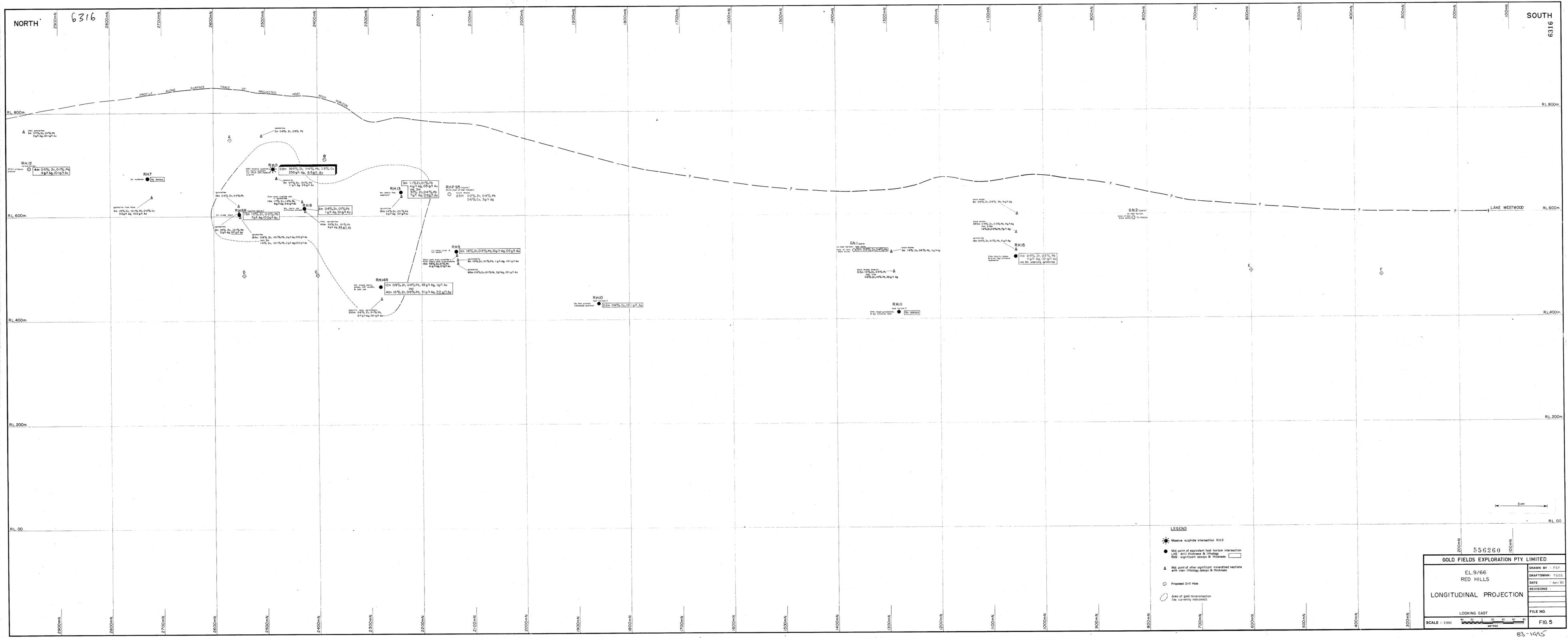
0 50 100 150 200 METRES

5 cm

LAKE WESTWOOD

DRAWN BY	F.G.F.
DRAFTSMAN	T.G.D.S.
DATE	April '83
REVISIONS	
FILE NO.	

FIG. 4a



NORTH 6316

SOUTH 6316

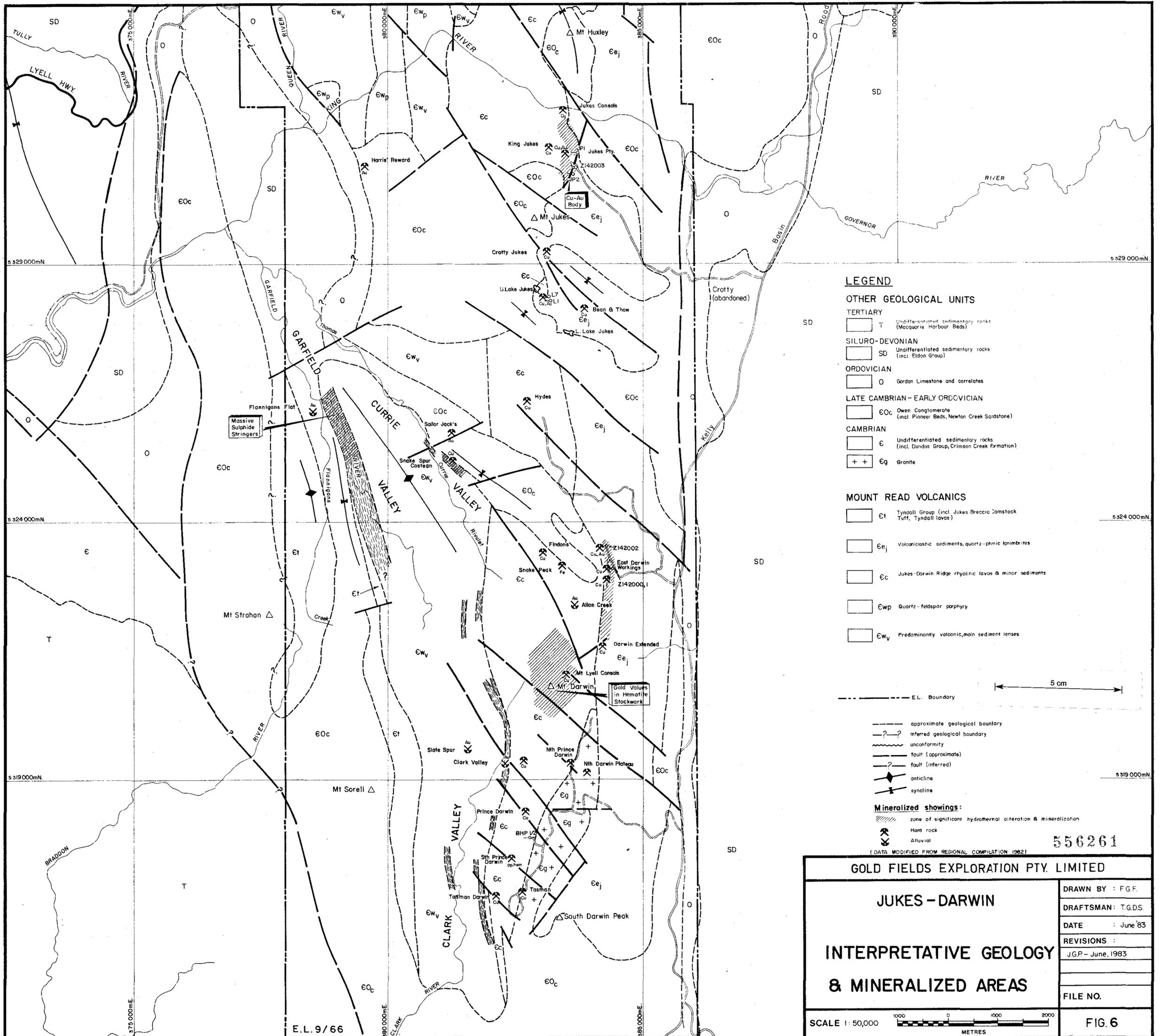
PROFILE ALONG SURFACE TRACE OF PROJECTED HOST ROCK HORIZON

LAKE WESTWOOD

LEGEND

- ☀ Massive sulphide intersection RH15
- Mid point of equivalent host horizon intersection
LHS - drill thickness & lithology
RHS - significant assays & thickness
- ▲ Mid point of other significant mineralized sections with main lithology, assays & thickness
- Proposed Drill Hole
- ◌ Area of gold mineralisation (as currently indicated)

556260	
GOLD FIELDS EXPLORATION PTY. LIMITED	
EL.9/66 RED HILLS	
LONGITUDINAL PROJECTION	
LOOKING EAST	
SCALE 1:2000	FILE NO. FIG. 5



LEGEND

- OTHER GEOLOGICAL UNITS**
- TERTIARY**
 T Undifferentiated sedimentary rocks (Macquarie Harbour Beds)
- SILURO-DEVONIAN**
 SD Undifferentiated sedimentary rocks (incl. Eldon Group)
- ORDOVICIAN**
 O Gordon Limestone and correlatives
- LATE CAMBRIAN - EARLY ORDOVICIAN**
 EOc Owen Conglomerate (incl. Pioneer Beds, Newton Creek Sandstone)
- CAMBRIAN**
 E Undifferentiated sedimentary rocks (incl. Dundas Group, Crimson Creek Formation)
 ++ Eg Granite

- MOUNT READ VOLCANICS**
- Et Tyndall Group (incl. Jukes Breccia Damstock Tuff, Tyndall lavas)
- Eej Volcaniclastic sediments, quartz-phiric ignimbrites
- Ec Jukes-Darwin Ridge rhyolitic lavas & minor sediments
- Ewp Quartz-feldspar porphyry
- Ewv Predominantly volcanic, main sediment lenses

