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**SUMMARY REPORT  
E.L. 5/94 - LEWIS RIVER  
TASMANIA**

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ANNUAL REPORT - LEWIS RIVER  
EL 5/94 MACMIN NL - HALL, D

By: Diana Hall

## S U M M A R Y

E.L. 5/94 was applied for on 4 February 1994. The licence forms an inverted U-shape and surrounds Aberfoyle's Elliott Bay E.L.

The total area of 135 km<sup>2</sup> covers lithologies equivalent to the Mt. Read Volcanics which host several mines further north.

Exploration to date has been mainly confined to limited stream sediment, rock-chip and soil sampling, which has produced several anomalous areas worthy of more detailed exploration effort, which have been inexplicably ignored by the previous licence holder.

In particular there are three areas of highly anomalous Au levels in pan concentrate samples:

- The margins of the Low Rocky Point Granite have produced several highly anomalous Au geochemical stream samples e.g. 50 Au grains in pan concentrate, analysed at 365 ppm from the western margin. The source of the anomaly has not been located. Gold anomalous areas were also located along the eastern and northern margins of the granite.
- The Three Creeks anomalous area covers a roughly circular area approximately 2 km diameter and included a majority of moderately to highly anomalous pan concentrate samples. e.g. 30 ppm/14 grains of Au; 51 ppm/10 grains of Au. No further exploration work appears to have been done after the initial stream sampling.
- The Upper Hudson River also has several highly anomalous pan concentrate samples which have had no follow-up e.g. 89 ppm Au/20 grains.

None of these areas of conspicuous Au anomalism has been drilled, many have not even been soil or rock chip sampled.

Several other weaker and/or less extensive Au geochemistry anomalies have been identified.

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Summary of Lewis River Anomalous Areas

PROSPECT	COMMENTS
<u>Low Rocky Point Granite</u>	Complex magnetics, stream, soil and rock-chip Au geochemical anomalies all around the granite margins suggest that Au mineralisation is related to the intrusion.
Eastern contact	Anomalous Au geochemistry in -80# stream sediment samples and presence of pyrite-quartz-haematite veins. Four stream sediment samples (of eleven sampled) >0.10 ppm Au. Nine rock-chip samples, one sample gave 0.68 ppm Au. More detailed stream sediment sampling required.
Northern contact (Voyager 6)	Airmagnetic anomaly plus anomalous Au geochemistry in stream sediments and some rock-chip samples. Fifteen stream sediment/pan concentrate samples. Best values 0.9 ppm Au in -80#, five samples >0.1 ppm Au. 22.6 ppm Au in pan concentrate. Up to 7.25 ppm Au in rock-chip samples. Requires further detailed mapping and some geochemical sampling.
Western contact	Some mapping, rock-chip, stream sediment and soil sampling completed. Anomalous Au geochemistry in soils needs gridding, soil sampling and further mapping. Best soil values 0.03 and 0.07 ppm Au. Best stream sediment value 250 ppm. (Penders lies at the centre of a 4 km long zone of Au anomalous stream sediment samples along the western contact.
Penders	Lies on major deformation zone at the contact between Low Rocky Point Granite and Western epiclastic rocks. Twelve stream sites sampled (11 for p.c.). Maximum values -80# Cu 10 ppm, Au 1.07 ppm, Pb, Zn, Ag, As BLD. Pan concentrate maximum Cu 10 ppm, Zn 140 ppm, Ag 46 ppm, Au 365.5 ppm, Pb, As BLD. Rock-chip samples from sulphide-rich rock samples in old workings gave up to 0.675 ppm Au. Samples from magnetite-pyrite beds gave <0.05 ppm Au. This area merits further geological mapping, rock-chip and soil sampling.
<u>Wanderer South</u>	3.15 km of lines cut. Thirteen pan concentrate/stream sediment samples collected, maximum values Au 0.22 ppm (p.c.), 0.13 ppm (-80#). Base metals all weakly anomalous in -80# (Cu 35 ppm, Pb 20 ppm, Zn 65 ppm). B/C soils sampled at 25 m spacing on gridlines. Au <0.01 ppm; anomalous Cu over basic volcanics, As 130 ppm in pyritic shales. Limited rock-chip sampling - 3 samples >0.008 ppm Au, maximum values = Cu 145 ppm, Pb 15 ppm, Zn 45 ppm.
<u>Voyager 18-33 Coastal section</u>	Some stockwork zones, some dolomitic horizons. Minor weakly anomalous rock-chip samples. Au up to 0.055 ppm. High Cu values (up to 2.15%).

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PROSPECT	COMMENTS
<u>Three Creeks Anomaly</u>	Moderate to highly anomalous Au stream sediment geochemistry (pan concentrate) over a 2 km radius zone e.g. 3 to 23 grains of Au, analysed to give 1.2 to 39 ppm Au. Has not had any follow-up. Requires detailed mapping and further geochemical sampling. Zone includes Airmagnetic anomalies 1 and 2.
<u>Upper Hudson River Anomaly</u>	Moderate to highly anomalous Au in pan concentrates from tributaries of Upper Hudson River. Au grain count 3-20 gave analyses of 5-456 ppm. Requires detailed mapping and further geochemical sampling.
<u>Airmagnetic anomaly 3</u>	Magnetic and soil geochemical anomalies coincident over granite/rhyolitic tuff contact. Soil anomaly - 5100 ppm Cu, 98 ppm Pb, 10 ppm As, 0.03 g/t Au. One pan concentrate 9.9 ppm Au. Two anomalous stream sediment samples in vicinity.
<u>Porphyry-Diorite contact</u>	Two adjacent but isolated anomalous pan concentrate samples, surrounded by unsampled? creeks. On fault boundary between dolerite and Elliott Point porphyry. Requires further creek sampling.

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## 1. INTRODUCTION

E.L. 5/94 Lewis River lies in SW Tasmania immediately north of Elliott Bay. The Licence forms an inverted U-Shape and surrounds E.L. 40/85 held by Aberfoyle (Figure 1). This area is underlain by highly prospective equivalents of the Mt. Read Volcanics which host many massive sulphide deposits further north in Tasmania

### 1.1 Licence Details

E.L. 5/94 was applied for on 4 February 1994. An estimated expenditure commitment of \$30,000 for year one and \$50,000 for year two was proposed.

### 1.2 Access

Vehicular access is from Birch Inlet on Macquarie Harbour. Four wheel bikes or bombardiers can be driven thence to the E.L. Helicopter access is feasible from Strathgordon (40 km east). The condition of the Moores Valley airstrip near the northern section of the E.L. is unknown.

### 1.3 Target Models

Several massive sulphide deposits and a gold deposit are hosted by the Mt. Read Volcanics. Five major massive sulphide deposits (Rosebery, Hellyer, Hercules, Mt. Lyell and Que River) plus the Henty gold deposit are found within the Mt. Read Volcanics Belt north of Macquarie Harbour.

The Rosebery-type polymetallic massive sulphides and Mt. Lyell type copper-gold deposits both contain minor gold (3 g/t and 0.4 g/t respectively). The high-grade, structurally-controlled Henty deposit contains 30 - 50 g/t Au.

Strong geological similarities have been noted between the Mt. Read Volcanics and the volcanics further south in the Elliott Bay region and the Lewis River Volcanics are thought to represent a continuation of the Mt. Read Volcanic Belt (Large et al., 1987).

The massive sulphide potential of the Licence area has probably been adequately tested by the previous licence-holders, however the gold potential remains high and incompletely tested.

### 1.4 Summary of Previous Exploration

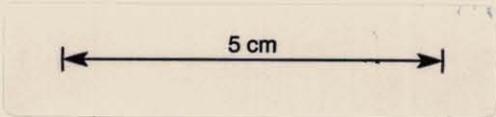
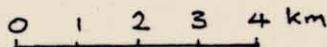
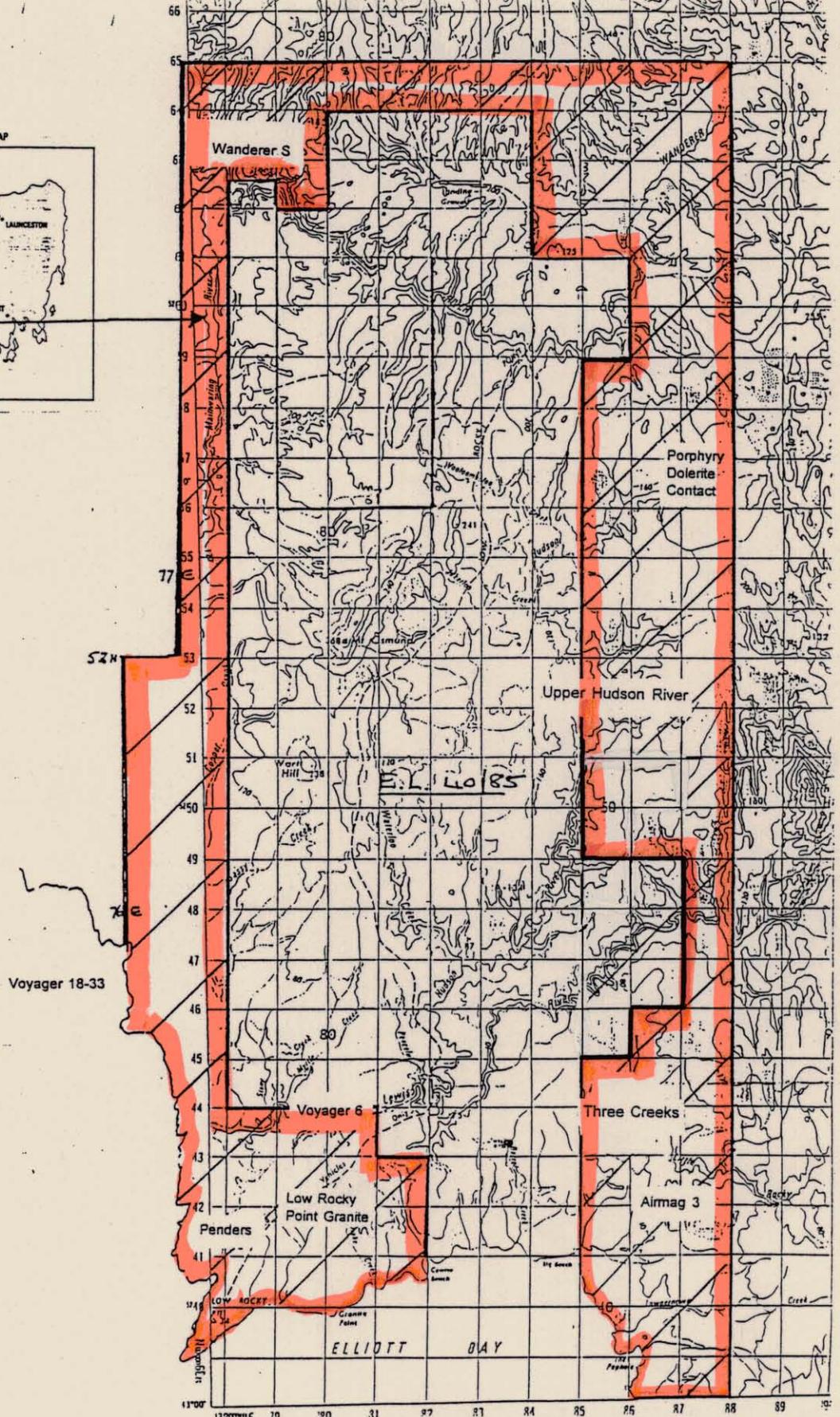
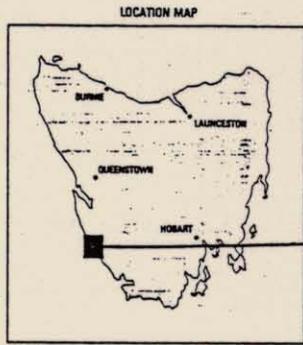
The major exploration in this area has been for massive sulphide mineralisation.

An initial helicopter-borne EM survey by BHP in 1975 was partly followed up with mainly stream sediment geochemistry by Geopeko between 1977-1984. In addition some gridding and bedrock geochemistry was carried out over the potential volcanic succession. Regional geological mapping concentrated on the Cambrian Volcanics.

In 1986 Cyprus Minerals carried out a Dighem survey, a minor part of which overlapped E.L. 5/94. Cyprus carried out further stream sediment sampling and regional geological mapping of selected areas. Computer-processed magnetic imaging and airphoto interpretation of structure were used to produce a lineament map.

In 1991 Aberfoyle carried out a Questem E-M survey.

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LEWIS RIVER E.L. 5/94	
LOCATION OF E.L. 5/94 SHOWING ANOMALOUS AREAS	
Compiled: May 1994	Figure 1

Exploration specifically for gold commenced mid 1986 by Cyprus Minerals and was continued by Aberfoyle until the area was relinquished at the end of 1991.

Only the Penders Prospect in E.L. 5/94 has been drilled, many of the remaining anomalous areas merit at least further geochemical and geological testing.

## 2. REGIONAL GEOLOGY

### 2.1 General

Subsections 2.1.1 through 2.1.5 have been quoted under the same headings from Green, 1990. All his figure references have been deleted.