- 5 cm
- E.L. Boundary
- approximate geological boundary
 -?- inferred geological boundary
 ~~~~~ unconformity  
 - - - fault (approximate)  
 - - - fault (inferred)  
 ^ anticline  
 v syncline

- Mineralized showings:**
- zone of significant hydrothermal alteration & mineralization
- Hard rock
- Alluvial

556261

(DATA MODIFIED FROM REGIONAL COMPILATION 1982)

**GOLD FIELDS EXPLORATION PTY. LIMITED**

**JUKES - DARWIN**

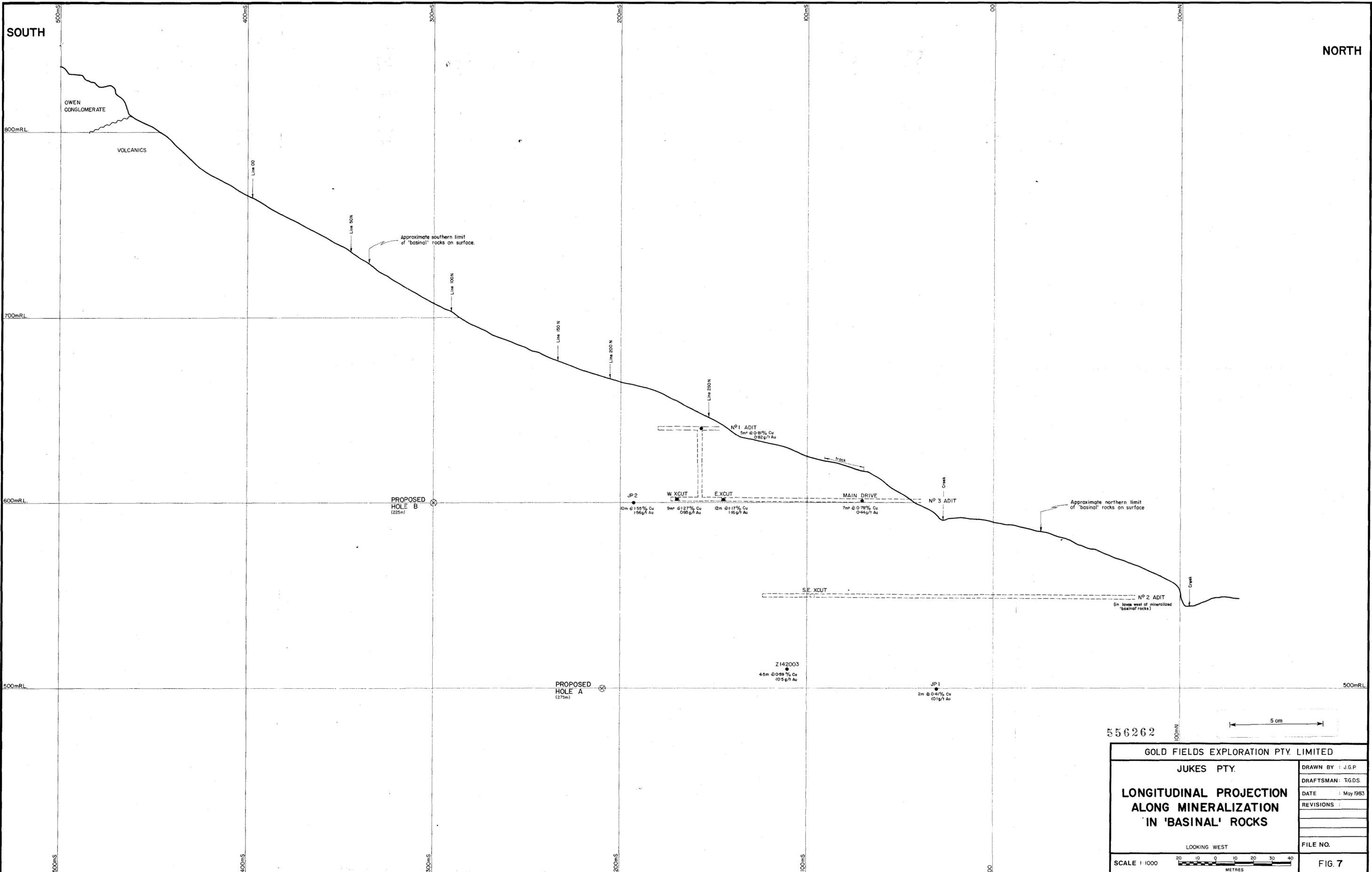
**INTERPRETATIVE GEOLOGY  
& MINERALIZED AREAS**

DRAWN BY : F.G.F.  
 DRAFTSMAN : T.G.D.S.  
 DATE : June '83  
 REVISIONS :  
 JGP - June, 1983  
 FILE NO.

SCALE 1:50,000

1000 0 1000 2000  
 METRES

FIG. 6



556262

|                                                                                |          |
|--------------------------------------------------------------------------------|----------|
| GOLD FIELDS EXPLORATION PTY. LIMITED                                           |          |
| JUKES PTY.                                                                     |          |
| <b>LONGITUDINAL PROJECTION<br/>ALONG MINERALIZATION<br/>IN 'BASINAL' ROCKS</b> |          |
| DRAWN BY : J.G.P.                                                              | FILE NO. |
| DRAFTSMAN : T.G.D.S.                                                           | FIG. 7   |
| DATE : May 1983                                                                |          |
| REVISIONS :                                                                    |          |

ADIT NO. 2  
Main Drive

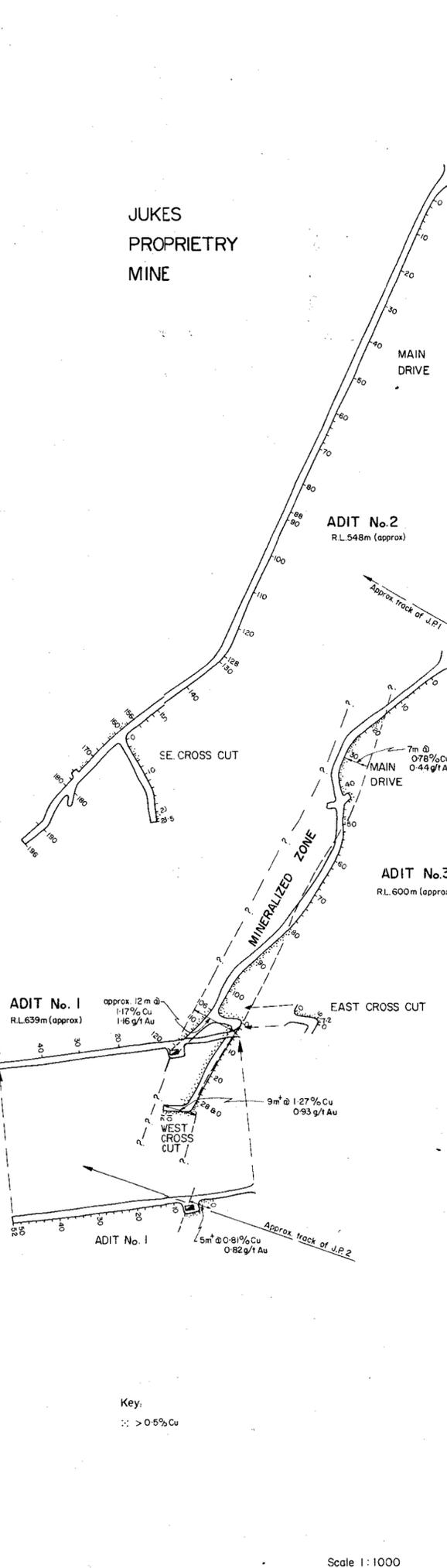
| m       | Cu    | Pb   | Zn  | Ag | S%  | Mn    | Au  | Ag  |
|---------|-------|------|-----|----|-----|-------|-----|-----|
| 0-10    | 960   | 20   | 130 | -  | 0.2 | 300   | -   | 0.2 |
| 10-20   | 830   | 30   | 70  | -  | -   | 160   | -   | 0.4 |
| 20-30   | 480   | 30   | 80  | -  | 0.1 | 220   | -   | 0.1 |
| 30-40   | 980   | 30   | 140 | -  | 1.9 | 290   | -   | 0.3 |
| 40-50   | 250   | 10   | 70  | -  | 0.1 | 330   | -   | -   |
| 50-60   | 310   | 110  | 80  | -  | 0.4 | 410   | -   | 0.1 |
| 60-62   | 370   | 80   | 80  | -  | 0.6 | 470   | -   | 0.3 |
| 62-64   | 310   | 40   | 120 | -  | 0.9 | 2200  | -   | 0.4 |
| 64-66   | 760   | 20   | 120 | -  | 0.7 | 1600  | -   | 0.2 |
| 66-68   | 2200  | 20   | 110 | -  | 1.1 | 1700  | -   | 0.6 |
| 68-70   | 900   | 20   | 100 | -  | 0.5 | 1800  | -   | 0.2 |
| 70-80   | 1700  | 30   | 100 | -  | 0.5 | 2100  | -   | 0.3 |
| 80-88   | 320   | 10   | 80  | -  | 0.6 | 2100  | -   | -   |
| 88-90   | 1750  | 20   | 90  | -  | 2.6 | 2700  | -   | 0.4 |
| 90-100  | 150   | 20   | 90  | -  | 0.2 | 1300  | -   | -   |
| 100-110 | 470   | 10   | 90  | -  | -   | 1000  | -   | -   |
| 110-120 | 300   | 10   | 90  | -  | -   | 700   | -   | -   |
| 120-130 | 680   | 10   | 100 | -  | 0.2 | 640   | -   | 0.1 |
| 130-140 | 590   | 20   | 80  | -  | -   | 500   | -   | -   |
| 140-150 | 620   | 20   | 130 | -  | 0.5 | 940   | -   | 0.2 |
| 150-152 | 520   | 20   | 120 | -  | 0.1 | 950   | -   | -   |
| 152-154 | 4800  | 20   | 140 | -  | 0.4 | 780   | -   | 0.3 |
| 154-156 | 800   | 10   | 110 | -  | 0.5 | 610   | -   | 0.2 |
| 156-158 | 1000  | 40   | 110 | -  | 0.1 | 890   | -   | -   |
| 158-160 | 2.40% | 7000 | 400 | 35 | 3.2 | 3300  | 1.7 | 2.9 |
| 160-162 | 1700  | 20   | 90  | -  | 0.7 | 740   | -   | 0.5 |
| 162-164 | 0.54% | 20   | 100 | 3  | 1.0 | 1200  | 0.3 | 2.3 |
| 164-166 | 890   | 30   | 150 | 2  | 0.2 | 850   | -   | 0.8 |
| 166-168 | 970   | 30   | 190 | -  | 0.2 | 1300  | -   | 0.3 |
| 168-170 | 700   | 10   | 120 | -  | 0.4 | 1600  | -   | 0.1 |
| 170-172 | 600   | 20   | 120 | -  | 0.1 | 1150  | -   | 0.1 |
| 172-174 | 1.00% | 120  | 220 | 12 | 1.3 | 22000 | 3.4 | 9.0 |
| 174-176 | 4900  | 40   | 190 | 6  | 2.0 | 12000 | 1.1 | 3.3 |
| 176-178 | 2400  | 60   | 220 | 4  | 0.4 | 15000 | 0.2 | 1.3 |
| 178-180 | 370   | 40   | 180 | -  | 0.7 | 3600  | -   | -   |
| 180-190 | 750   | 20   | 110 | -  | 0.4 | 2200  | -   | -   |
| 190-196 | 830   | 30   | 130 | -  | 0.3 | 1300  | -   | 0.1 |

S.E. Cross Cut

| m       | Cu    | Pb   | Zn   | Ag | S%  | Mn   | Fire Assay Au | Ag   |
|---------|-------|------|------|----|-----|------|---------------|------|
| 0-2     | 2100  | 70   | 90   | 3  | 1.0 | 1300 | 0.3           | 2.6  |
| 2-4     | 5.68% | 1900 | 3800 | 55 | 5.7 | 1600 | 2.3           | 58.0 |
| 4-6     | 1.52% | 450  | 230  | 12 | 1.6 | 860  | 1.0           | 9.2  |
| 6-8     | 3900  | 250  | 150  | 4  | 0.7 | 1400 | 0.6           | 2.0  |
| 8-10    | 3800  | 250  | 190  | 6  | 0.6 | 560  | 0.2           | 3.6  |
| 10-12   | 0.60% | 120  | 180  | 4  | 0.9 | 1450 | 0.2           | 2.5  |
| 12-14   | 4400  | 230  | 100  | 4  | 0.8 | 400  | -             | 3.0  |
| 14-16   | 1100  | 30   | 130  | -  | 0.4 | 950  | -             | 0.3  |
| 16-18   | 1100  | 10   | 150  | -  | 0.2 | 920  | -             | -    |
| 18-20   | 480   | 20   | 130  | -  | 0.2 | 1100 | -             | -    |
| 20-22   | 0.55% | -    | 140  | 2  | 0.7 | 1500 | -             | 0.6  |
| 22-23.5 | 430   | -    | 140  | -  | 0.2 | 1150 | -             | -    |

ADIT NO. 1

| m     | Cu    | Pb  | Zn  | S%  | Mn   | Au  | Ag  |
|-------|-------|-----|-----|-----|------|-----|-----|
| 0-1   | 0.42% | 70  | 210 | 0.5 | 460  | 0.6 | 1.7 |
| 1-2   | 0.88% | 40  | 150 | 0.5 | 420  | 0.4 | 4.0 |
| 2-3   | 1.10% | 50  | 160 | 0.4 | 500  | 1.5 | 6.8 |
| 3-4   | 0.48% | 40  | 180 | 0.3 | 590  | 0.3 | 1.8 |
| 4-5   | 0.70% | 70  | 200 | 0.6 | 620  | 1.3 | 3.0 |
| 5-6   | 0.92% | 80  | 200 | 0.8 | 600  | 1.1 | 3.1 |
| 6-7   | 0.80% | 60  | 180 | 0.8 | 520  | 0.9 | 3.1 |
| 7-8   | 1.15% | 80  | 230 | 1.0 | 650  | 0.5 | 4.7 |
| 8-9   | 0.22% | 50  | 230 | 0.9 | 670  | 0.5 | 1.5 |
| 9-10  | 0.12% | 50  | 220 | 0.4 | 680  | -   | 0.3 |
| 10-12 | 0.10% | 40  | 170 | 0.3 | 910  | -   | 0.5 |
| 12-14 | 820   | 30  | 120 | 0.3 | 450  | -   | -   |
| 14-16 | 230   | 20  | 90  | 0.1 | 350  | -   | -   |
| 16-18 | 240   | 30  | 90  | 0.3 | 370  | -   | -   |
| 18-20 | 330   | 40  | 80  | 0.6 | 370  | -   | -   |
| 20-22 | 350   | 110 | 90  | -   | 340  | -   | 0.2 |
| 22-24 | 230   | 20  | 90  | 0.2 | 610  | -   | -   |
| 24-26 | 240   | 40  | 100 | -   | 1150 | -   | -   |
| 26-28 | 1050  | 30  | 160 | 0.2 | 1500 | -   | 0.2 |
| 28-30 | 420   | 20  | 60  | -   | 170  | -   | -   |
| 30-32 | 560   | 20  | 60  | -   | 160  | -   | -   |
| 32-34 | 130   | 30  | 70  | -   | 160  | -   | -   |
| 34-36 | 570   | 60  | 90  | -   | 230  | -   | 0.8 |
| 36-38 | 250   | 90  | 90  | -   | 280  | -   | 0.5 |
| 38-40 | 370   | 60  | 90  | 0.3 | 310  | -   | 0.4 |
| 40-42 | 380   | 50  | 70  | 0.2 | 280  | -   | 0.3 |
| 42-44 | 500   | 50  | 80  | 0.2 | 360  | -   | 0.2 |
| 44-46 | 540   | 100 | 70  | 0.1 | 310  | 0.2 | 0.5 |
| 46-48 | 990   | 100 | 80  | 0.2 | 590  | -   | 0.8 |
| 48-50 | 730   | 100 | 70  | 0.3 | 330  | -   | 0.4 |
| 50-52 | 200   | 50  | 60  | -   | 500  | -   | 0.1 |



ADIT NO. 3  
Main Drive

| m       | Cu          | Pb  | Zn  | S%  | Mn    | Fire Assay Au | Ag   |  |
|---------|-------------|-----|-----|-----|-------|---------------|------|--|
| 0.2     | 2400        | 60  | 150 | -   | 250   | -             | 0.5  |  |
| 2.4     | 2400        | 40  | 150 | 0.3 | 180   | -             | 0.4  |  |
| 4.6     | 2500        | 30  | 160 | -   | 300   | -             | 0.4  |  |
| 6.8     | 2600        | 30  | 180 | 0.5 | 380   | -             | 0.6  |  |
| 8-10    | 2000        | 30  | 200 | 0.6 | 570   | -             | 0.3  |  |
| 10-12   | 2900        | 20  | 170 | 0.5 | 650   | -             | 0.3  |  |
| 12-14   | 4000        | 30  | 200 | 0.5 | 1000  | -             | 0.4  |  |
| 14-16   | 3800        | 20  | 200 | 0.6 | 770   | -             | 0.3  |  |
| 16-18   | 0.82%       | 20  | 180 | 0.5 | 570   | 0.2           | 0.7  |  |
| 18-20   | 0.62%       | 20  | 170 | 0.2 | 480   | 0.1           | 1.7  |  |
| 20-22   | 3000        | 30  | 180 | -   | 500   | -             | 0.8  |  |
| 22-24   | 2500        | 20  | 140 | 0.5 | 300   | 0.3           | 1.1  |  |
| 24-26   | 1.38%       | 30  | 220 | 0.8 | 530   | 0.7           | 4.6  |  |
| 26-28   | 2.70%       | 50  | 240 | 0.5 | 630   | 2.0           | 14.1 |  |
| 28-30   | 0.72%       | 30  | 200 | 0.5 | 460   | 0.4           | 3.6  |  |
| 30-32   | 2800        | 30  | 190 | 0.9 | 450   | 0.2           | 1.7  |  |
| 32-34   | 1.00%       | 30  | 240 | 0.6 | 630   | 1.1           | 3.4  |  |
| 34-36   | 0.80%       | 30  | 230 | 0.4 | 530   | 0.5           | 1.7  |  |
| 36-38   | 0.72%       | 20  | 180 | 0.2 | 460   | 0.1           | 1.5  |  |