#### 2.1.1 Mt. Read Volcanics

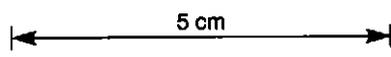
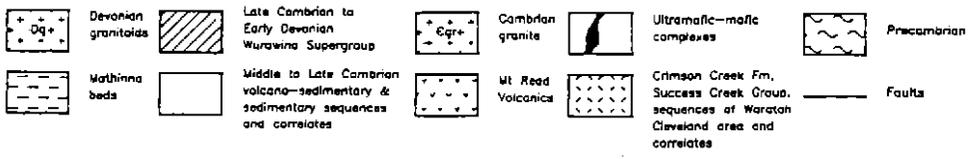
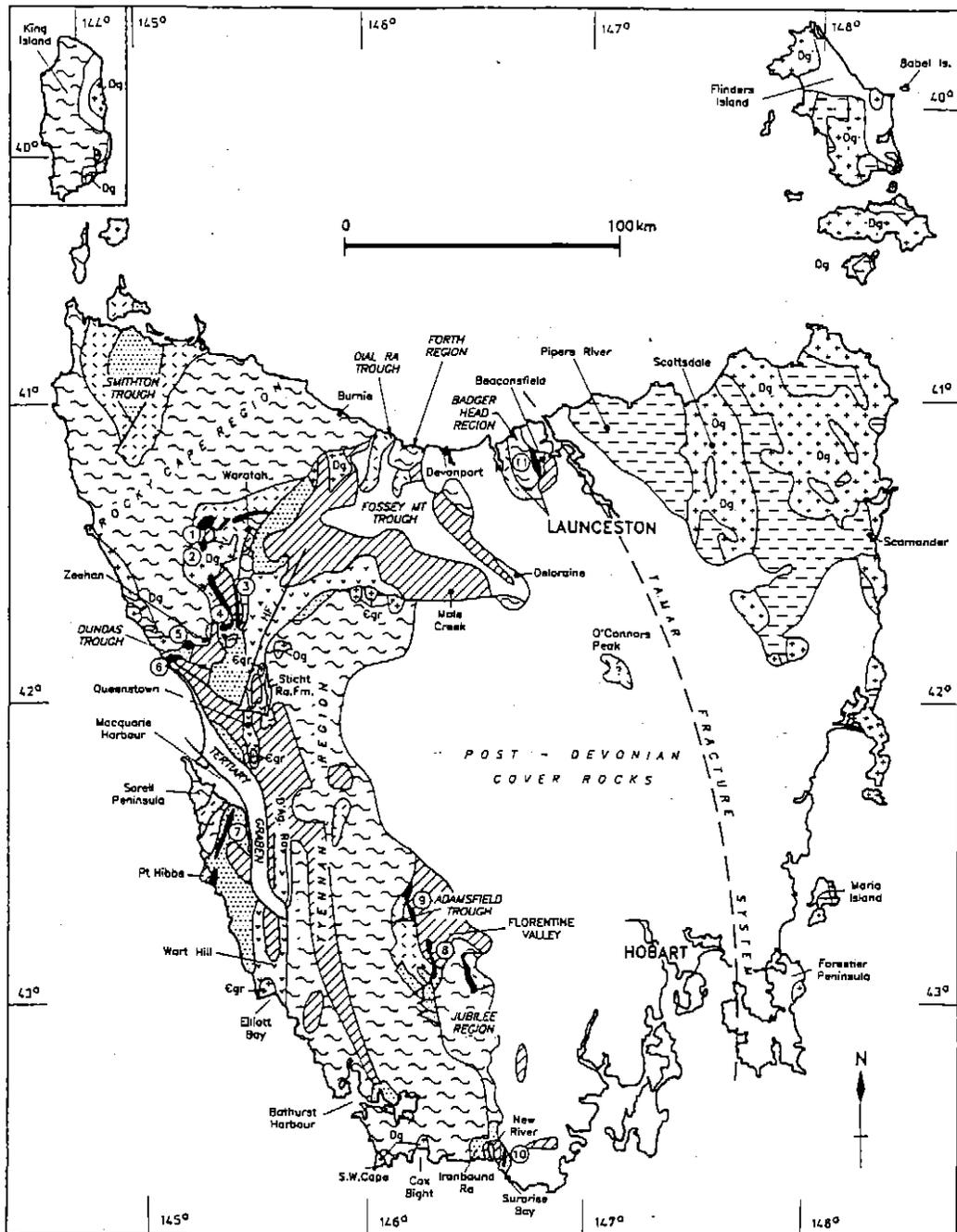
*The Mt. Read Volcanics (named after Mount Read, 2 km east of the Hercules mine), are dominantly calc-alkaline volcanic and intrusive rocks ranging in composition from subordinate basalt and andesite to predominant dacite and rhyolite. They form an arcuate belt wrapping around the western and northern margins of the Tyennan region from Elliott Bay to near Deloraine (Figures 1a and 1b). The age of the volcanics is poorly constrained, but they may be restricted to the Middle and Late Cambrian. The oldest fossils in the volcanics are of late Middle Cambrian age at Que River (Undillan) and at Mount Lyell (Boomerangian) where they occur in units underlain by the bulk of the local volcanic sequences (Gee, Jago and Quilty, 1970; Jago et al., 1972, Corbett, in Corbett and Solomon, 1989; Jago and Brown, in Brown, 1989). Minor felsic and mafic volcanics and intrusives occur within Late Cambrian to Early Ordovician siliciclastic sequences of the Denison Group (Owen Conglomerate and correlatives) which blanket, commonly unconformably, much of the eastern and northern flanks of the Mt. Read Volcanics (Corbett, in Corbett and Solomon, 1989). On the western margin the volcanics either interfinger with, or are faulted against, fossiliferous sedimentary rocks of the Dundas Group and correlatives. No felsic volcanic detritus has been reported from the Crimson Creek Formation or from the oldest units of the Dundas Group, so it appears that the Mt. Read Volcanics may be synchronous with the Dundas Group.*

*In central western Tasmania, the Mt. Read Volcanics are bisected by a major NNE trending fault zone, the Henty Fault, which separates the belt into two different metallogenic and lithological segments. Although movement on the fault was considerable in the Devonian (Berry, 1989), a concentration of tholeiitic dykes in the vicinity of the fault SE of Mount Read strongly suggest it was an active structure in the Cambrian (Corbett and Lees, 1987).*

#### 2.1.2 Mt. Read Volcanics Southeast of the Henty Fault

*Southeast of the Henty Fault the Mt. Read Volcanics have been subdivided into three broad lithological units (Corbett, in Corbett and Solomon, 1989):*

1. *a western volcanic association of sediments, vitric-and crystal-rich volcanoclastics with andesite to dacitic intrusives,*
2. *a central volcanic complex (CVC) composed mainly of rhyolitic to dacitic lavas with a minor proportion of the fine grained sediments, and*
3. *a younger sequence of characteristic quartzphyric pyroclastics, lavas, intrusive porphyries and epiclastic sediments passing upward into volcanoclastic conglomerate and sandstone (the Tyndall Group).*

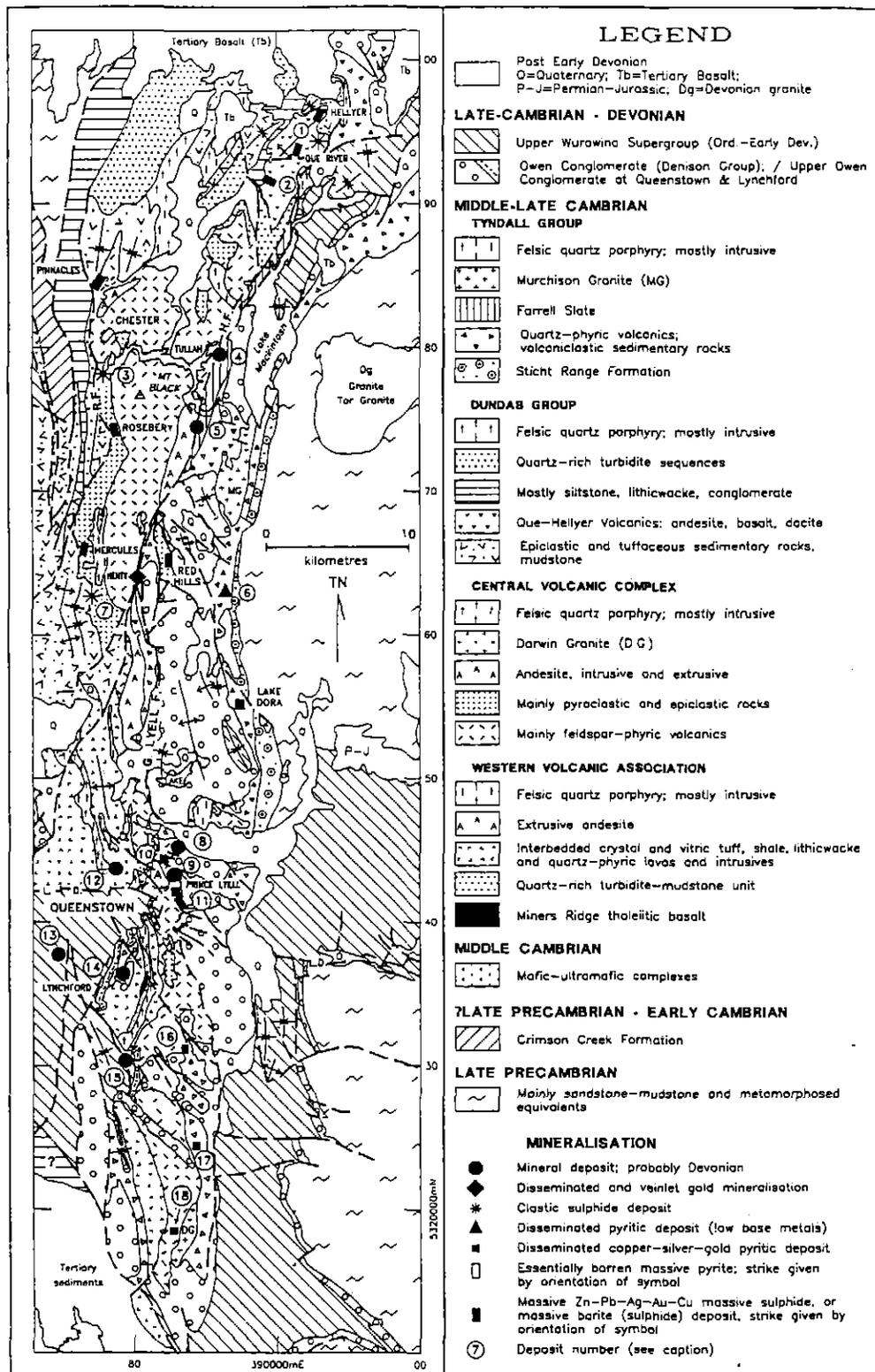


**MACMIN N.L.**

**GENERAL GEOLOGY  
TASMANIA**

(from Green, 1990)

Figure 1a



5 cm

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**SIMPLIFIED GEOLOGY**  
**CENTRAL WEST TASMANIA**

(from Green, 1990)

Figure 1b

The western volcanic association is a subaqueously deposited suite of quartz-feldspar crystal tuff, vitric tuff, mud-stone, shale and epiclastic breccia intruded by a number of sill-like bodies of quartz-feldspar-biotite porphyry, feldspar-pyroxene-quartz porphyry and hornblende-feldspar porphyry. In the Lynchford area, south of Queenstown, the lowest exposed unit is a distinctive low potash ophitic tholeiitic basalt, the Miners Ridge basalt (Corbett, in Corbett and Solomon, 1989), which differs from all other known rocks in the Mt. Read Volcanics in that it is depleted in light rare earth elements (A.J. Crawford, personal communication, in Corbett and Solomon, 1989). It is similar geochemically to the low titanium basalts associated with the mafic-ultramafic complexes (Crawford and Berry, 1988). At the top of the sequence, at its western margin, a calc-alkaline basalt is overlain disconformably by the Tyndall Group. Northwest of Queenstown, the western association is faulted against Dundas Group correlatives along the eastern branch of the Henty Fault. On its eastern margin, the association is overlain by the CVC in the Lynchford area, but north of Queenstown (Corbett, in Corbett and Solomon, 1989).

No diagnostic fossils have been found in the western volcanic association, although on lithological grounds it is most similar to the Dundas Group. Mineralisation is minor: small auriferous quartz veins (e.g. King River, Harris Reward) and barite lodes (e.g. Madam Howard) have been worked in the past. These are probably of Devonian age. Similar gold vein deposits, such as Woody Hill, occur in clastic rocks as young as Early Devonian.

The CVC between Mount Darwin (about 20 km south of Queenstown) and Red Hills consists mainly of feldspar-phyric dacite and rhyodacite lavas, tuffs and agglomerates, with a significant proportion of andesitic tuffs, flows and intrusives in the Queenstown-Tyndall Range area. Clastic sedimentary rocks are comparatively rare and consist of shale, volcaniclastic breccia and sandstone. Distinctive phyric potash rich spherulitic rhyodacite lava occurs in the Mount Darwin area and at Red Hills. In the former area the volcanics are intruded by the Darwin Granite, a coarse grained biotite granite, clasts of which are incorporated into the unconformably overlying Tyndall Group (White, 1975; Corbett, 1981).