| 38-40   | 3000        | 20  | 200 | 0.1 | 460   | -             | 0.8  |  |
| 40-42   | 1.40%       | 30  | 160 | 0.5 | 300   | 0.8           | 2.7  |  |
| 42-44   | 0.92%       | 40  | 100 | 0.4 | 220   | 0.2           | 1.9  |  |
| 44-46   | 2800        | 50  | 80  | -   | 160   | 0.4           | 1.8  |  |
| 46-48   | 1700        | 60  | 30  | -   | 50    | 0.3           | 2.1  |  |
| 48-50   | 0.60%       | 40  | 30  | 0.1 | 640   | 0.2           | 0.7  |  |
| 50-52.5 | 1500        | 60  | 40  | 0.4 | 2400  | -             | -    |  |
| 52.5-54 | 330         | 150 | 30  | -   | 410   | -             | 0.2  |  |
| 54-56   | 170         | 360 | 30  | -   | 400   | 2.0           | 1.0  |  |
| 56-58   | 620         | 100 | 30  | -   | 520   | -             | 0.1  |  |
| 58-60   | 100         | 80  | 20  | -   | 250   | -             | -    |  |
| 60-62   | 90          | 160 | 20  | -   | 600   | 0.2           | 0.2  |  |
| 62-64   | 380         | 350 | 40  | -   | 1100  | -             | -    |  |
| 64-66   | 90          | 230 | 30  | -   | 900   | -             | 0.1  |  |
| 66-68   | 80          | 110 | 40  | -   | 1100  | -             | -    |  |
| 68-70   | 90          | 100 | 30  | -   | 1500  | -             | 0.1  |  |
| 70-72   | NOT ASSAYED |     |     |     |       |               |      |  |
| 72-74   | 50          | 20  | 20  | -   | 1800  | -             | -    |  |
| 74-76   | 350         | 60  | 50  | -   | 1300  | 0.1           | 0.5  |  |
| 76-78   | 900         | 120 | 80  | 0.2 | 780   | -             | 0.7  |  |
| 78-80   | 300         | 150 | 60  | 0.4 | 430   | -             | 0.3  |  |
| 80-82   | 0.74%       | 180 | 80  | 0.4 | 5400  | 0.1           | 2.0  |  |
| 82-84   | 1.10%       | 900 | 570 | 1.2 | 5400  | 0.3           | 13.5 |  |
| 84-86   | 0.72%       | 70  | 130 | 0.9 | 7000  | 0.1           | 1.6  |  |
| 86-88   | 0.98%       | 50  | 90  | 0.8 | 8400  | 0.4           | 1.7  |  |
| 88-90   | 1.88%       | 40  | 100 | 1.6 | 11800 | 0.4           | 3.1  |  |
| 90-92   | 0.82%       | 40  | 110 | 1.2 | 8400  | 0.3           | 1.3  |  |
| 92-94   | 1.10%       | 40  | 160 | 0.9 | 1700  | 0.2           | 1.7  |  |
| 94-96   | 4100        | 50  | 200 | 0.6 | 840   | 0.2           | 1.3  |  |
| 96-98   | 0.92%       | 60  | 200 | 0.7 | 1500  | 0.3           | 3.2  |  |
| 98-100  | 0.80%       | 60  | 210 | 0.3 | 700   | 0.4           | 3.6  |  |
| 100-102 | 3200%       | 50  | 200 | 0.5 | 960   | 0.4           | 1.2  |  |
| 102-104 | 1.10%       | 50  | 190 | 1.1 | 2000  | 0.8           | 3.6  |  |
| 104-106 | 1.28%       | 60  | 220 | 1.4 | 1800  | 0.5           | 3.9  |  |
| 106-108 | 1.54%       | 90  | 210 | 1.7 | 2500  | 4.6           | 7.0  |  |
| 108-110 | 1.28%       | 80  | 210 | 1.0 | 3800  | 0.7           | 4.1  |  |
| 110-112 | 0.78%       | 60  | 210 | 1.0 | 1800  | 0.5           | 1.6  |  |
| 112-114 | 3600        | 60  | 250 | 0.3 | 3000  | 0.1           | 1.1  |  |
| 114-116 | 0.90%       | 70  | 210 | 1.0 | 880   | 1.3           | 3.0  |  |
| 116-118 | 1700        | 40  | 220 | 0.2 | 900   | -             | 0.3  |  |
| 180-120 | 900         | 30  | 170 | -   | 850   | -             | 0.2  |  |

EAST CROSS CUT

| m   | Cu    | Pb  | Zn  | S%  | Mn   | Au  | Ag  |
|-----|-------|-----|-----|-----|------|-----|-----|
| 0-2 | 1.47% | 20  | 190 | 1.3 | 4200 | 0.6 | 2.6 |
| 2-4 | 1.04% | 20  | 170 | 0.9 | 4000 | 0.7 | 2.1 |
| 4-6 | 1.06% | 30  | 100 | 1.1 | 7000 | 1.6 | 3.0 |
| 6-7 | 2.11% | 110 | 130 | 1.9 | 7600 | 0.9 | 5.9 |

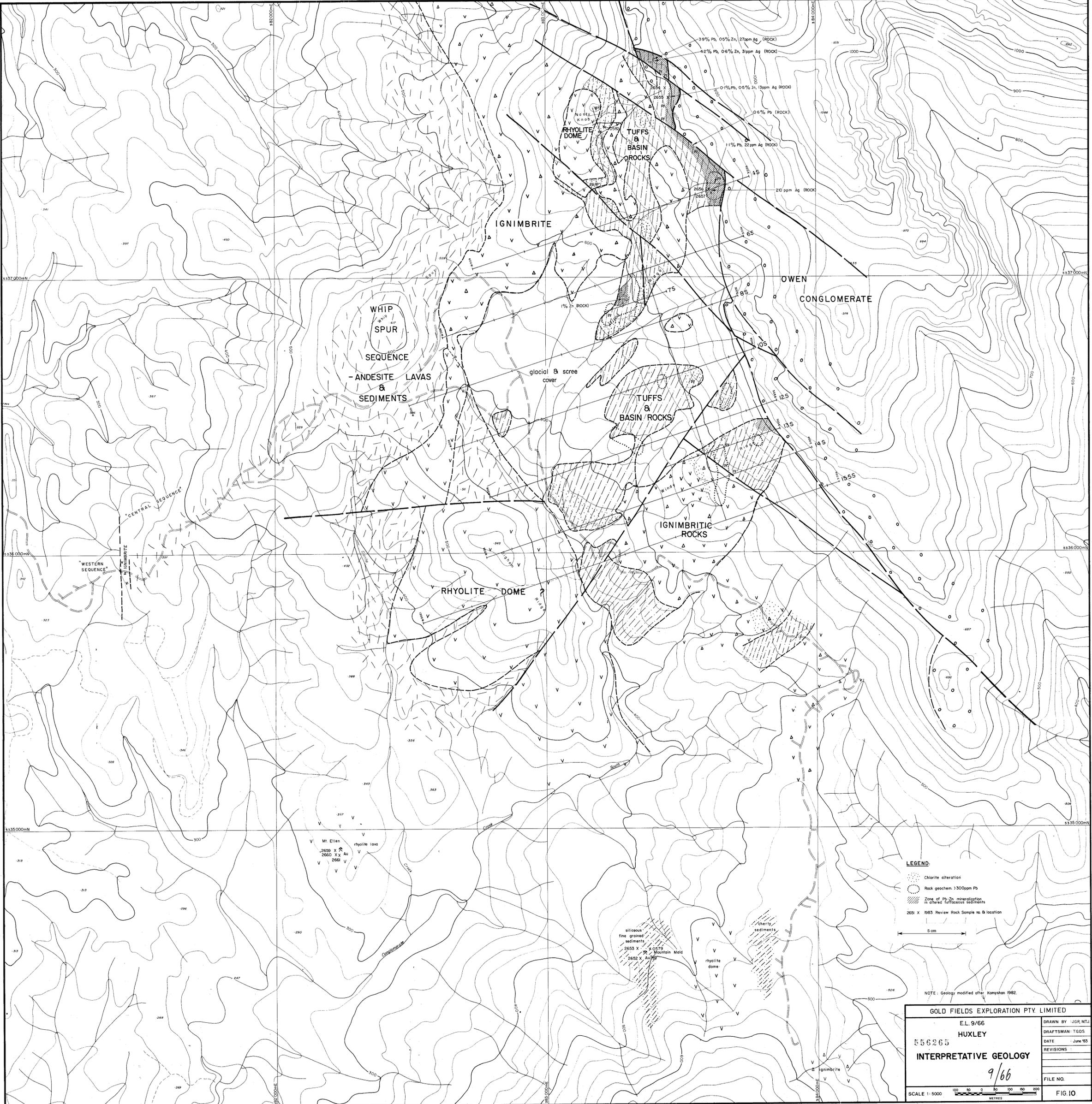
WEST WALL HANGING WALL DRIVE

| m       | Cu       | Pb  | Zn  | S%  | Mn   | Au  | Ag   |  |
|---------|----------|-----|-----|-----|------|-----|------|--|
| 0-2     | NO ASSAY |     |     |     |      |     |      |  |
| 2-4     | 0.96%    | 60  | 110 | 1.1 | 6800 | 0.2 | 2.3  |  |
| 4-6     | 3.76%    | 100 | 180 | 3.7 | 7800 | 5.0 | 11.4 |  |
| 6-8     | 1.85%    | 140 | 210 | 1.4 | 8600 | 2.2 | 6.7  |  |
| 8-10    | 1.34%    | 70  | 270 | 1.2 | 5200 | 0.3 | 2.9  |  |
| 10-12   | 0.76%    | 60  | 200 | 0.6 | 4500 | 0.3 | 1.4  |  |
| 12-14   | 0.82%    | 70  | 200 | 1.0 | 800  | 1.3 | 2.5  |  |
| 14-16   | 1.30%    | 50  | 190 | 1.3 | 5200 | 1.3 | 2.6  |  |
| 16-18   | 1.76%    | 40  | 130 | 1.7 | 7400 | 0.2 | 3.9  |  |
| 18-20   | 1.82%    | 50  | 130 | 1.7 | 7600 | 0.9 | 4.6  |  |
| 20-27   | 1.22%    | 50  | 180 | 1.2 | 6800 | 0.4 | 2.0  |  |
| 22-24   | 2700     | 40  | 200 | 0.4 | 4600 | -   | 0.5  |  |
| 24-25.4 | 0.80%    | 60  | 140 | 0.8 | 9600 | 0.2 | 1.2  |  |

EAST WALL HANGING WALL DRIVE

| m     | Cu  | Pb  | Zn | S% | Mn   | Au | Ag  |
|-------|-----|-----|----|----|------|----|-----|
| 0-2   | 840 | 160 | 30 | -  | 530  | -  | -   |
| 2-4   | 560 | 500 | 50 | -  | 3900 | -  | 0.7 |
| 4-6   | 230 | 100 | 20 | -  | 480  | -  | 0.1 |
| 6-8   | 140 | 50  | 20 | -  | 1200 | -  | -   |
| 8-10  | 350 | 50  | 30 | -  | 1200 | -  | -   |
| 10-12 | 110 | 10  | 20 | -  | 320  | -  | -   |
| 12-14 | 250 | 40  | 20 | -  | 660  | -  | 0.  |





**LEGEND:**

- Chlorite alteration
- Rock geochem. 3300ppm Pb
- Zone of Pb-Zn mineralization in altered tuffaceous sediments
- 2651 X 1983 Review Rock Sample no. & location

5 cm

NOTE: Geology modified after Komynshon 1982.

|                                      |          |
|--------------------------------------|----------|
| GOLD FIELDS EXPLORATION PTY. LIMITED |          |
| E.L. 9/66                            |          |
| HUXLEY                               |          |
| 556265                               |          |
| <b>INTERPRETATIVE GEOLOGY</b>        |          |
| 9/66                                 |          |
| SCALE 1:5000                         |          |
|                                      |          |
| METRES                               |          |
| DRAWN BY: JGR, MTL                   | FILE NO. |
| DRAFTSMAN: TGDS                      |          |
| DATE: June '65                       |          |
| REVISIONS:                           |          |
| FIG. 10                              |          |

ROCK CHIP ASSAYS

| Sample No. | Gr. | Fl. | Cl. | Sl. | St. | Py. | Sp. | Py. | Sp. |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 21001      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21002      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21003      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21004      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21005      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21006      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21007      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21008      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21009      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21010      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21011      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21012      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21013      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21014      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21015      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21016      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21017      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21018      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21019      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21020      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21021      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21022      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21023      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21024      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21025      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21026      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21027      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21028      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21029      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21030      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21031      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21032      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

NOT ASSAYED

| Sample No. | Gr. | Fl. | Cl. | Sl. | St. | Py. | Sp. | Py. | Sp. |