Apart from small zinc-lead-copper-silver-gold pyritic massive sulphide deposits at Red Hills and in the Lyell Comstock area, mineralisation in the CVC SE of the Henty Fault is copper dominated. At Mount Lyell (Hills, this publication) the dominant ore type is disseminated chalcopyrite-pyrite in chloritised rhyolite (e.g. Prince Lyell), although massive pyrite-chalcopyrite deposits (e.g. The Blow) have also been important producers. These styles of mineralisation are believed to be of Cambrian age (Markham, 1968; Reid, 1975; Walshe and Solomon, 1981), but bornite rich ores near the faulted contact with the Owen Conglomerate (e.g. North Lyell, Lyell Comstock) and bornite-chalcocite ores in the Gordon Limestone (e.g. Lyell Blocks) may be Devonian in age and may be products of leaching and reprecipitation of pre-existing Cambrian mineralisation (Solomon, Rafter and Jensen, 1969; Arnold and Fitzgerald, 1986; Solomon, Vokes and Walshe, 1987; Hills, this publication).

Numerous disseminated chalcopyrite deposits occur in chloritised felsic volcanics in the Jukes-Darwin area. At East Darwin, disseminated pyrite-chalcopyrite mineralisation occurs in quartz-sericite altered volcanics, and at Prince Darwin pyrite and chalcopyrite occur in stockwork magnetite-hematite veins. The majority of deposit are hosted by chloritised volcanics; at Jukes Proprietary mineralisation extends up into the Tyndall Group (White, 1975; Corbett and Solomon, 1989).

### 2.1.3 Tyndall Group and Underlying Siliciclastic Rocks

The Tyndall Group is most extensively developed between the CVC and the Tyennan region, but it also overlies the western volcanic association near Lynchford. Significant erosion preceded deposition of the Tyndall Group at Mount Darwin. In the Mount Lyell area, the bulk of hydrothermal alteration occurred before deposition of Boomeranngian (late Middle Cambrian) limestone at the base of the group (Green, 1971; Jago et al., 1972; Corbett et al., 1974).

To the west of the Tyennan region the Tyndall Group is underlain by the Sticht Range beds consisting of 1200 m of Precambrian- and felsic volcanic-derived conglomerate, sandstone and mudstone (Baillie, 1989). Correlatives of the Sticht Range beds extend NE of Queenstown discontinuously over 50 km to the north. Probable correlatives also exist to the south.

The Tyndall Group is laterally variable, but a common factor is the quartzphyric nature of the volcanics. Lavas, prophyritic intrusives, pyroclastics and volcanoclastic conglomerate and sandstone are the main rock types. Minor shale and vitric tuff are locally present (Corbett, in Corbett and Solomon, 1989). The groups intruded by biotite-hornblende granodiorite and adamellite dated at  $524 \pm 15$  Myr by K-Ar (McDougall and Leggo, 1965; Adams et al., 1985) and by quartz-feldspar-biotite porphyry (McNeill, 1987; Corbett, in Corbett and Solomon, 1989). The volcanics are overlain conformably by the Farrell Slate which generally consists of highly sheared slate, greywacke, quartz-feldspar bearing tuff, vitric ash and minor lava (McNeill, 1986), although Berry (1989) regards the contact as faulted.

Mineralisation in the Tyndall Group is varied, but deposits are generally small. Copper and lead-silver vein deposits in the area east of the Farrell Slate are probably Devonian, but disseminated pyritic minor base metal mineralisation associated with altered granite and sericitised and chloritised volcanics in the Lake Serlin area (Gulson and Porritt, 1987) and NNW trending, structurally controlled disseminated pyrrite-chalcopyrite deposits hosted by chloritised volcanics in the Lake Dora area are probably Cambrian in age.

The most significant deposit in the Tyndall Group is the Henty prospect, where gold mineralisation occurs over a strike length of 600m in pyritic schistose volcanics in the footwall of the Henty Fault. The mineralisation is mainly in narrow veins and massive pyrite (Little River Goldfields N.L., 1988). On the basis of lead isotope ratios, a Cambrian origin for some of the mineralisation is indicated, but a contribution from radiogenic lead from the country rock during Devonian plutonism or post-Cambrian metamorphism cannot be ruled out (Gulson and Porritt, 1987). Modelling of gravity data suggests that the top of the Devonian granite is some 6 km below the surface in the area (Leaman and Richardson, 1989), so significant input from granite derived fluids appears to be unlikely.

### 2.1.4 Areas South of Macquarie Harbour

In the D'Aguilar Range conglomerate, largely of Precambrian derivation with a minor volcanoclastic component, overlies Tyennan basement. Succeeding quartzphyric rhyolite, tuff and intrusive porphyry are unconformably overlain by polymict conglomerate, sandstone, tuff and shale beneath the Owen Conglomerate (I.D. Martin, unpublished data, 1974). Further south in the Elliott Bay area, the Lewis River Volcanics comprise quartz-feldspar porphyry lavas, pyroclastic breccias and tuffs with horizons of siltstone, volcanoclastic sandstone. Precambrian-derived conglomerate and black shale, which face west and are succeeded, apparently conformably, by Pleasant Creek Formation mudstone, felsic epiclastic breccia and sandstone, and sedimentary breccia. In the same area the Lewis River volcanics are unconformably overlain by volcanoclastic conglomerate, sandstone and pyritic black shale which are succeeded by the Owen Conglomerate (Large, Herrmann and Corbett,

1987). Pre-kinematic biotite granite plutons intrusive into the Lewis River Volcanics are probable of Cambrian age (Mcdougall and Leggo, 1965). Mineralisation has been discovered at a number of localities, the most significant of which is at Wart Hill where small pods of zinc-lead-silver-gold rich massive sulphides occur (Large, Herrmann and Corbett, 1987).

Correlation of the rocks of the Elliott Bay and D'Aguiar Range areas is problematical; they are most probably equivalent to the Tyndall Group (Corbett, in Corbett and Solomon, 1989).

A belt of calc-alkaline quartz-feldsparphyric felsic volcanics and andesitic lava and breccia, locally intruded by diorite, the Noddy Creek Volcanics, occurs south of Macquarie Harbour (White, 1975; McClenaghan and Corbett, in Corbett and Solomon, 1989).

#### 2.1.5 Volcanics West of the Henty Fault

To the NW of the Henty Fault an east facing sequence of pumice rich pyroclastic and epiclastic rocks, the Primrose Pyroclastics, is the oldest unit of the CVC. In the Rosebery area, the Primrose Pyroclastics consist of a lower felsophyric pumice rich pyroclastic unit, several hundred metres thick, overlain by siltstone which hosts the Rosebery orebody, black slate with horizons of epiclastic sandstone and rarer beds of Precambrian-derived graded sandstone, and an upper unit which is dominated by quartz-feldsparphyric, mass flow, epiclastic breccia with clasts and rafts of slate (Green, Solomon and Walshe, 1981). In the Bastvan Dam area 4 km north of Rosebery, the breccia contains outsize rafts of massive sulphide. The lowest unit, the footwall pyroclastics, is extensively altered in the Rosebery and Hercules mine areas to quartz-sericite-chlorite-pyrite assemblages which represent the feeder pipes to the overlying massive sulphide orebodies (Lees et al., this publication). Significant gold mineralisation has been defined 1 km south of Hercules (North Broken Hill Limited, 1987).

The Primrose Pyroclastics are overlain to the east by the lava dominated dacitic and andesitic Mount Black Volcanics which are truncated to the east by the Henty Fault. The Rosebery Fault thrusts the Primrose Pyroclastics over Dundas Group correlatives to the west, the lowest unit of which is the White Spur Formation. To the south of the Hercules mine, the White Spur Formation overlies the Primrose Pyroclastics with a transgressive, and in places erosional, contact and locally contains clasts of massive sulphides and altered volcanics at its base (Corbett and Lees, 1987).

North of the Bastvan Dam, there is an abrupt change in the style of volcanism which probably marks the northern margin of the Rosebery-Hercules volcanic centre. To the north, felsophyric lavas and tuffs host a lens of bedded pyritic chert and massive pyrite at the Chester mine which has been exploited as a source of sulphur. Further north again, an andesite body is overlain by a complex sequence of lavas, some of which are quartzphyric, shales, chert and tuff. Small lenses of zinc-lead-silver-gold rich massive sulphide and disseminated mineralisation, strongly disrupted by faults subsidiary to the adjacent Rosebery Fault, occur within the shales and cherts at The Pinnacles (Gregory, 1986; Corbett, in Corbett and Solomon, 1989). To the north of Mount Block, felsophyric acid lavas and pyroclastics are folded into a broad anticline and are overlain by Dundas Group greywacke, vitric tuff and mudstone along a probable faulted unconformity, although elsewhere the contact is apparently unfaulted (Komyshan, 1986).

The sedimentary sequence underlies the Que-Hellyer Volcanics which consist of basaltic, andesitic and subordinate dacitic lavas and less frequent volcanoclastic rocks. The unit shows remarkable thickness variations, from 600 to 1000 m in the Que River area (Corbett, in Corbett and Solomon, 1989) to a few metres at 2.5 km NW of Hellyer (Vicary and Pemberton, 1988), a feature indicative of volcanism in an active tectonic environment, possibly a caldera setting. The Que River and Hellyer orebodies (McArthur and Dronseika, this publication) are located at the contact between lower altered andesite and overlying

polymict volcanoclastics. Evidence for local fault control of mineralisation is present at both deposits (Mc Arthur, 1986; Large et al., 1988). Between Que River and Hellyer the volcanoclastic unit locally contains large clasts of massive sulphide. In the Hellyer area the volcanoclastic unit is overlain by pillowed, hyaloclastic and sheet basalt flows (McArthur, 1986), which form the upper-most unit of the Que Hellyer Volcanics. The basalt passes conformably upward into the Que River shale with local development of peperite at the contact. The overlying quartzphyric epiclastic breccia, greywacke turbidite, shale and siltstone sequence is intruded by sill-like to slightly transgressive quartz-feldspar porphyry bodies (Komyshan, 1986). To the north this sequence includes major proportions of vitric tuff and pumiceous epiclastic tuff and breccia and is followed conformably by correlatives of the Tyndall Group (Vicary and Pemberton, 1988). To the west of the Que River area the upper units of the Dundas Group are predominantly siliciclastic and carbonate bearing (Collins, Gulline and Williams, 1981; Green, 1983).

## 2.2 Mt. Read Volcanics - South to North Correlation

The correlation of Mt. Read Volcanics in the Lewis River - Elliott Bay area to subdivisions within the northern Mt. Read Volcanics is uncertain and controversial. Whether such correlations are meaningful in terms of prospectivity for mineral deposits is also controversial.

Large in Large et al., (1987) noted

*correlation of the relatively simple sequence at Elliott Bay with the complex sequence in the Mt. Darwin-Que River area is problematic and difficult to resolve with certainty. There seems little doubt that the Lewis River Volcanics represent a continuation of the Mt. Read Volcanic belt, since the rocks are petrologically similar and occupy the same geographic-stratigraphic position at the margin of the Tyennan Precambrian block and underlying the Owen Conglomerate.*

*In terms of correlation with the three main subdivisions of the northern part of the belt, Large and Wilson (1982) equated the Lewis River Volcanics with the central volcanic sequence, and the Waterloo Creek Group with the Tyndall Group. This was based on the fact that the centrally located Lewis River Volcanics are dominated by rhyolitic pyroclastics, lavas, subvolcanic intrusions, and granitoids broadly similar to those in the central volcanic sequence, whereas the Waterloo Creek Group consists of epiclastics and quartz porphyritic tuff unconformably overlying the central volcanic sequence in a manner similar to the Tyndall Group. However, the typical albite porphyritic rhyolites and dacites which dominate the central volcanic sequence in the Lyell-Murchison area do not appear to be present at Elliott Bay. Whether this is due to non development, burial by younger volcanics, or a facies change to quartz-feldspar porphyritic rocks is uncertain.*

Corbett in Large et al (1987) favoured an alternative correlation and

*equates the Lewis River Volcanics with the Tyndall Group exposed along the eastern margin of the belt in the vicinity of Mt. Murchison. Here, a basal conglomerate-sandstone-shale unit (Sticht Range Beds) sits unconformably on the Precambrian rocks (as is also the case near D'Aguiler Range) and passes up into sequence of quartz-feldspar porphyritic volcanics, intrusions, and volcanoclastic conglomerates. The sequence is intruded by the subvolcanic Murchison Granite of Cambrian age, which may be equivalent to the Low Rocky Point granite. Near its faulted western margin, the Murchison volcanic sequence passes gradationally into a unit of slate and volcanogenic sandstone (the Farrell slates), a sequence resembling the Pleasant Creek Formation. The sub-Owen Conglomerate sequences in both areas are also similar, beginning with a basal volcanoclastic unit (generally thicker and more sandstone rich at Elliott Bay), followed by a siltstone-sandstone unit (only locally present in the Murchison-Lyell area), and capped by the typical siliceous conglomerate.*

Large in Large et al 1987 comments further

*If this correlation of the Lewis River Volcanics with the Tyndall Group is correct, it provides further evidence that massive sulfide mineralisation has occurred in the younger part of the Mount Read Volcanic belt, originally thought to be relatively unmineralised.*

Corbett (1992) revised his opinion and equated the Elliott Bay volcanics to the Eastern Sequence in the Mt. Murchison area. In this area the Eastern Sequence comprises a belt of mainly quartz feldspar porphyritic volcanic, intrusive and volcanoclastic beds overlying the Sticht Range Beds to the east and north of Mt. Murchison. He also equated the Waterloo Creek Group with the Tyndall Group.