|------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 21033      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21034      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21035      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21036      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21037      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21038      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21039      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21040      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21041      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 21042      | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |

NOT ASSAYED



LEGEND

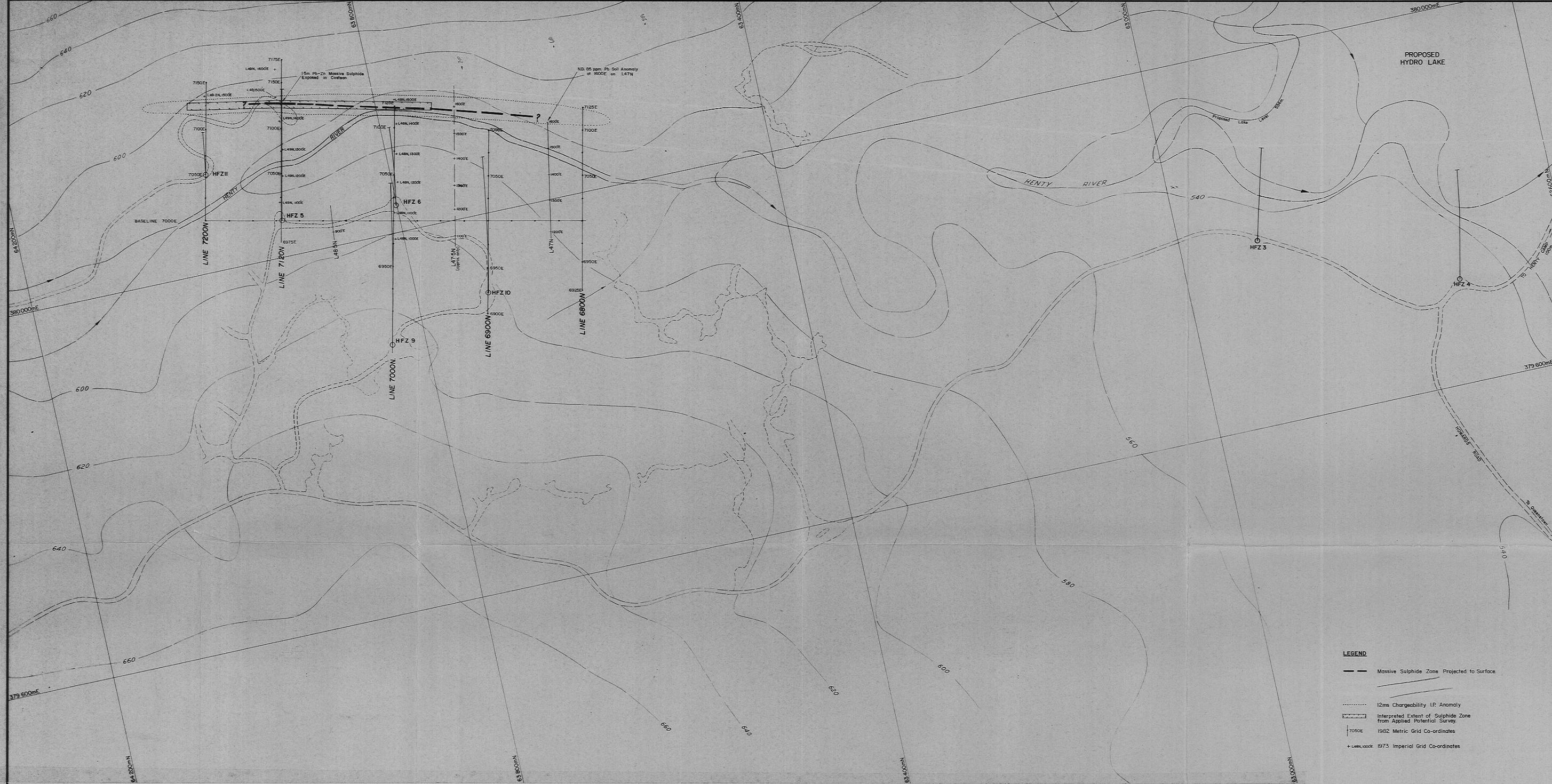
- Rock chip sample location
- Stream sediment No. Assays: Cu, Pb, Zn, Au
- X: Less than detection limit (generally <0.02)
- Stream to which sample location No. is assigned
- Contour lines
- Grid lines
- Scale bar: 5 cm

THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

**HUXLEY AREA**  
Stream Sediment Survey (1981-83)  
Cu, Pb, Zn, Au

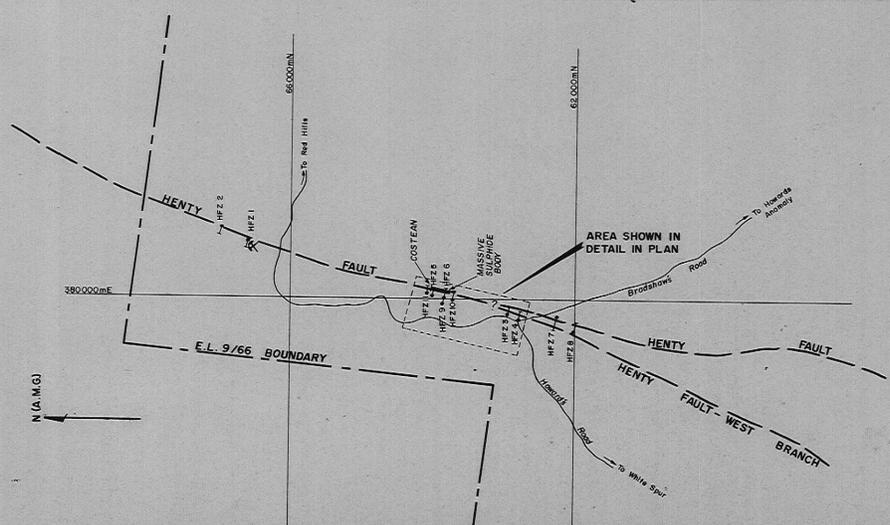
Mead.

FIG. 11  
NO. 1255-2

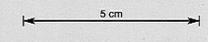


- LEGEND**
- Massive Sulphide Zone Projected to Surface.
  - ..... 12ms Chargeability IP Anomaly
  - Interpreted Extent of Sulphide Zone from Applied Potential Survey.
  - + 7000E 1982 Metric Grid Co-ordinates
  - + L48N, 1000E 1973 Imperial Grid Co-ordinates

**LOCALITY DIAGRAM**  
SCALE 1:50 000



156267



|                                     |          |
|-------------------------------------|----------|
| GOLDFIELDS EXPLORATION PTY. LIMITED |          |
| E.L. 9/66                           |          |
| HENTY FAULT ZONE                    |          |
| DIAMOND DRILLING PLAN               |          |
| 9/66                                |          |
| 83-1995                             |          |
| SCALE 1:2000                        | FILE NO. |
| 40 20 0 20 40 60 80<br>Metres       | FIG. 12  |

DRAWN BY : P.W.E.  
DRAFTSMAN : T.G.D.S.  
DATE : Sept. '82  
REVISIONS :  
P.W.E. Oct. '82  
J.G.P. Dec. '82

NORTH

SOUTH

NORTHERN  
LIMIT OF GRADIENT ARRAY  
IP ANOMALY  
(12 m.sec. CONTOUR)

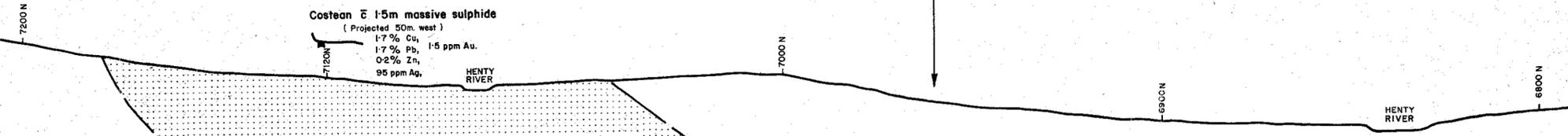
SOUTHERN  
LIMIT OF GRADIENT ARRAY  
IP ANOMALY  
(12 m.sec. CONTOUR)

APPLIED POTENTIAL ANOMALY

Costean  $\bar{c}$  1.5m massive sulphide  
(Projected 50m. west)  
1.7% Cu,  
1.7% Pb, 1.5 ppm Au,  
0.2% Zn,  
95 ppm Ag.

HENTY RIVER

HENTY RIVER



R.L. 550m

R.L. 500m

R.L. 450m

R.L. 400m

R.L. 350m

HFZ 11 barren  
(Projected 13m. west)

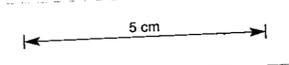
HFZ 5 barren  
(on section)

HFZ 6 (0.55m)  
(Projected 5m. west)  
1.1% Cu,  
4.1% Pb,  
7.1% Zn,  
85 ppm Ag,  
2.1 ppm Au

HFZ 9 (0.7m)  
(Projected 35m. east)  
1.1% Cu,  
1.1% Pb,  
2.1% Zn,  
4.1 ppm Ag,  
1.3 ppm Au

HFZ 10 (0.6m)  
(Projected 30m. east)  
3.75% Cu,  
1.3% Pb,  
0.6% Zn,  
126 ppm Ag

556268



LEGEND

HFZ 9 (0.7m) - intersect point of hole on eastern side of Henty Fault Zone, with true thickness of massive sulphide.

Possible limits to massive sulphide body.

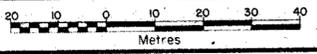
GOLDFIELDS EXPLORATION PTY. LIMITED

E.L. 9/66  
HENTY FAULT ZONE

LONGITUDINAL SECTION 7075N.

83-1995 LOOKING EAST 9/66

SCALE 1:1000



|                 |                |
|-----------------|----------------|
| DRAWN BY        | P.W.E., J.G.P. |
| DRAFTSMAN       | T.G.D.S.       |
| DATE            | Dec. 1982      |
| REVISIONS       |                |
| J.G.P. Dec. '82 |                |
| FILE NO.        |                |

FIG 13

6324

5362000mN

5358000mN

5354000mN

**LEGEND**

**QUATERNARY**

Thick Glacial Cover (approx. >20m.)

**UPPER CAMBRIAN - LOWER ORDOVICIAN**

Owen Conglomerate including Newton Creek Sandstone Member

**CAMBRIAN (MT. READ VOLCANICS)**

Key Zones  
Tyndall Group felsic lavas, agglomerates & tuffs

Silver Zone hematite-carbonate (±Ag Central Howards area) sediments & pyroclastics shallow sub aqueous oxidizing environment

Sulphide Zone bedded sulphides in altered pyritic tuffaceous sediments deeper sub aqueous reducing environment

Principal shale lenses within main Sulphide Zone

Gradient Array Chargeability Anomalies (Bishop, 1982) 30m sec contour except No. 5 Basin Lake (20m sec)

Principal Fault

Diamond Drill Hole

Geology modified after Kamysyan 1982.

THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

**HOWARDS ANOMALY - BASIN LAKE AREAS**

**INTERPRETATIVE GEOLOGY**



REVISIONS

|  |
|--|
|  |
|  |
|  |
|  |
|  |

FIG. 14

SCALE 1:20,000  
DATE MAY 1983

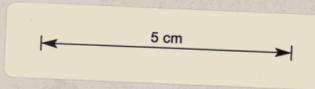
DRAWN BY F.G.F.  
DRAFTSMAN T.G.D.S.

83-1995  
Mainly 9/66 (some CRA 5/85)

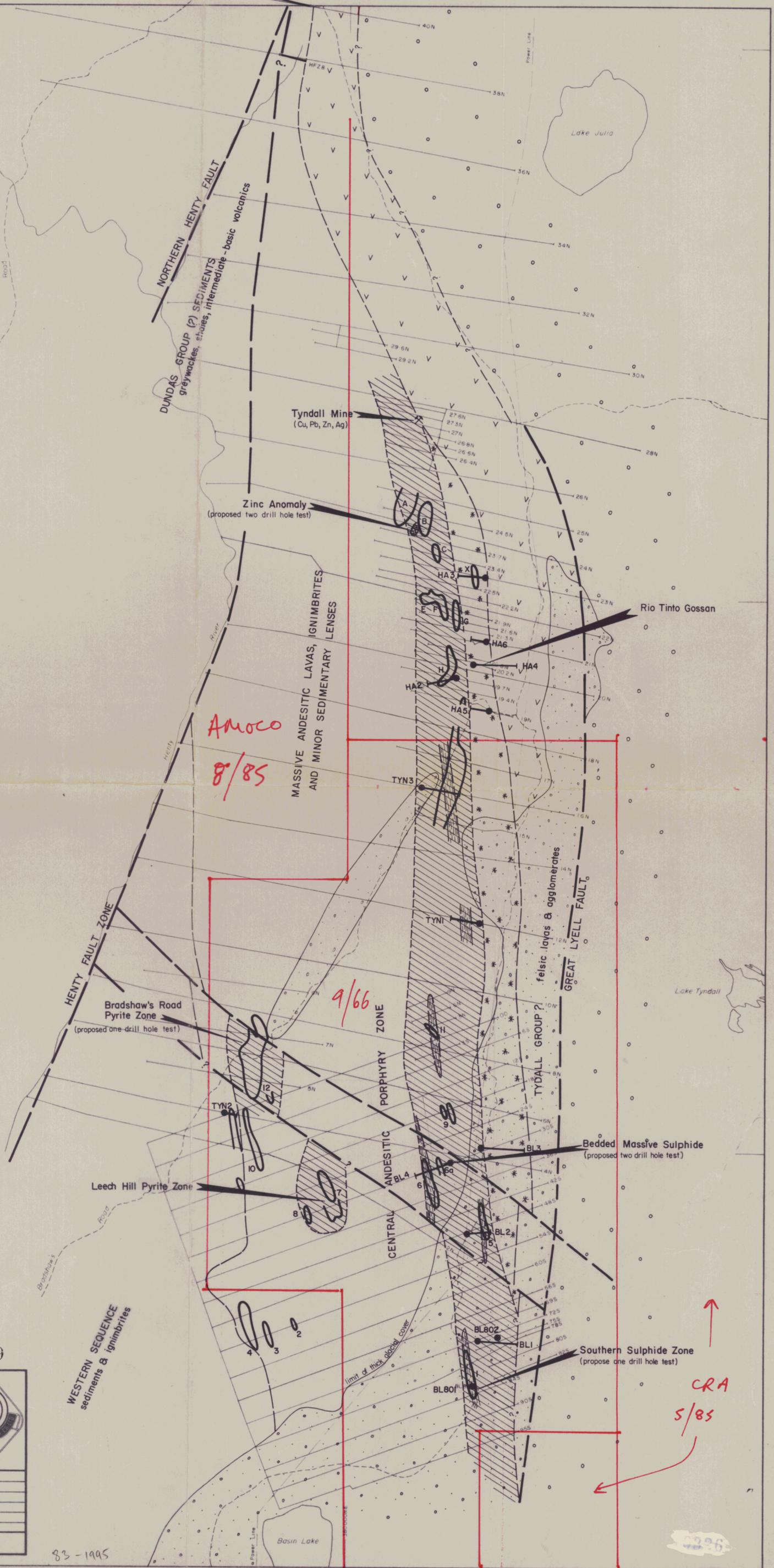
83-1995

2/2

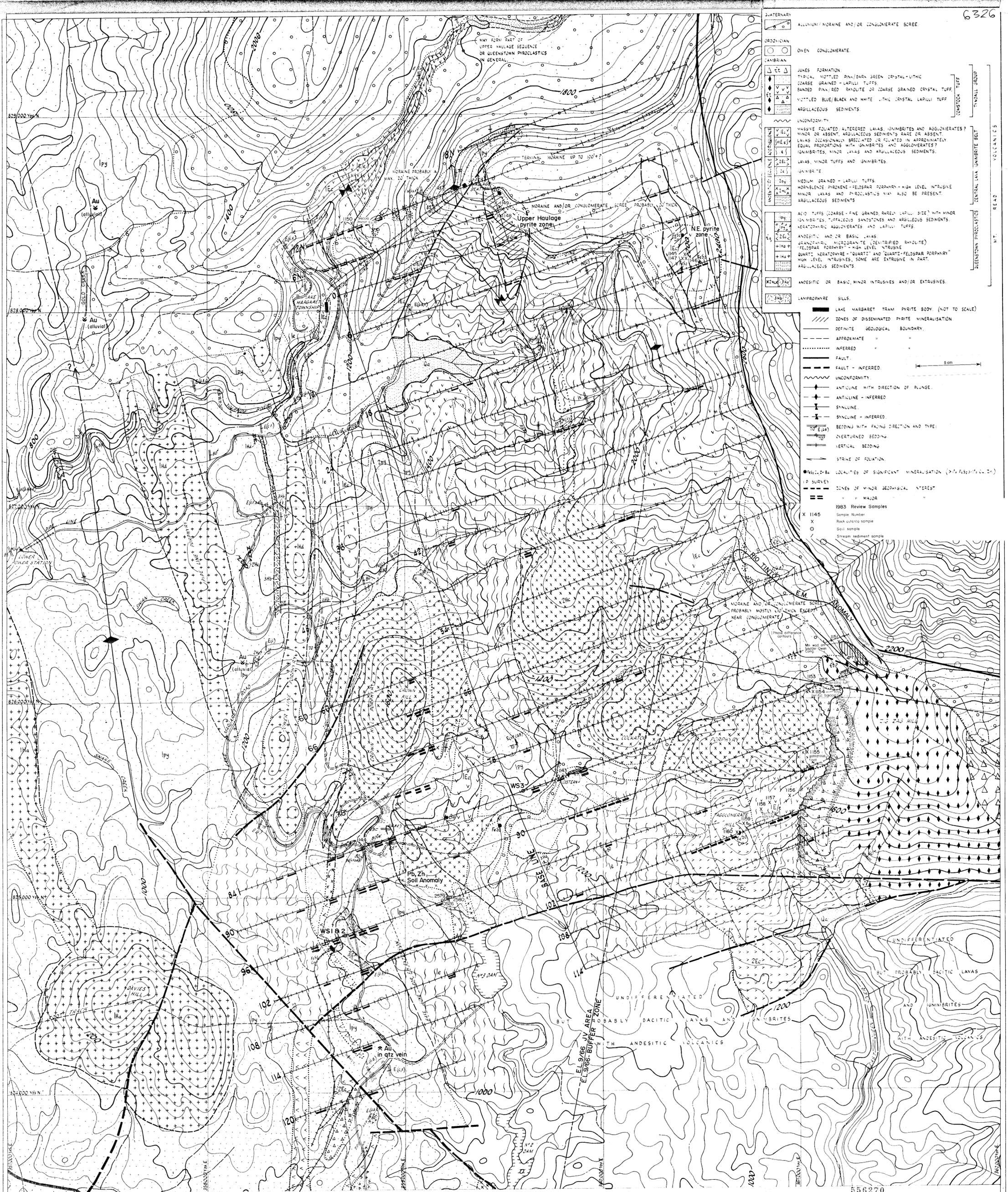
556269



WESTERN SEQUENCE  
sediments & ignimbrites



6325



- QUATERNARY
  - ALLUVIUM MORAINAL AND/OR CONGLOMERATE SCREE
- ORDOVICIAN
  - OVEN CONGLOMERATE
- CAMBRIAN
  - JUKES FORMATION
    - TYPICAL MOTTLED PINK/DARK GREEN CRYSTAL-LITHIC
    - COARSE GRAINED - LAPILLI TUFFS
    - BANDED PINK/RED SANDSTONE OR COARSE GRAINED CRYSTAL TUFF
    - MOTTLED BLUE/BLACK AND WHITE LITHIC CRYSTAL LAPILLI TUFF
    - ARGILLACEOUS SEDIMENTS
- UNCONFORMITY
  - MASSIVE FOLIATED ALTERED LAVAS, IGNI-MORBES AND AGGLOMERATES? MINOR OR ABSENT, ARGILLACEOUS SEDIMENTS RARE OR ABSENT
  - LAVAS OCCASIONALLY BRECCIATED OR FOLIATED IN APPROXIMATELY EQUAL PROPORTIONS WITH IGNI-MORBES AND AGGLOMERATES?
  - IGNI-MORBES, MINOR LAVAS AND ARGILLACEOUS SEDIMENTS
  - LAVAS, MINOR TUFFS AND IGNI-MORBES
  - IGNI-MORBES
  - MEDIUM GRAINED - LAPILLI TUFFS
  - HORNBLENE DIORITIC-FELDSPAR PORPHYRY - HIGH LEVEL INTRUSIVE
  - MINOR LAVAS AND PYROCLASTICS MAY ALSO BE PRESENT
  - ARGILLACEOUS SEDIMENTS
- ANDESITIC OR BASIC, MINOR INTRUSIVES AND/OR EXTRUSIVES

- LANIPROPHYRE SILLS
- LAKE MARGARET TRAM PYRITE BODY (NOT TO SCALE)
- ZONES OF DISSEMINATED PYRITE MINERALISATION
- DEFINITE GEOLOGICAL BOUNDARY
- APPROXIMATE
- INFERRED
- FAULT
- FAULT - INFERRED
- UNCONFORMITY
- ANTICLINE WITH DIRECTION OF PLUNGE
- ANTICLINE - INFERRED
- SYNCLINE
- SYNCLINE - INFERRED
- BEDDING WITH FACING DIRECTION AND TYPE:
  - UP (U)
  - VERTICAL BEDDING
  - STRIKE OF FOLIATION
- LOCALITIES OF SIGNIFICANT MINERALISATION (Pb, Zn, Fe, Cu, etc.)
- ZONES OF MINOR GEOPHYSICAL INTEREST
  - MAJOR
- 1983 Review Samples
  - X 1145 Sample Number
  - X Rock outcrop sample
  - O Soil sample
  - Stream sediment sample

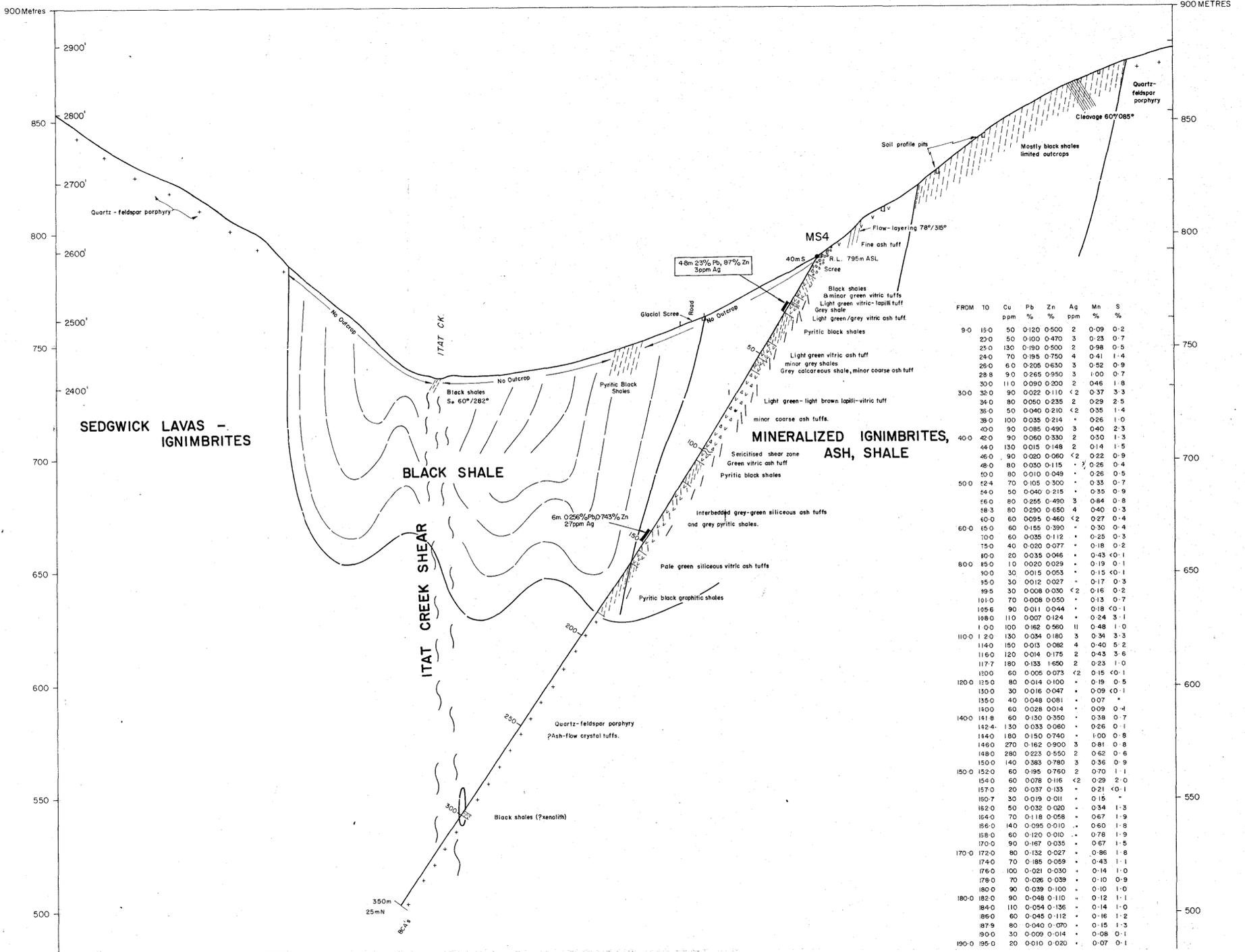
556270

|                                              |  |                  |
|----------------------------------------------|--|------------------|
| <b>THE MOUNT LYELL M. &amp; R. COY. LTD.</b> |  | DRAWN, NWS & PGR |
| GEOLOGICAL DEPARTMENT                        |  | TRACED, T.G.S.   |
| HENRY - YOLANDE E.L. 41/71                   |  | CHECKED          |
| WEST SEDGWICK GRID 7/66                      |  | DATE, MAY 1982   |
| GEOLOGICAL MAP SHOWING                       |  | SCALE, 1:6000    |
| MAIN ANOMALIES 83-1985                       |  | FIG. 15          |

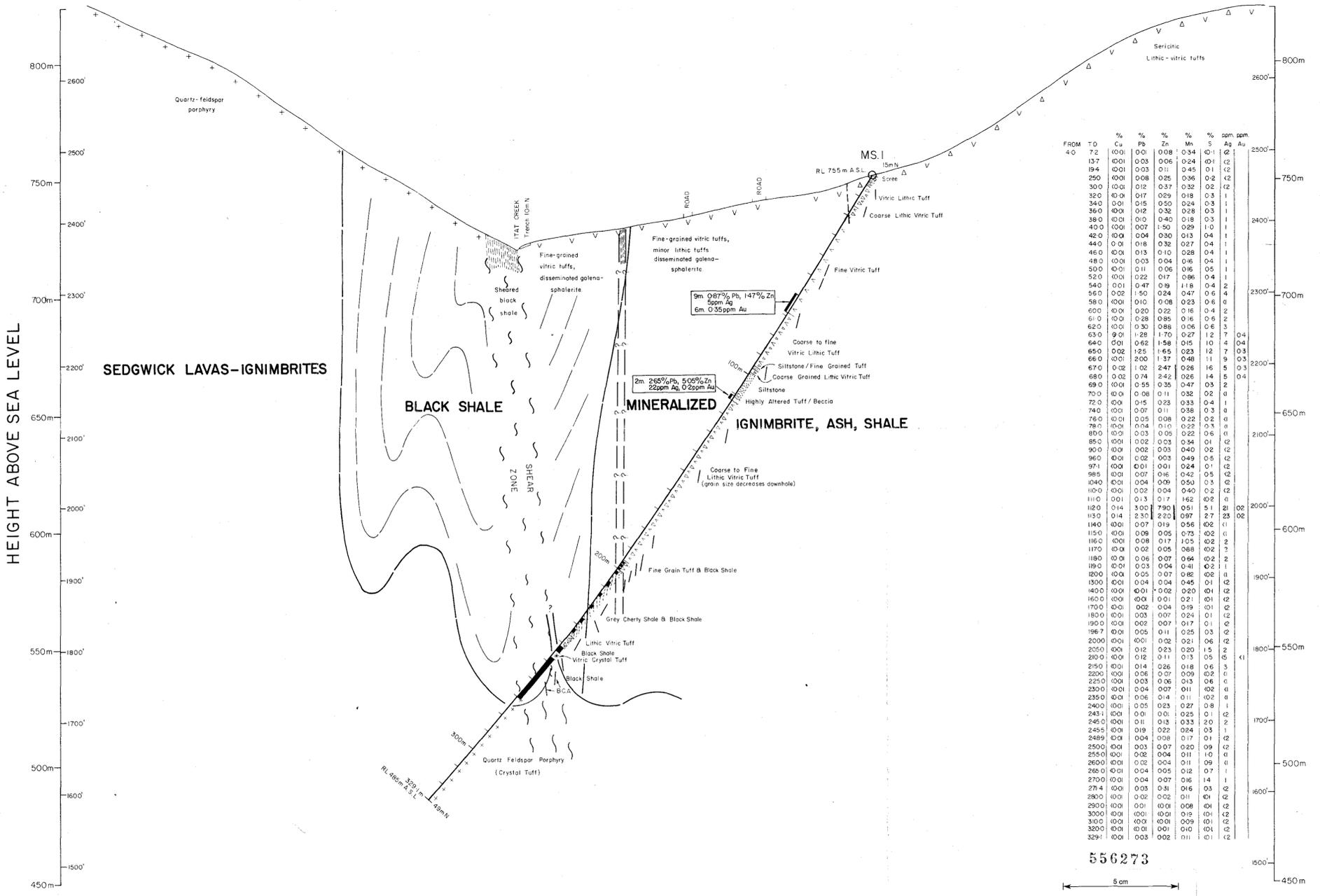




DRILLING PROFILE LINE 18N



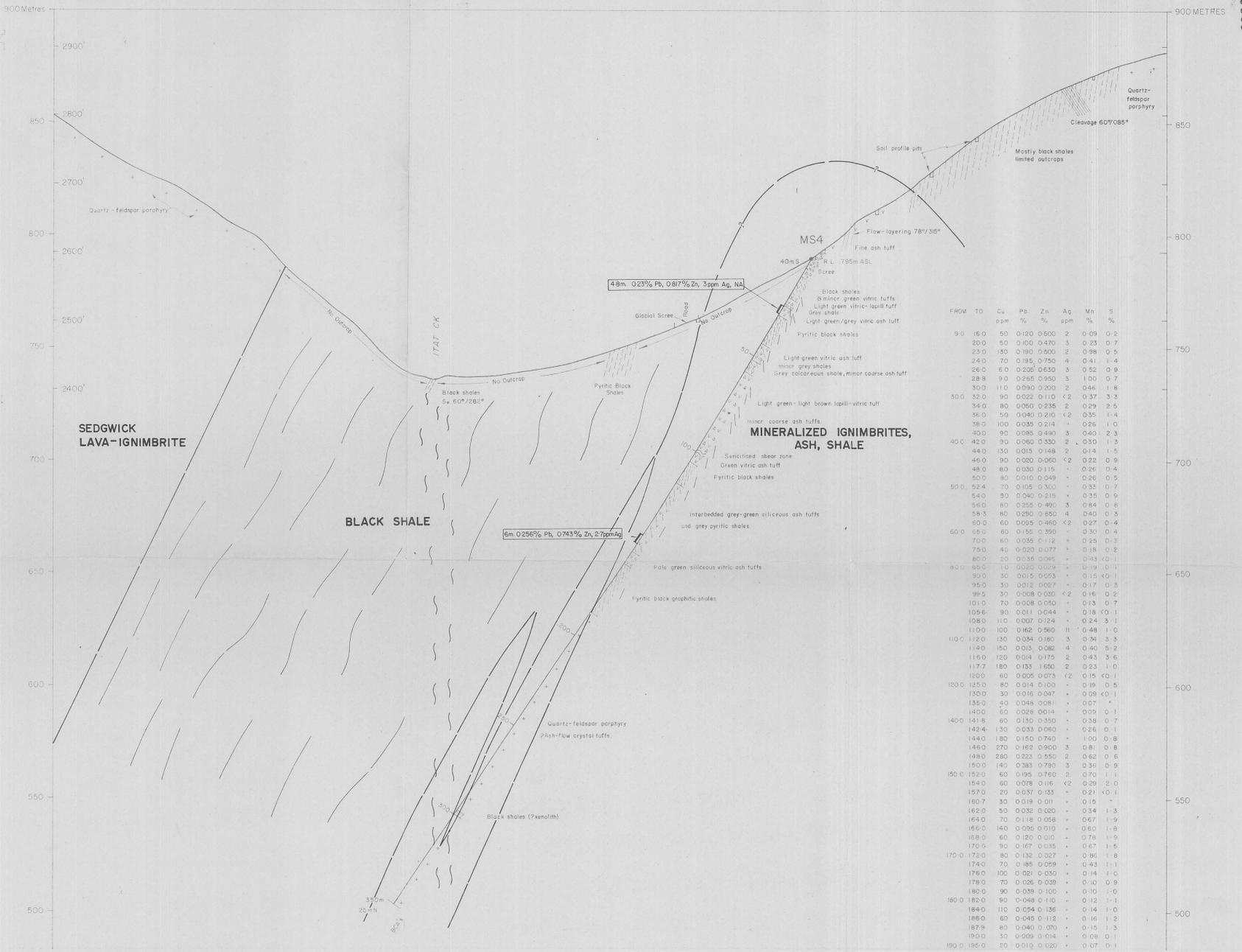
DRILLING PROFILE LINE 16 N



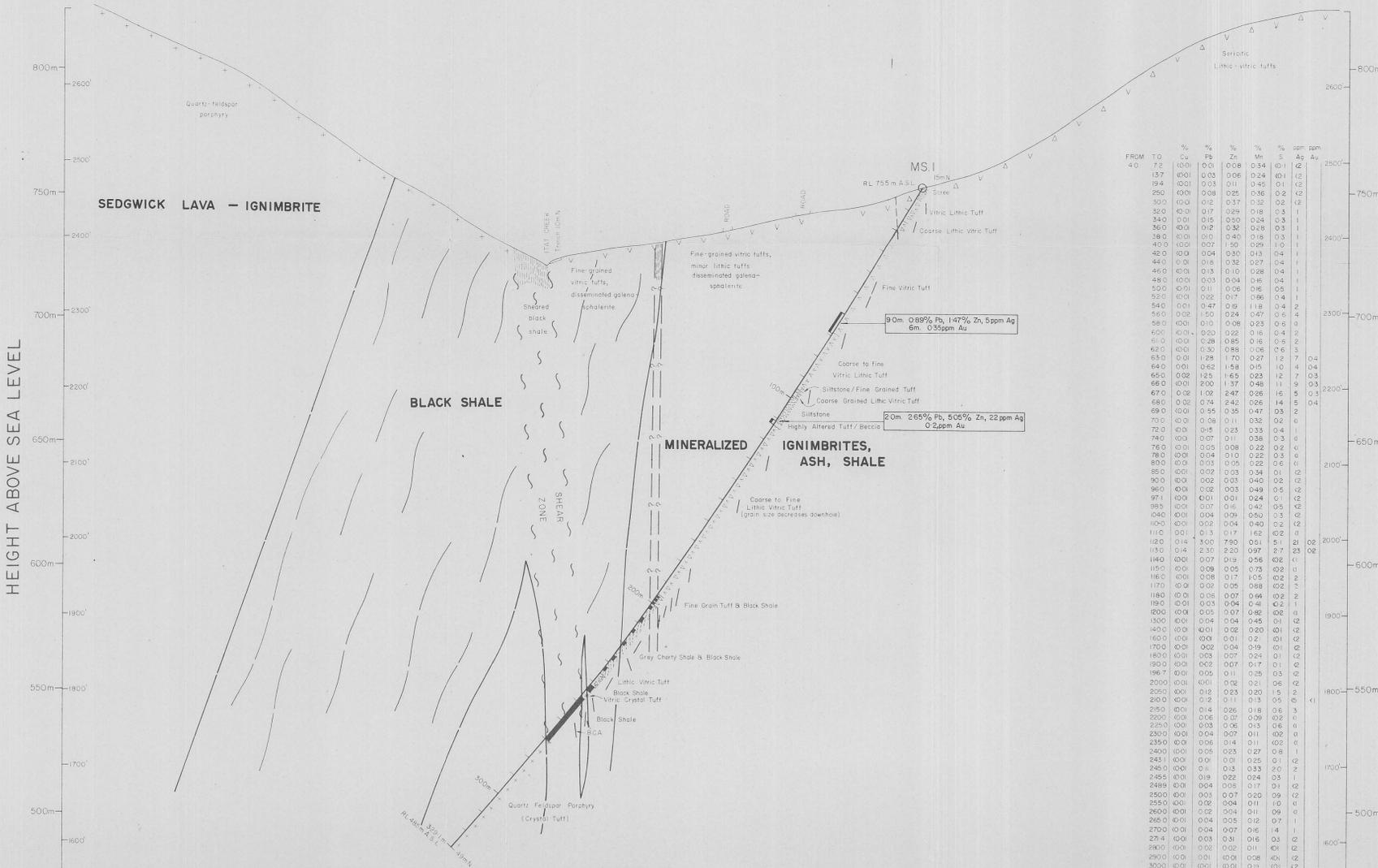
GOLD FIELDS EXPLORATION PTY LIMITED  
 E.L. 9/66  
 BEATRICE GRID  
 ITAT CREEK 9/66  
 INTERPRETATION A  
 83-1995  
 SCALE 1:1000  
 METRES  
 DRAWN BY: R.P.  
 DRAFTSMAN: T.G.D.S.  
 DATE: June 1965  
 REVISIONS:  
 FILE NO.  
 FIG. 18

628

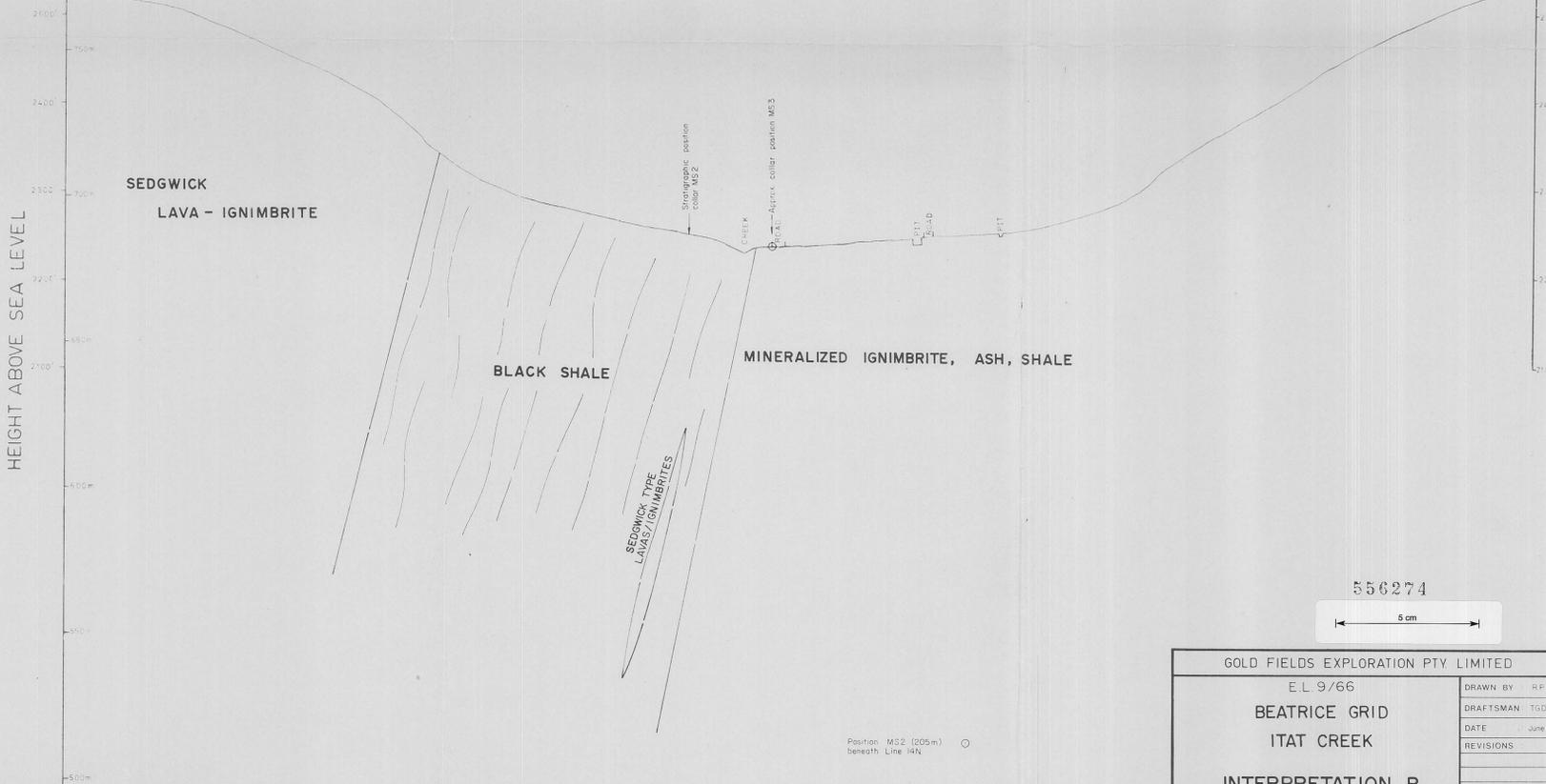
DRILLING PROFILE LINE 18N



DRILLING PROFILE LINE 16N



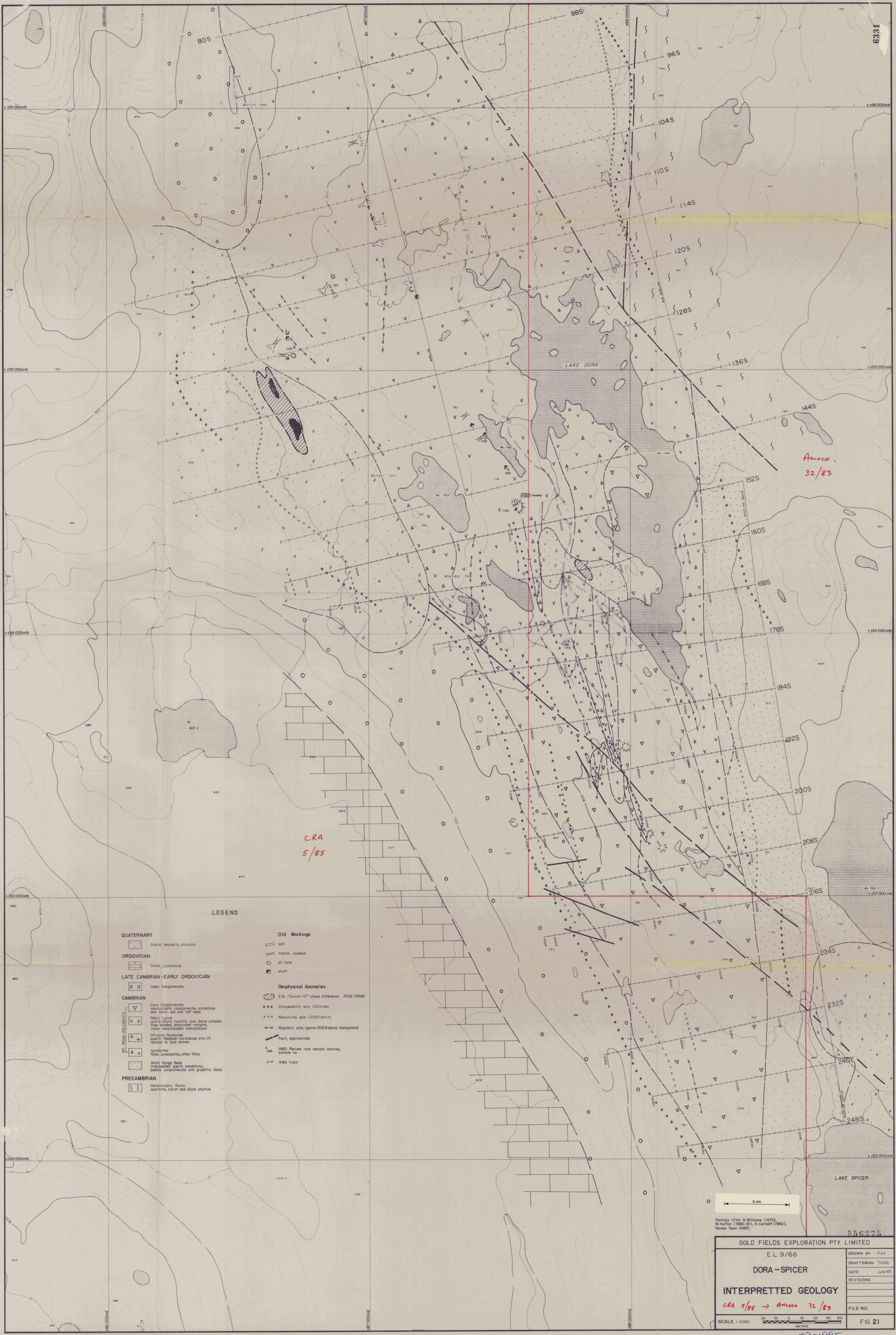
DRILLING PROFILE Line 14N



556274

5 cm

GOLD FIELDS EXPLORATION PTY. LIMITED  
 E.L. 9/66  
 BEATRICE GRID  
 ITAT CREEK  
 INTERPRETATION B  
 23-1995  
 SCALE 1:1000  
 FILE NO. FIG 19



**LEGEND**

|                                                                       |                                               |
|-----------------------------------------------------------------------|-----------------------------------------------|
| <b>QUATERNARY</b>                                                     | <b>Old Workings</b>                           |
| Glacial deposits, alluvium                                            | adit                                          |
| <b>ORDOVICIAN</b>                                                     | trench, coastean                              |
| Gorda Limestone                                                       | pit, hole                                     |
| <b>LATE CAMBRIAN - EARLY ORDOVICIAN</b>                               | shaft                                         |
| Owen Conglomerate                                                     | <b>Geophysical Anomalies</b>                  |