McPhee and Allen (1992) recently concluded that the Tyndall Group rocks may be prospective for massive sulphides. This conclusion impacts on the Lewis River area as there are numerous airborne EM and geochemical anomalies within Tyndall Group correlates. McPhee and Allen (1992) state:

*sea floor hydrothermal systems responsible for the massive sulfide mineralisation in the Mount Read Volcanics operated in a variety of volcanic hosts and settings. In particular, the volcanoclastic facies associations that dominate the western volcano-sedimentary sequences and the Tyndall Group may be as prospective as the formations dominated by lavas (Central Volcanic Complex, Que-Hellyer Volcanics). In fact, such a volcanoclastic association hosts the Hercules and Rosebery massive sulfide deposits. These volcanoclastic associations also offer a means of eventually establishing correlations within the Mt. Read Volcanics that will constrain the relative ages of the known ore deposits. For example, correlation of the lower part of the Southwell Subgroup, the White Spur Formation, and the upper part of the Hercules-Rosebery volcanoclastic sequence would imply that the mineralisation at Hellyer is lower in the stratigraphic pile than that at Hercules-Rosebery. Existing understanding suggests the reverse.*

Whether the above correlations have any significance in terms of the prospectivity of E.L. 5/94 is entirely conjectural, however, we do know that massive sulphides of similar composition to Rosebery and significant gold both occur in the Elliott Bay area.

The southern sections of the Mt. Read Volcanics may be as prospective as the northern belt and are likely to yield significant deposits with sustained exploration.

### 2.3 **Comparison of Mt. Read Volcanics to other Eastern Australian Areas**

Large et al (1987) and Large (1987) compared VMS deposits from the Mt. Read Volcanics in Tasmania with others throughout Eastern Australia, and the metal value of Tasmanian deposits with other deposits throughout Australia. Some of his figures are now a little out of date (Hellyer is larger and the Henty high grade gold deposit should be added) but his conclusions are still valid.

Large et al (1987) concluded

*Of the 42 known deposits (in Eastern Australia), 19 are in the Cambrian Mt. Read Volcanics of Tasmania: these make up 62% of the total tonnage. The major types of deposits in the Mt. Read Volcanics are: (1) lead-zinc-rich polymetallic (Pb, Zn, Cu, Ag & Au) ore deposits such as Rosebery, Hercules, Que River, and Hellyer and (2) copper rich massive and disseminated ore deposits such as Prince Lyell and North Lyell. The polymetallic ores average 21% combined Pb+Zn plus 160 g/t Ag and 3 g/t Au and the mean size is about 10 million tonnes; therefore they represent an extremely attractive exploration target.*

Rosebery and Hellyer are (were) both about 20M tonnes.

Large (1987) also stated

*the Tasmanian deposits are generally the largest and certainly the richest of all Australian deposits. The reason that the Tasmanian ores have a higher in ground dollar/tonne value than ores from all other major districts is due to the fact that they are rich in five separate metals: lead, zinc, silver, gold and copper. On a global basis the Western Tasmanian Volcanic province ranks with the other top class volcanogenic massive provinces including the Abitibi (E. Canada), Bathurst (New Brunswick) and Scandinavian mineral provinces.*

### 3. SUMMARY OF DEPOSITS HOSTED BY THE MOUNT READ VOLCANICS

- 3.1 **Hellyer** (no text, figure only)
- 3.2 **Rosebery** (no text, figure only)
- 3.3 **Que River** (no text, figure only)
- 3.4 **Hercules** (no text, figure only)
- 3.5 **Mount Lyell** (no text, figure only)
- 3.6 **Henty** (no text, figure only)
- 3.7 **Elliott Bay Mineral Occurrences**

Large (1987) describes prospects in the Elliott Bay area as follows:

*In the Elliott Bay region, for example, seventeen significant mineralised zones have been defined in the recent Geopeko exploration program. The most significant prospects are shown in Figure 2, Three of these prospects are worthy of specific comment.*

- (1) *At Voyager 19 a series of small lenses of high grade lead-zinc-silver-gold mineralisation were discovered in rhyolitic volcanics. High grades of metals (13.9% lead, 21.9% zinc, 680 ppm silver and 0.8 ppm gold) were obtained from surface trenches exposing the mineral deposit. Recent studies by research geologists at the University of Tasmania indicate that the geological and geochemical characteristics of this mineralisation are identical to the major deposits at Rosebery and Hellyer.*
- (2) *At Voyager 24 where a region of low grade gold mineralisation has been defined in the initial exploration program. Preliminary drilling intersected gold grades up to 17.5 ppm Au, and suggest the possibility of a style of gold mineralisation previously unknown for the Mount Read Volcanic Arc.*
- (3) *At Voyager 12 where current exploration indicates an extensive area of gold mineralisation.*

*Aberfoyle now holds the Elliott Bay E.L. and we are not aware of the results of their exploration programs.*

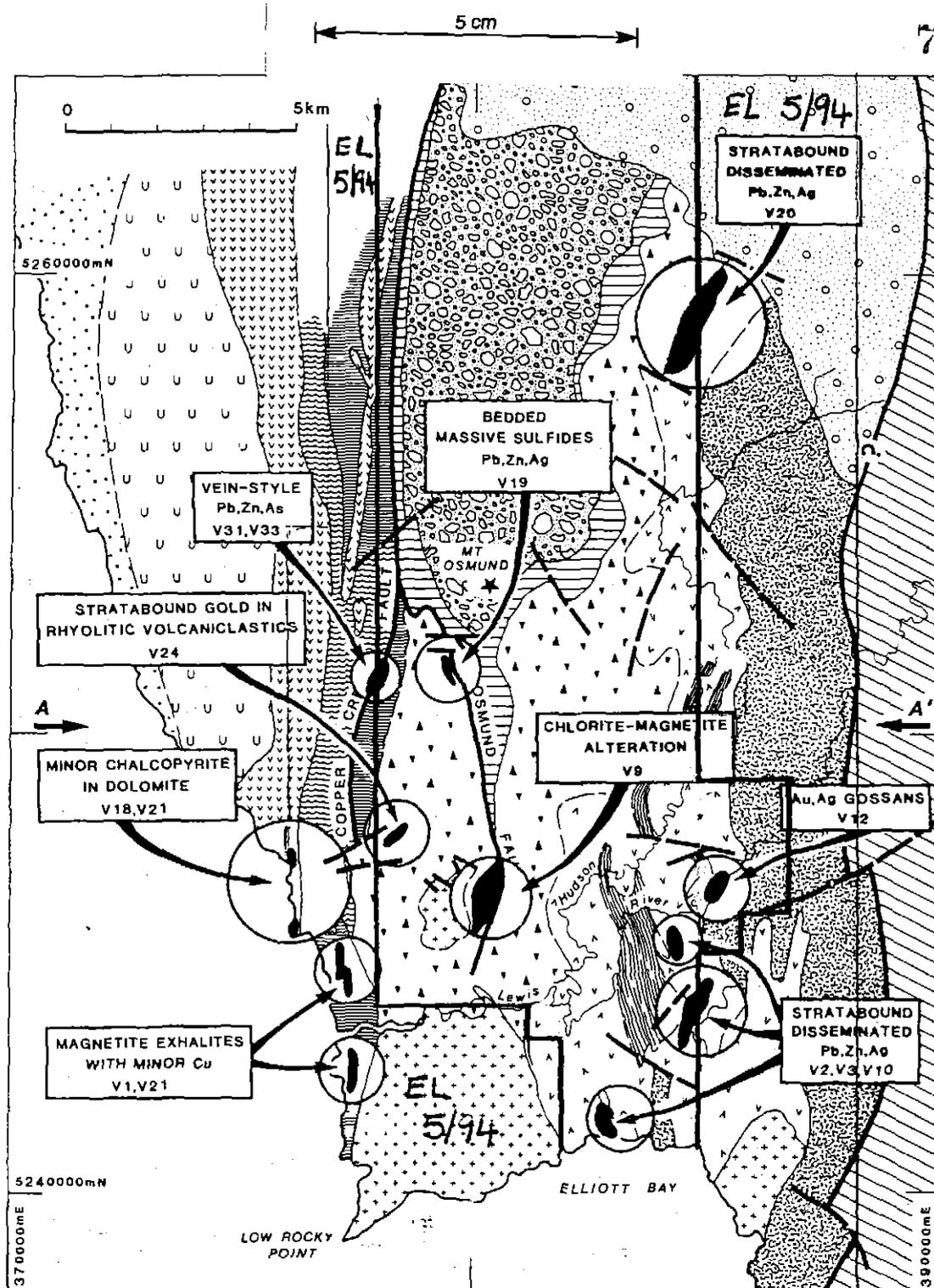


FIG. 2 Location of various types of mineralization in the Elliott Bay area. See Figure 3 for explanation of patterns.

Average Metal Grades in the Major Mineralization Types at Elliott Bay

Style	Sampled thickness (m)	Pb (%)	Zn (%)	Cu (%)	Ag (ppm)	Au (ppm)	As (ppm)
<b>Wart Hill Pyroclastics</b>							
Massive sulfides							
Voyager 19 Lens A	4	10.2	17.9	0.16	138	0.6	200
Lens B	3	13.9	21.9	0.20	680	0.8	160
Disseminated gold (V24)	53					0.15	
	3 <sup>1</sup>					17.5	
<b>Hudson River Pyroclastics</b>							
Disseminated Pb-Zn-Ag (V2, V3, V10)	5	2.2			29		
Gold-silver gossans (V12)		0.4	0.02	0.23	100	24.0	5,000
<b>Western sequence</b>							
Vein-style Pb-Zn-As (V31, V33)	10	1.28	2.23	0.1	27	0.2	14,000

<sup>1</sup> 3-m high-grade intersection in drill hole V24/3

<sup>2</sup> Represents an average of random rock chip samples of gossans

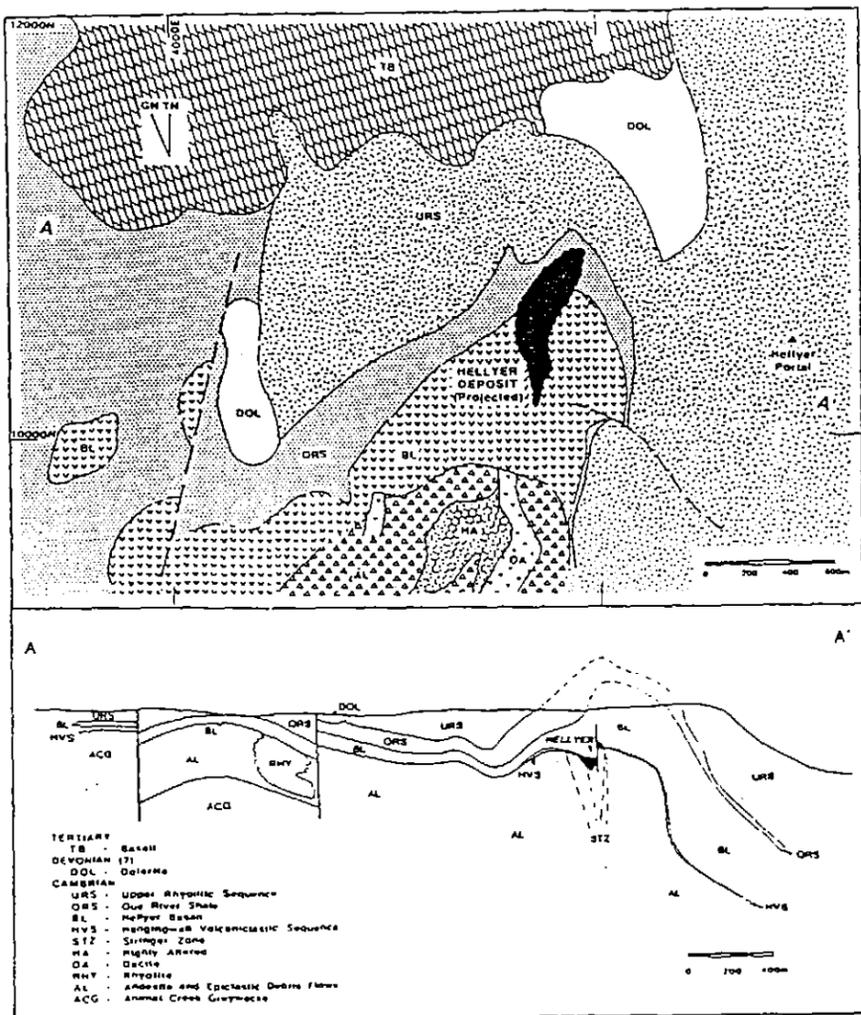


FIG. 2. Surface geology, plan view and cross section, surrounding the Hellyer deposit. TN = true north, GN = grid north.

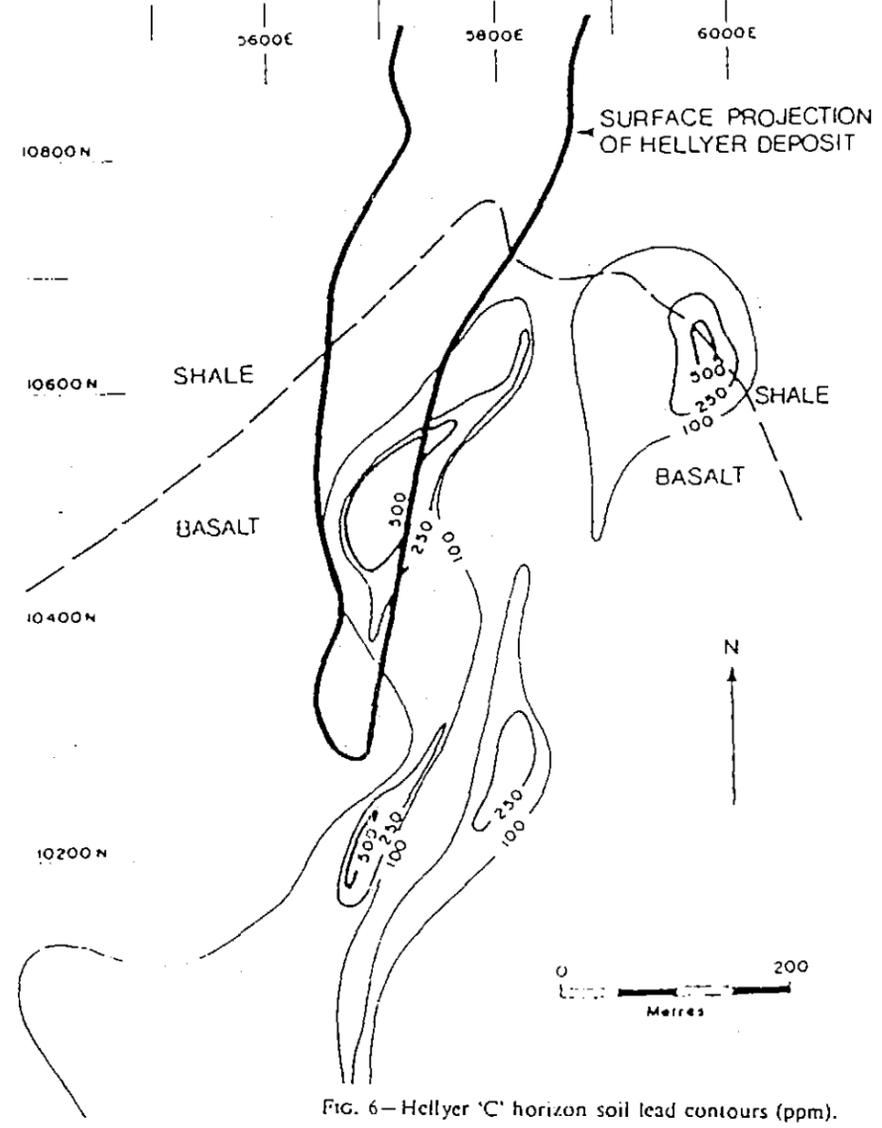


FIG. 6 - Hellyer 'C' horizon soil lead contours (ppm).

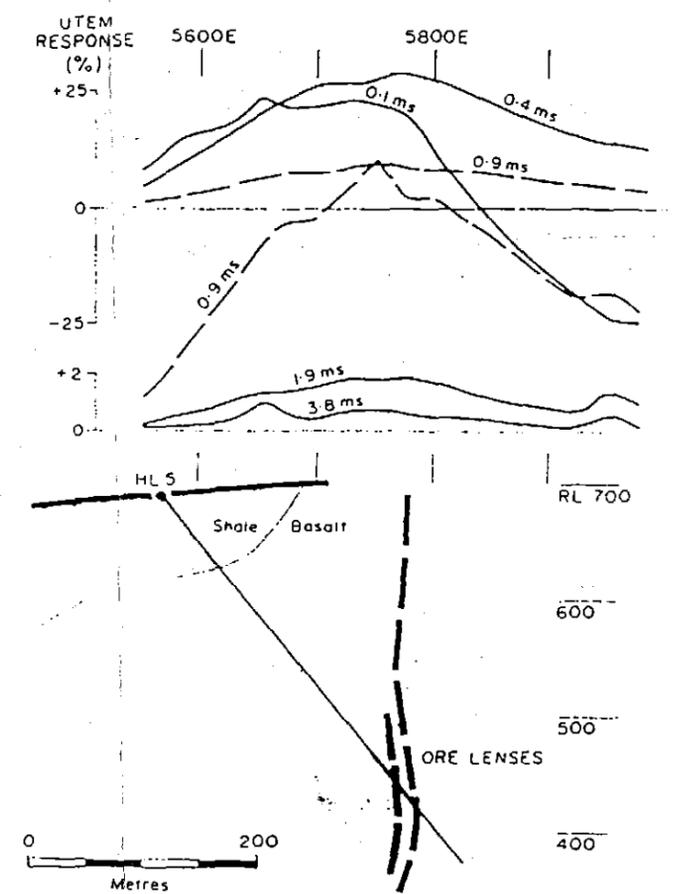


FIG. 11 - Hellyer UTEM response (vertical component) cross section 10700N.

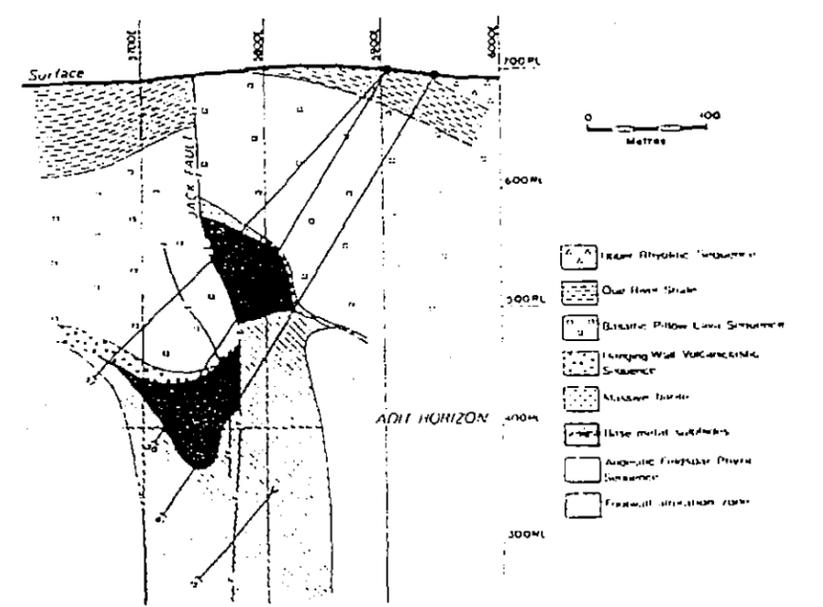


FIG. 3 - Hellyer cross section 10750N.

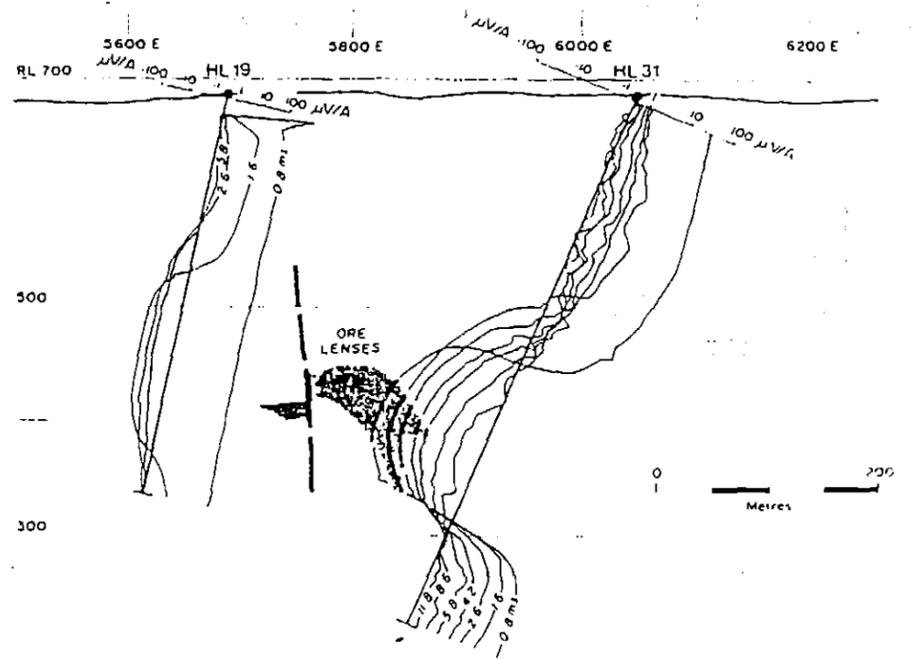


FIG. 12 - Hellyer downhole SIROTEM cross section 10900N.

**MACMIN N.L.**

**HELLYER DEPOSIT**  
**GENERAL CHARACTERISTICS**

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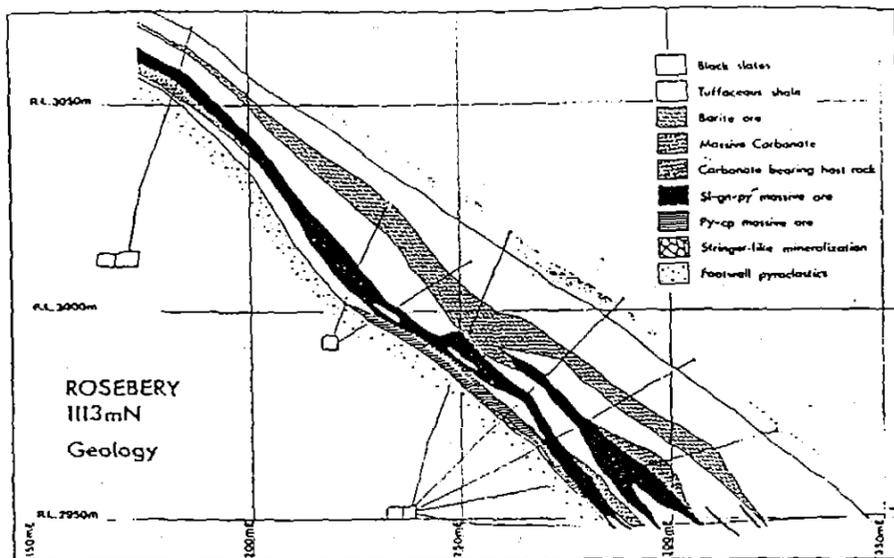


FIG. A Geology of section 1113 mN.

Types of Mineralization in the Rosebery North End (compiled from Brathwaite, 1974; Green et al., 1981; and this study)

Type of mineralization	Distribution	Ore minerals		
		Major	Minor and trace	Cangaue minerals
Pyrite-chalcopyrite massive sulfide	Discrete pods at the base of massive sphalerite-galena-pyrite ore	Pyrite and chalcopyrite	Sphalerite, galena, arsenopyrite, tetrahedrite, kobeinite, cosalite, bismuth, pyrrhotite, and electrum	Chlorite, quartz, and lesser carbonate and sericite
Sphalerite-galena-pyrite ore	Stratigraphically above and laterally away from pyrite-chalcopyrite	Sphalerite, galena, and pyrite	Chalcopyrite, arsenopyrite, tetrahedrite, magnetite, electrum, and argenite	Chlorite, quartz, carbonate, and sericite
Massive barite mineralization	Stratigraphically above massive sphalerite-galena-pyrite ore	Sphalerite and galena	Pyrite, chalcopyrite, tetrahedrite, electrum, and boumonite	Barite, quartz, allite, sericite, and carbonate
Distal pyrite mineralization	At the edges of and stratigraphically above massive sphalerite-galena	Pyrite	Sphalerite, galena, chalcopyrite, tetrahedrite, and electrum	Quartz, sericite, chlorite, and carbonate
Remobilized sulfide mineralization	Veins adjacent to or within fine-grained massive sulfide	Galena, chalcopyrite, sphalerite, and pyrite	Tetrahedrite, meneghinite, pyrrargyrite, jordaniite, boumonite, and electrum	Quartz and carbonate