| <b>CAMBRIAN</b>                                                       | E.M. (Turam) 32° phase difference RTAE (1958) |
| Dora Conglomerate                                                     | Chargeability axis >20 m sec.                 |
| volcaniclastic conglomerate, sandstone and minor ash and tuff beds    | Resistivity axis (2000 ohm.m)                 |
| Felsic Lavae                                                          | Magnetic axis, approx. 600# above background  |
| quartz-diorite flow domes complex                                     | Fault, approximate                            |
| flow banded, brecciated margins, minor volcanoclastic intercalations  | 1983 Review rock sample location, sample no.  |
| <b>INTRUSIVE PORPHYRIES</b>                                           | 4WD track                                     |
| quartz-feldspar-hornblende sills (?) related to lava domes            |                                               |
| <b>MT. READ VOLCANICS</b>                                             |                                               |
| Ignimbrites                                                           |                                               |
| felsic pyroclastics, often lithic                                     |                                               |
| <b>PRECAMBRIAN</b>                                                    |                                               |
| Shish Range Beds                                                      |                                               |
| interbedded quartz sandstone, pebble conglomerate and graphitic shale |                                               |
| <b>Metamorphic Rocks</b>                                              |                                               |
| quartzite, schist and black phyllite                                  |                                               |

556275

GOLD FIELDS EXPLORATION PTY LIMITED

E.L. 9/66

DRAWN BY F.G.F.

DRAFTSMAN T.G.D.S.

DORA-SPICER

DATE June 83

INTERPRETTED GEOLOGY

REVISIONS

CRA 5/85 → Amoco 32/85

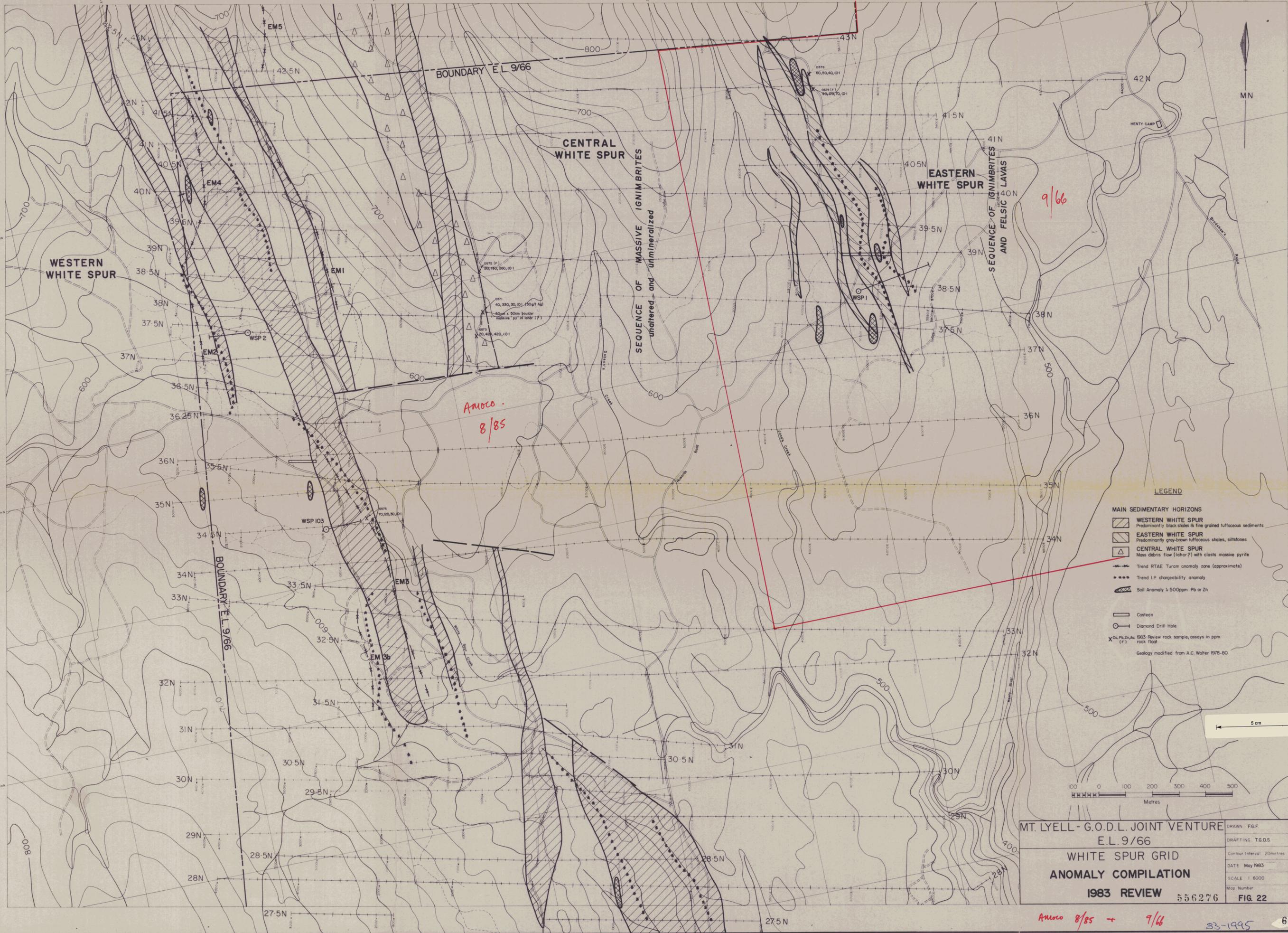
FILE NO.

SCALE 1:5000

0 50 100 150 200 250 300 METRES

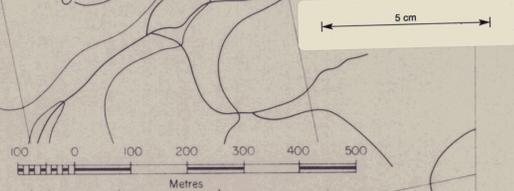
FIG. 21

83-1995



**LEGEND**

- MAIN SEDIMENTARY HORIZONS**
- WESTERN WHITE SPUR**  
Predominantly black shales & fine grained tuffaceous sediments
  - EASTERN WHITE SPUR**  
Predominantly grey-brown tuffaceous shales, siltstones
  - CENTRAL WHITE SPUR**  
Mass debris flow (lahar?) with clasts massive pyrite
- ANOMALY ZONES**
- Trend RTAE Turam anomaly zone (approximate)
  - Trend I.P. chargeability anomaly
  - Soil Anomaly > 500ppm Pb or Zn
- OTHER FEATURES**
- Castean
  - Diamond Drill Hole
  - 'x' Pb, Zn, Au: 1983 Review rock sample, assays in ppm rock float
- Geology modified from A.C. Walter 1978-80



MT. LYELL - G.O.D.L. JOINT VENTURE  
 E.L. 9/66  
 WHITE SPUR GRID  
 ANOMALY COMPILATION  
 1983 REVIEW 556276 **FIG. 22**



- LEGEND**  
Henty River Grid area (after Meares 1980)
- Felsic gneisses and rhyolites
  - Massive basalt flows
  - Andesitic lavas, some porphyritic minor rhyolites
  - Grey green tuffaceous siltstones & shales minor sandstones
  - Hematitic siltstones & shales minor greywacke
  - Disseminated & veinlet galena-sphalerite
  - Diamond drill hole
  - Major fault zone
  - Gabbro
  - IP anomalous area
  - Anomalous anomaly - contour 500 m  
Survey by Geox Pty Ltd for Dept of Mines, 26 May 1981



Geological data from Newham 1959, McKibben 1972, Meares 1976-8 and Corbett (pers comm.)

550217

**GOLD FIELDS EXPLORATION PTY LIMITED**

EL. 9/66

**HENTY RIVER - WEST TYNDAL**

**INTERPRETATIVE GEOLOGY AND PRINCIPAL GEOPHYS. ANOMALIES**

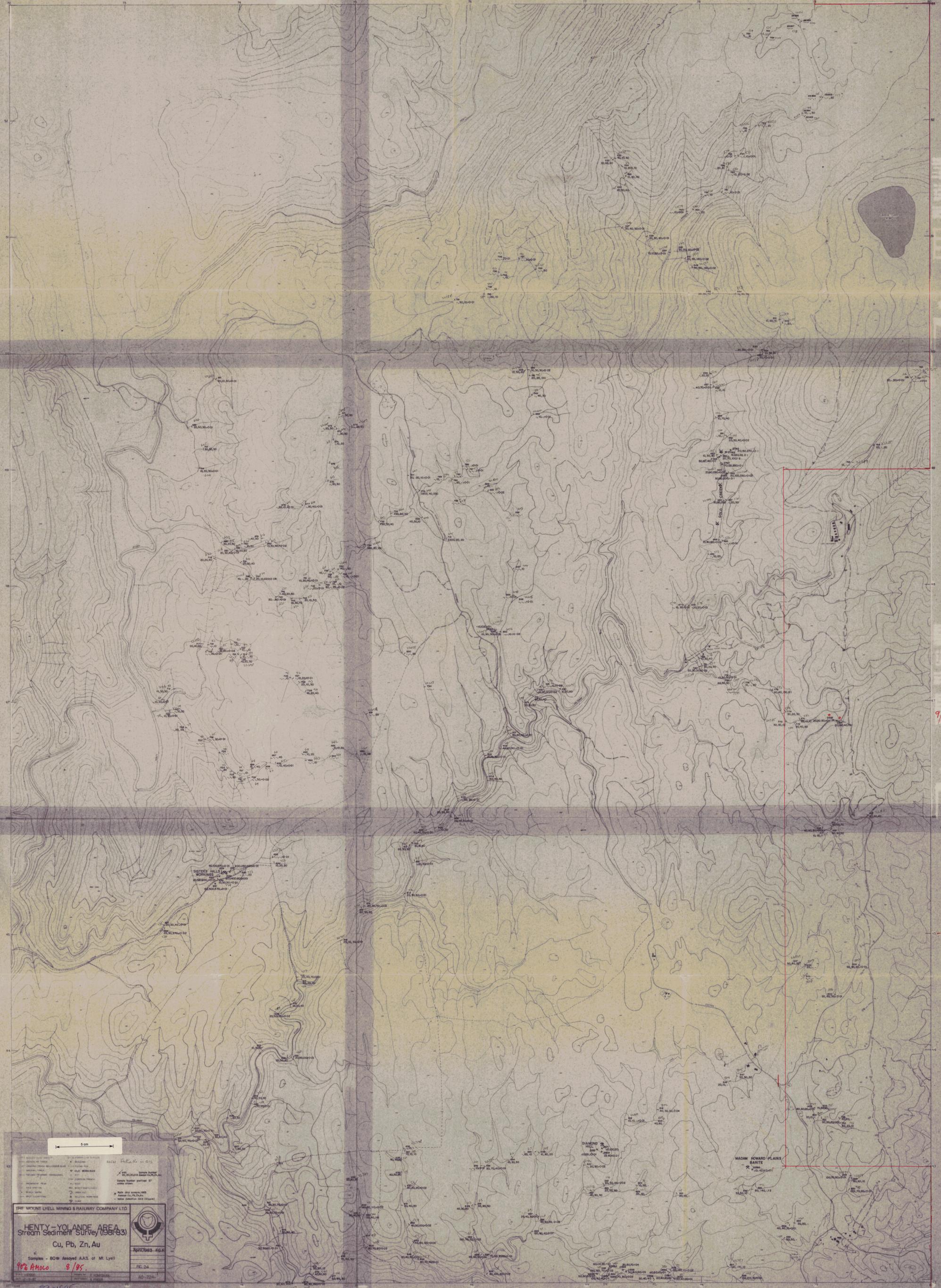
SCALE 1:5000

83-1995 *ALL 8/85 AMOCO.*

|           |           |
|-----------|-----------|
| DRAWN BY  | F.G.F.    |
| DRAFTSMAN | T.G.D.S.  |
| DATE      | June 1985 |
| REVISIONS |           |
| FILE NO.  |           |

FIG 23

9/66



9/66

5 cm

THE MOUNT LYELL MINING & RAILWAY COMPANY LTD.

**HENTY-YOLANDE AREA**  
Stream Sediment Survey (1981-83)

Cu, Pb, Zn, Au

Samples - 808 Assayed AAS at Mt Lyell

908 AMOLO 8/85

FIG. 24

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