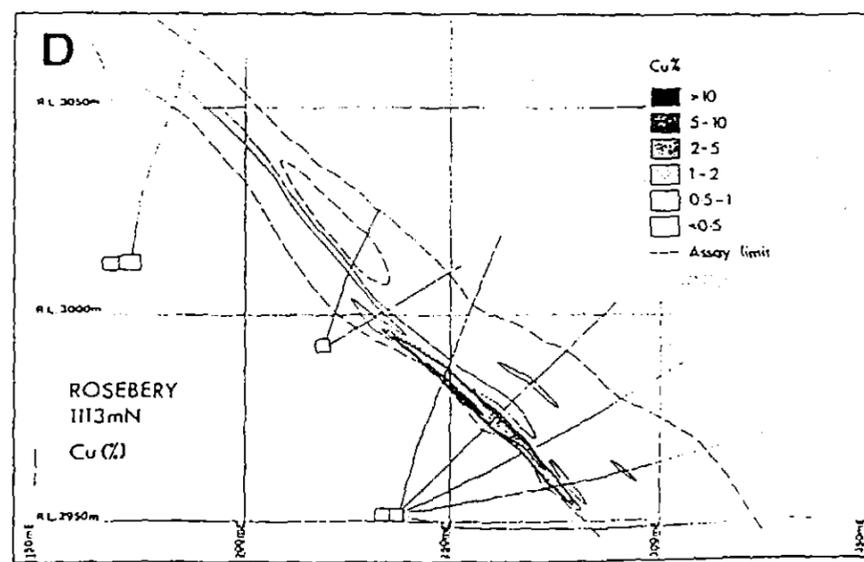
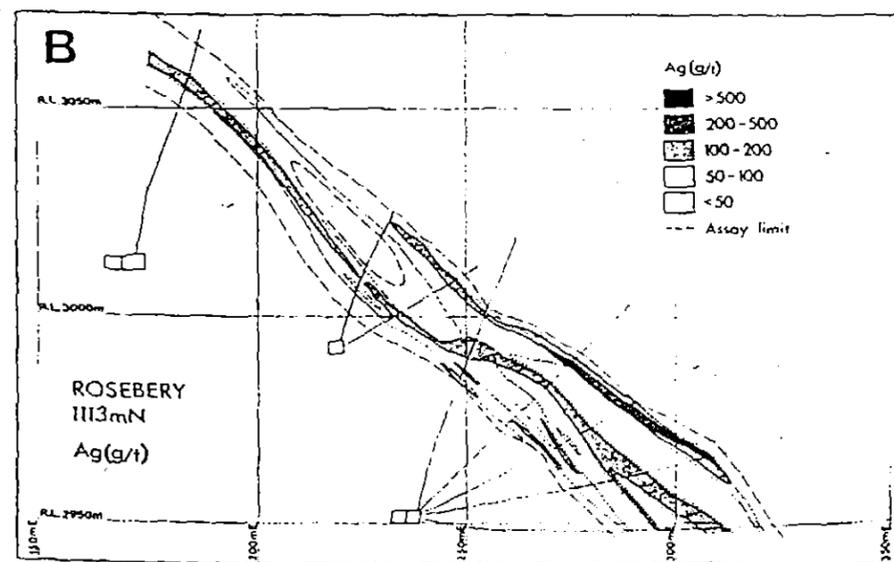
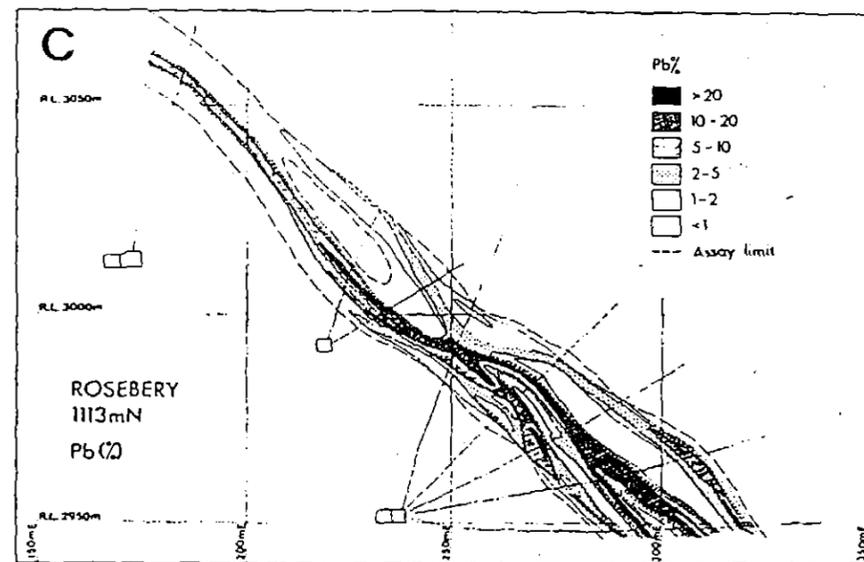
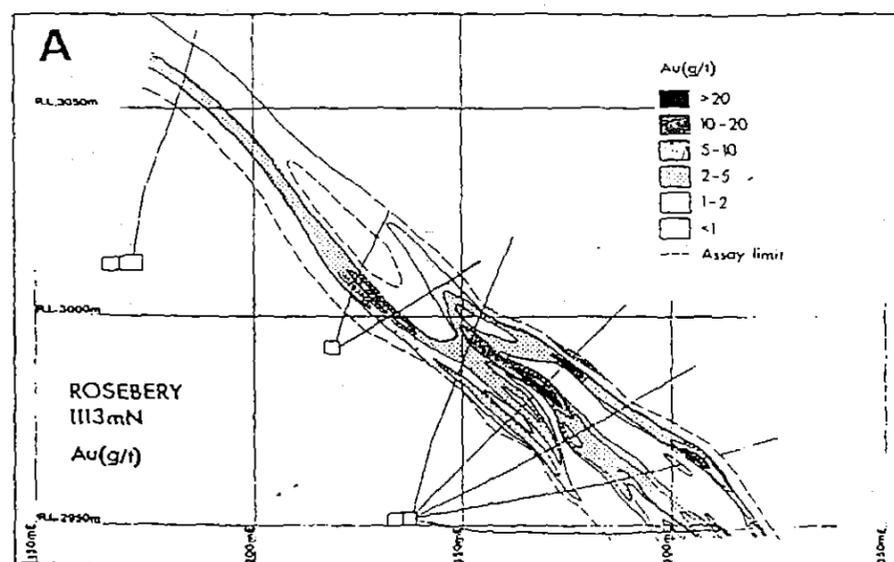


FIG. B. Metal distributions along section 1113 mN (a) gold, (b) silver, (c) lead, and (d) copper.

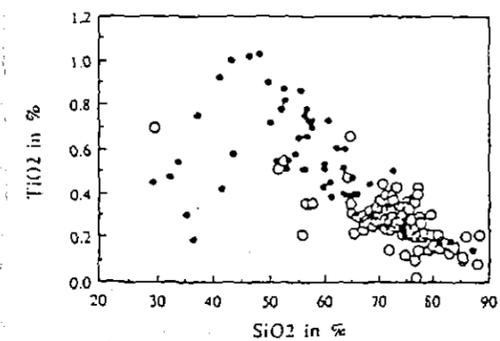
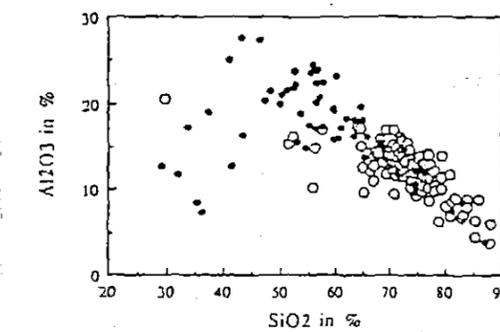
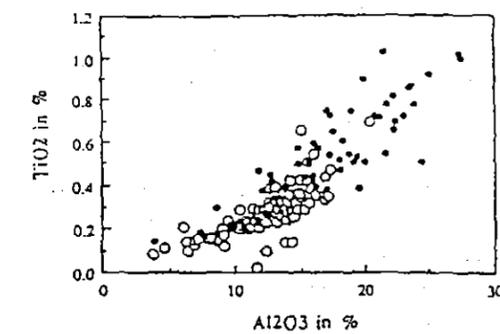


Figure C. Relation between SiO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub> in the host rock and footwall pyroclastics (based on XRF data by Smith, 1975, and Naschwitz, 1985). ● host rock, ○ footwall

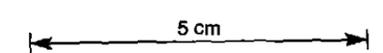
**MACMIN N.L.**

**ROSEBERY DEPOSIT**

**GENERAL CHARACTERISTICS**

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3.2



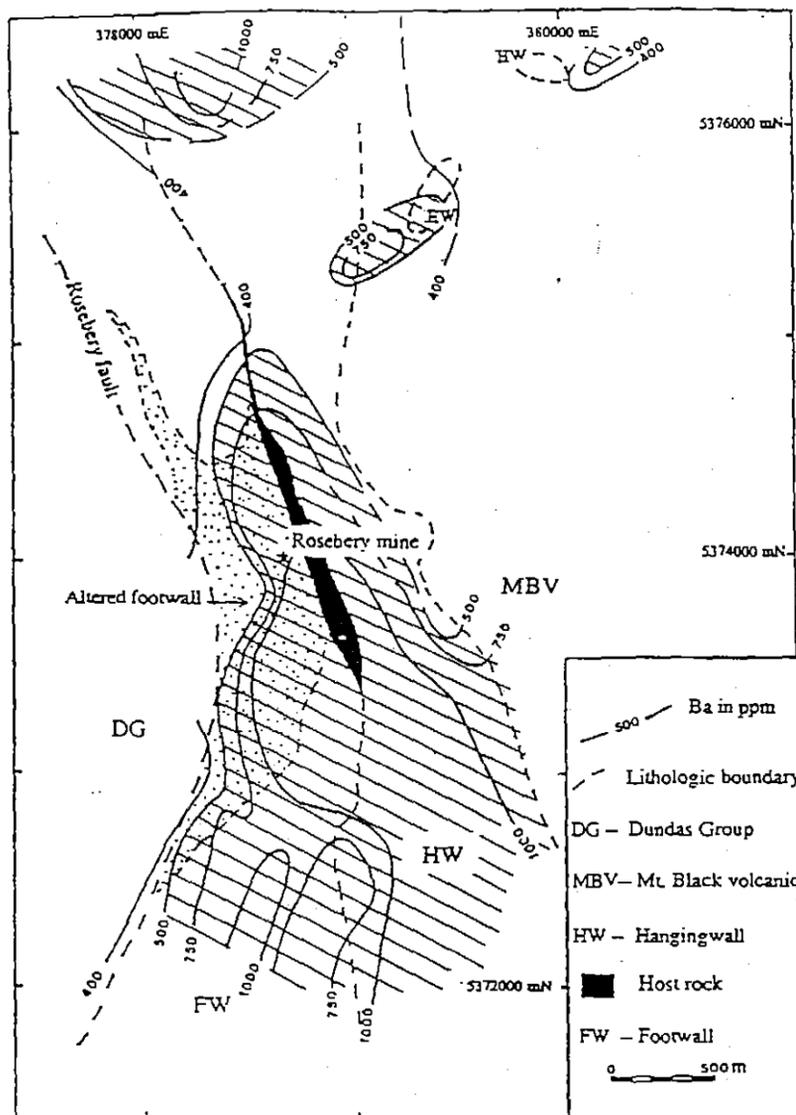


Figure A

Distribution of Ba in the rocks of the Rosebery mine area. Data based on re-analysis by PIXE of the surface rock samples originally collected by Naschwitz (1985). (Geology modified after Lees, 1986).

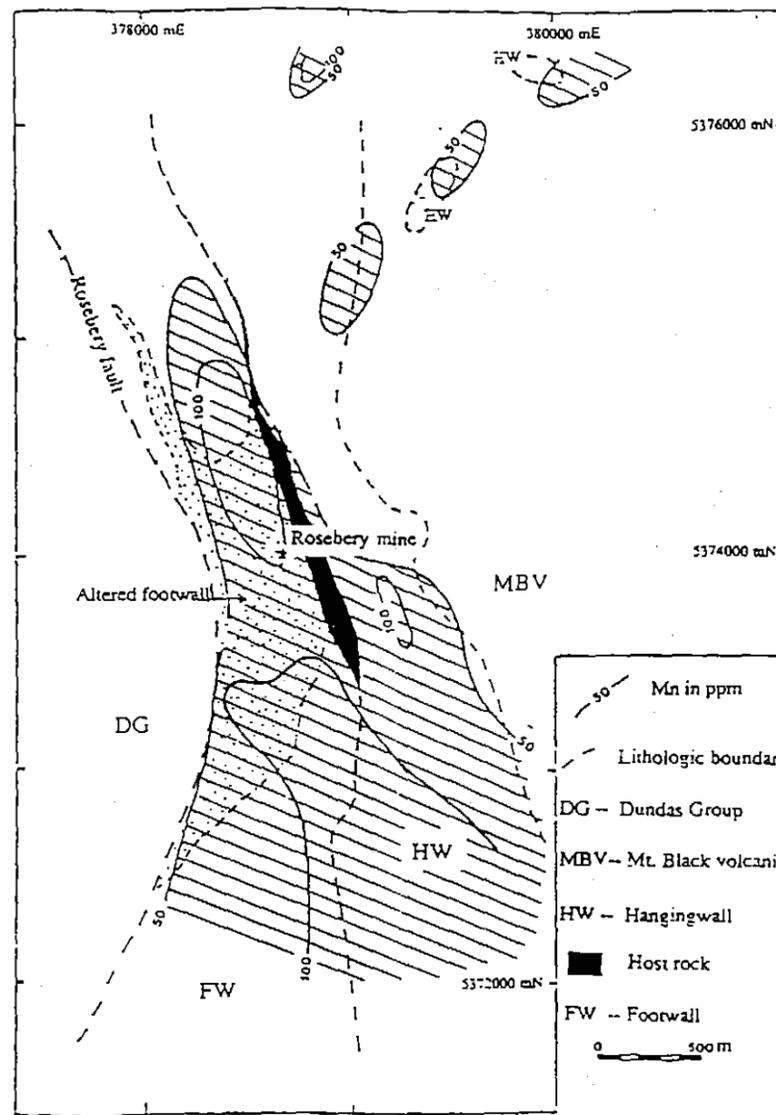


Figure B

Distribution of Mn in the rocks of the Rosebery mine area. Data based on re-analysis by PIXE of the surface rock samples originally collected by Naschwitz (1985). (Geology modified after Lees, 1986).

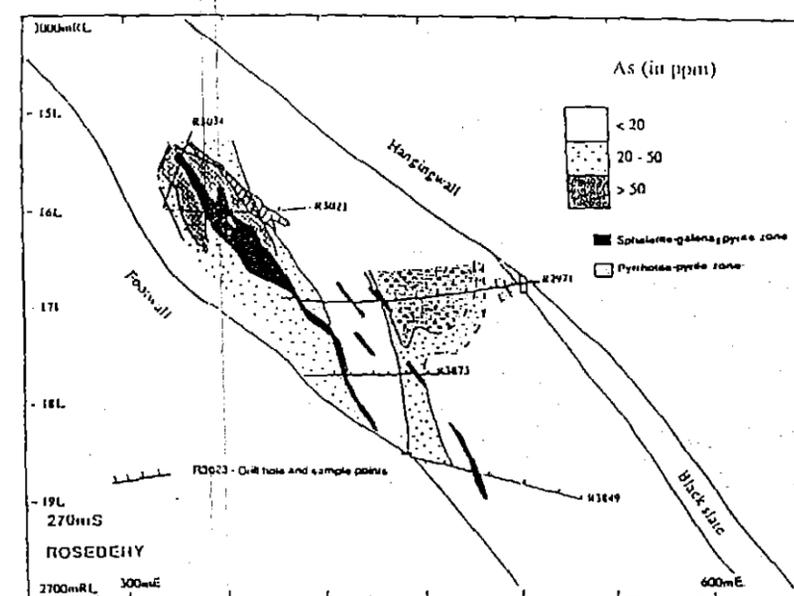


Figure C. Variation of As in the host rocks from 270 mS section, Rosebery deposit. (Ore zones modified after Khin Zaw et al., 1988).

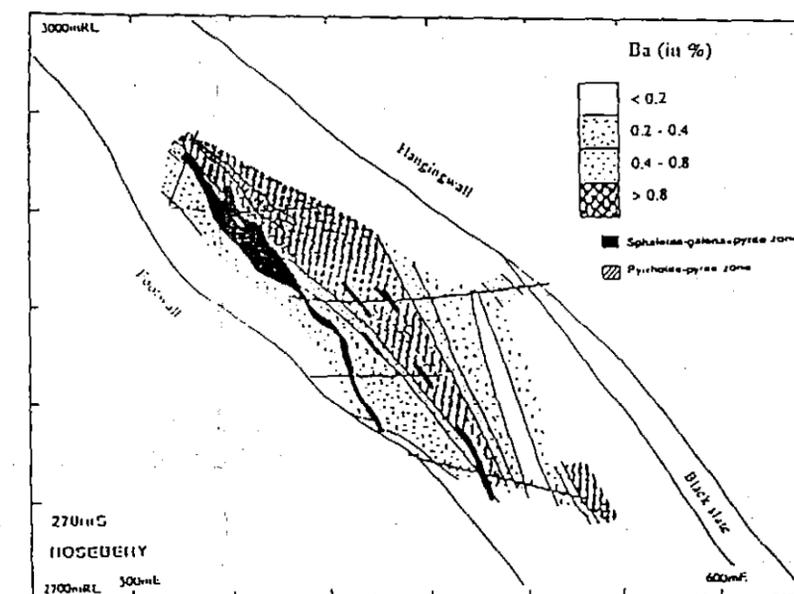


Figure D. Variation of Ba in the host rocks from 270 mS section, Rosebery deposit.

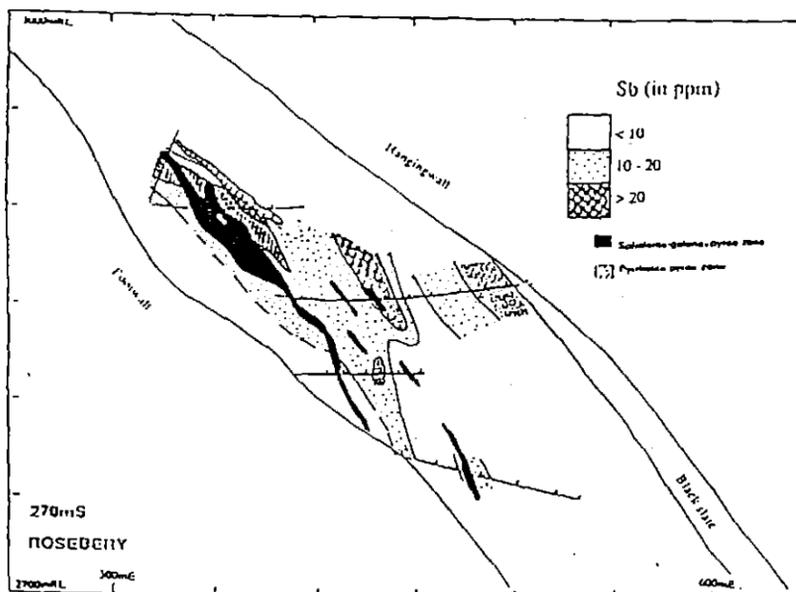


Figure E. Variation of Sb in the host rocks from 270 mS section, Rosebery deposit.

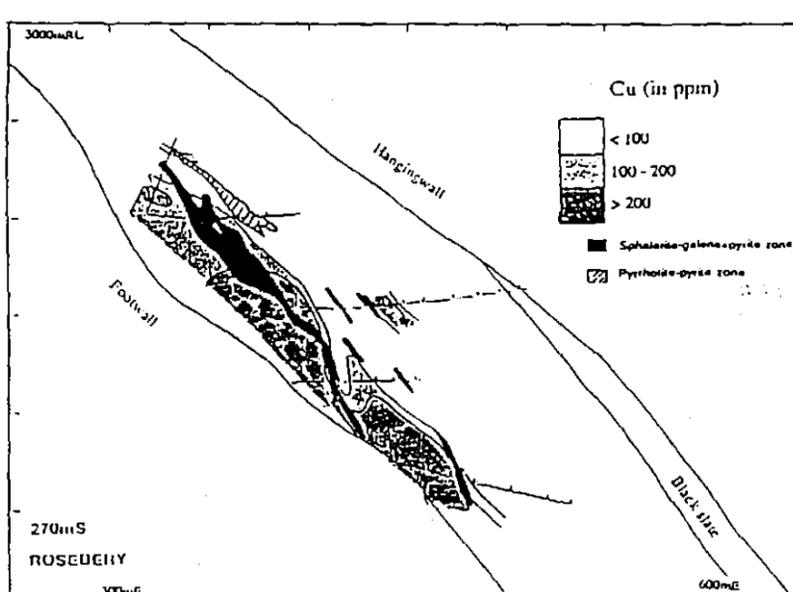


Figure F. Variation of Cu in the host rocks from 270 mS section, Rosebery deposit.

5 cm

**MACMIN N.L.**

**ROSEBERY DEPOSIT**  
GENERAL CHARACTERISTICS

Compiled: Oct. 1992, P. McNeil

3.2

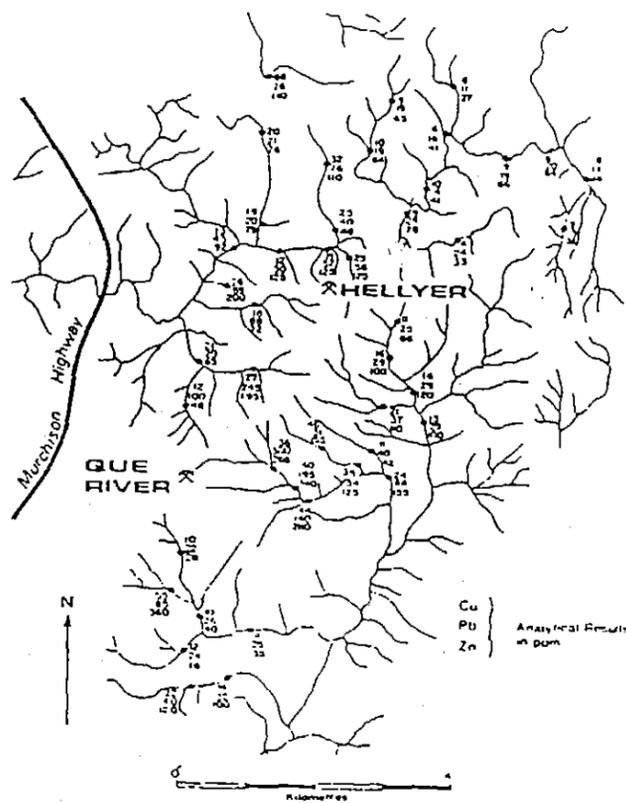


FIG. A.—Stream sediment geochemistry in vicinity of Que River prospect (80 mesh samples).

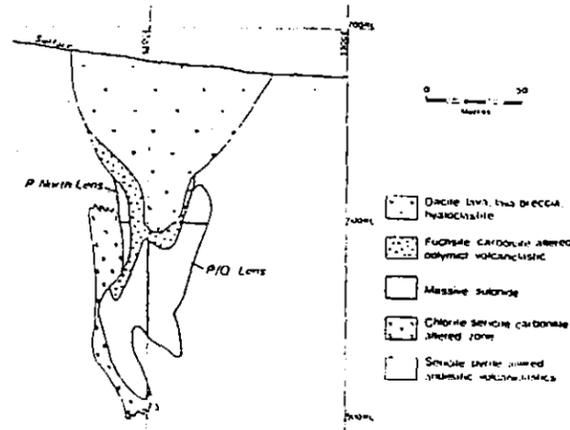


FIG. B.—Que River cross section 7550N.

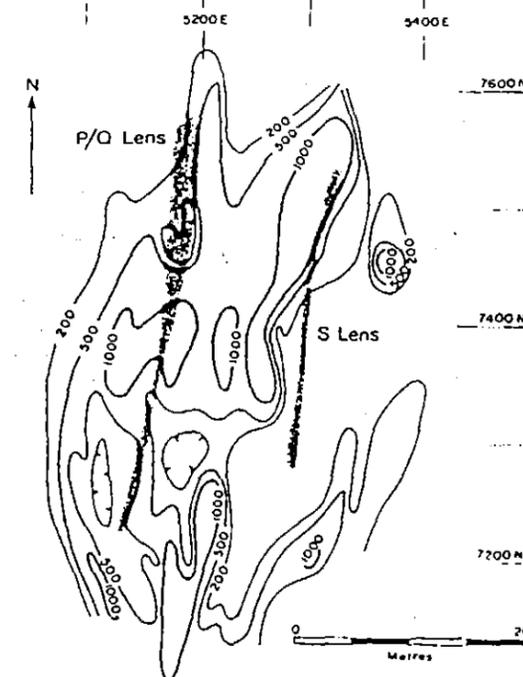


FIG. C.—Que River 'C' horizon soil lead contours (nppm).

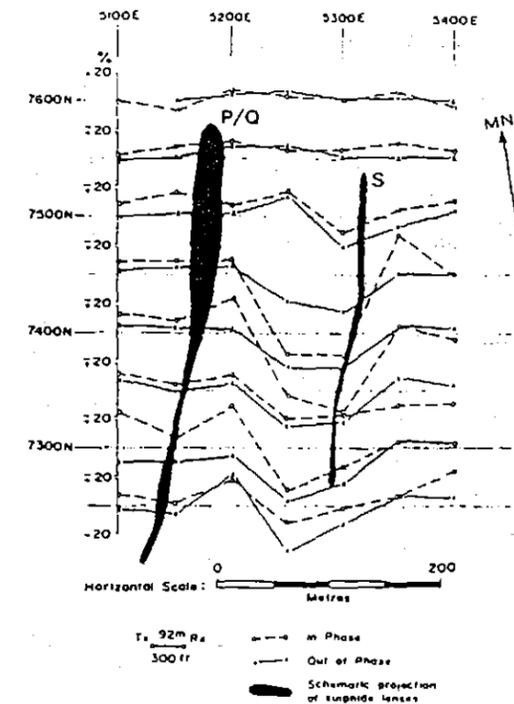


FIG. D.—Que River horizontal loop EM profiles (2400 Hz).

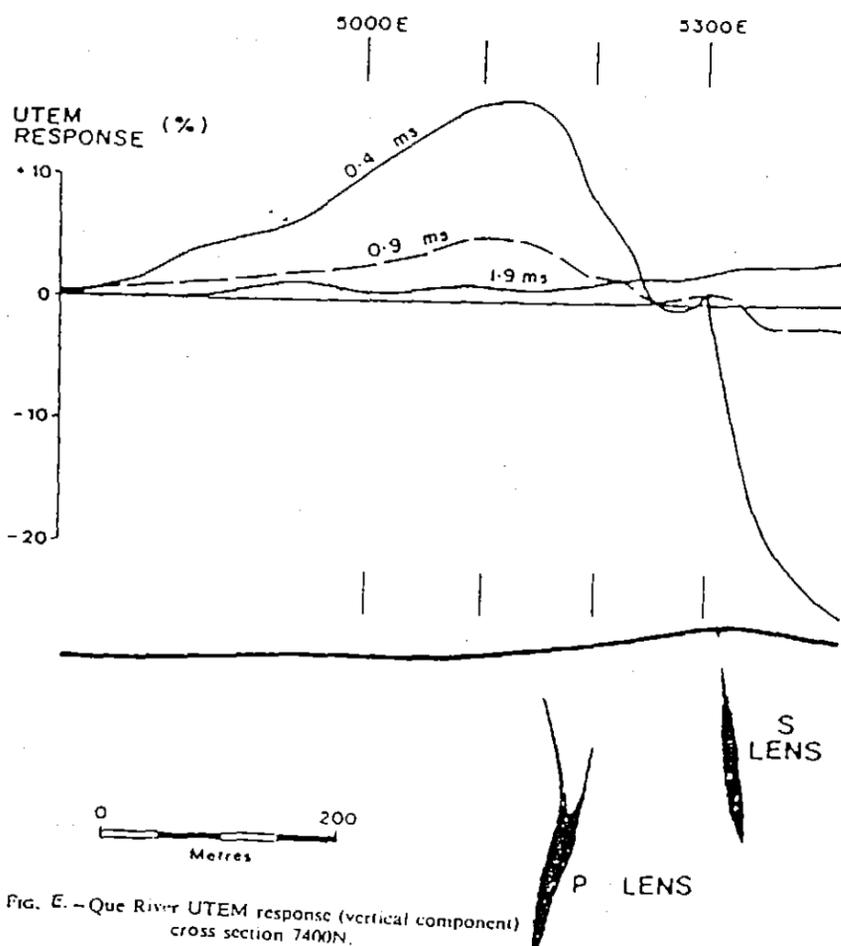


FIG. E.—Que River UTEM response (vertical component) cross section 7400N.

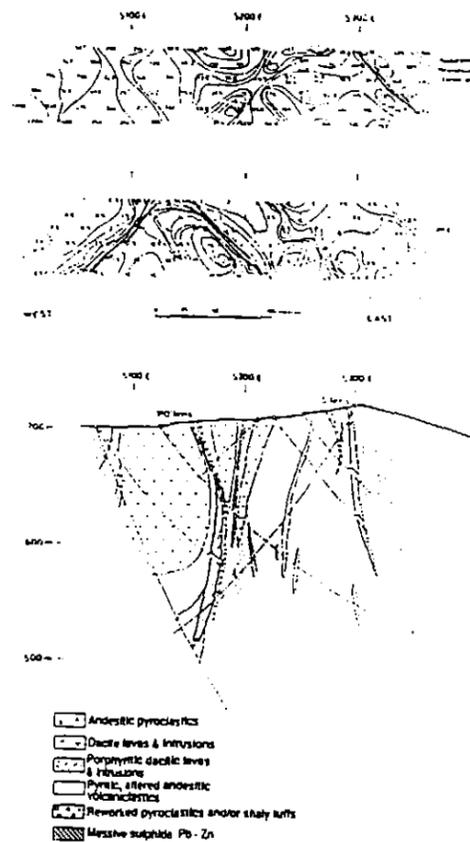


FIG. F.—Resistivity and IP pseudosections from the Que River deposit and the corresponding geologic cross sections, line 7400N. After Webster and Skye (1979).

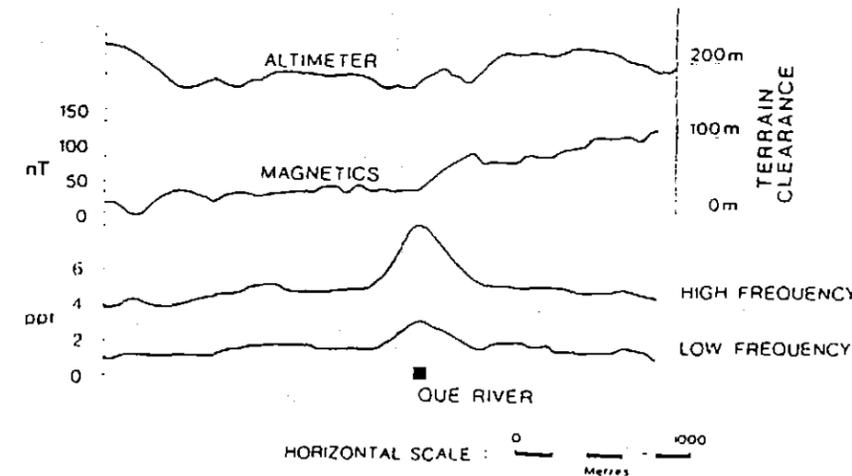


FIG. G.—Airborne electromagnetic discovery traverse, 1972; McPhar H400 system.

<b>MACMIN N.L.</b>	
<b>QUE RIVER DEPOSIT GENERAL CHARACTERISTICS</b>	
Compiled: Oct. 1992, P. McNeil	3.3

5 cm

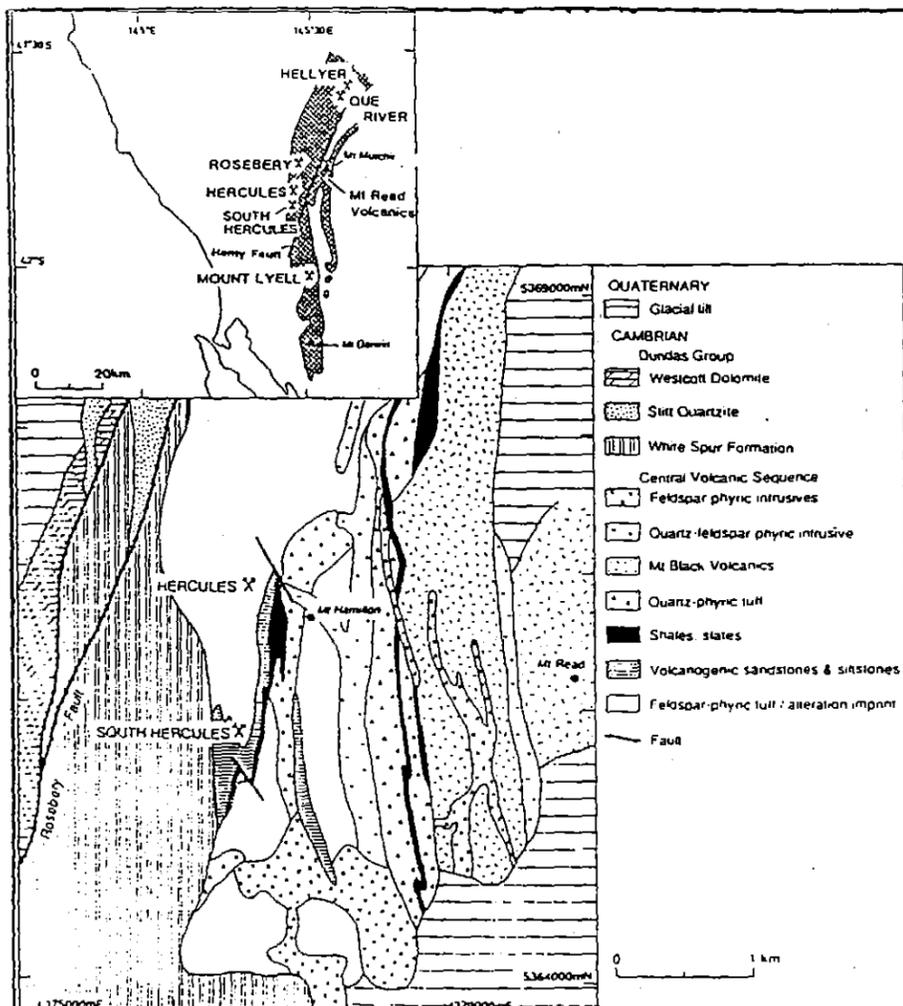


FIG. A. Geology of the South Hercules area, western Tasmania (modified after Lees, 1987; Lees et al., 1990).

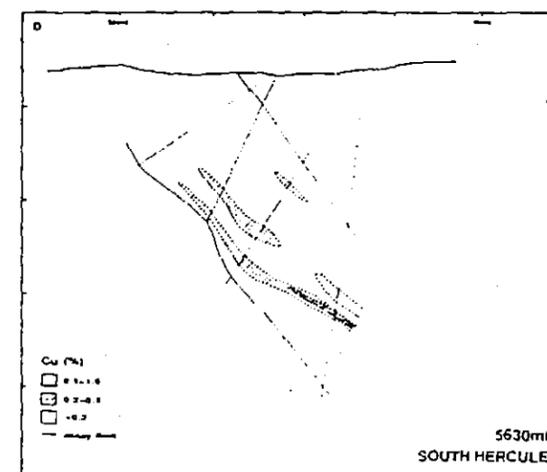
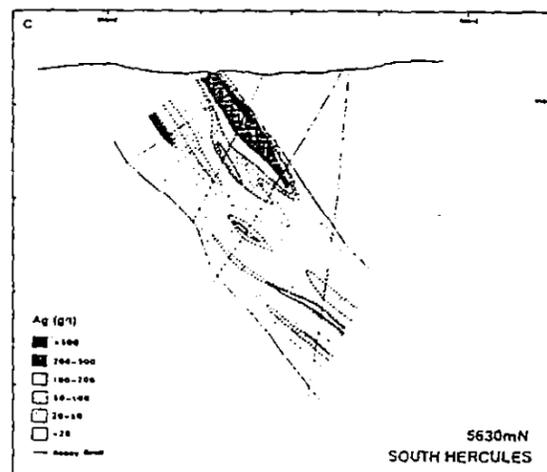
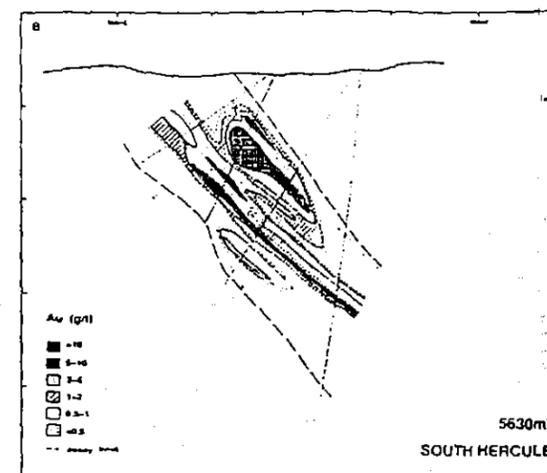
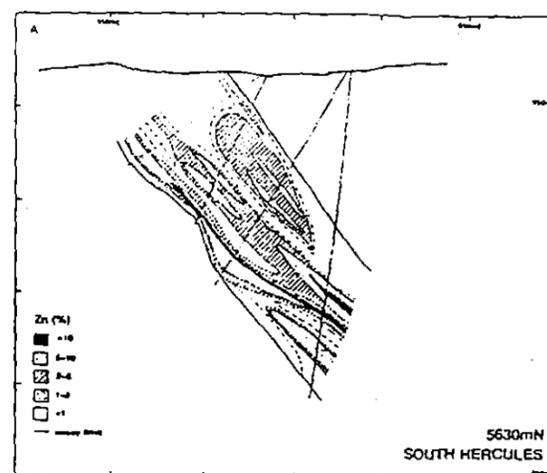


FIG. C. Metal distribution along section 5630mN: (A) zinc, (B) gold, (C) silver, and (D) copper, South Hercules deposit, western Tasmania.

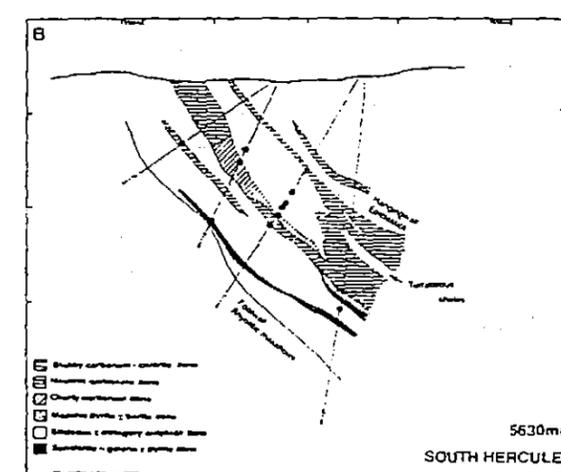
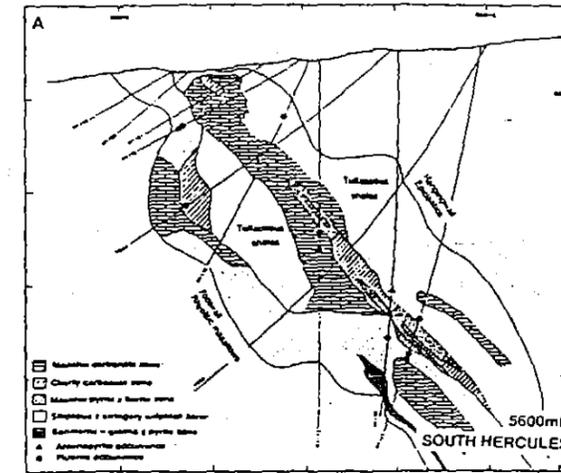


FIG. D. Geology of the 5600mN section (A) and the 5630mN section (B), South Hercules deposit, western Tasmania.

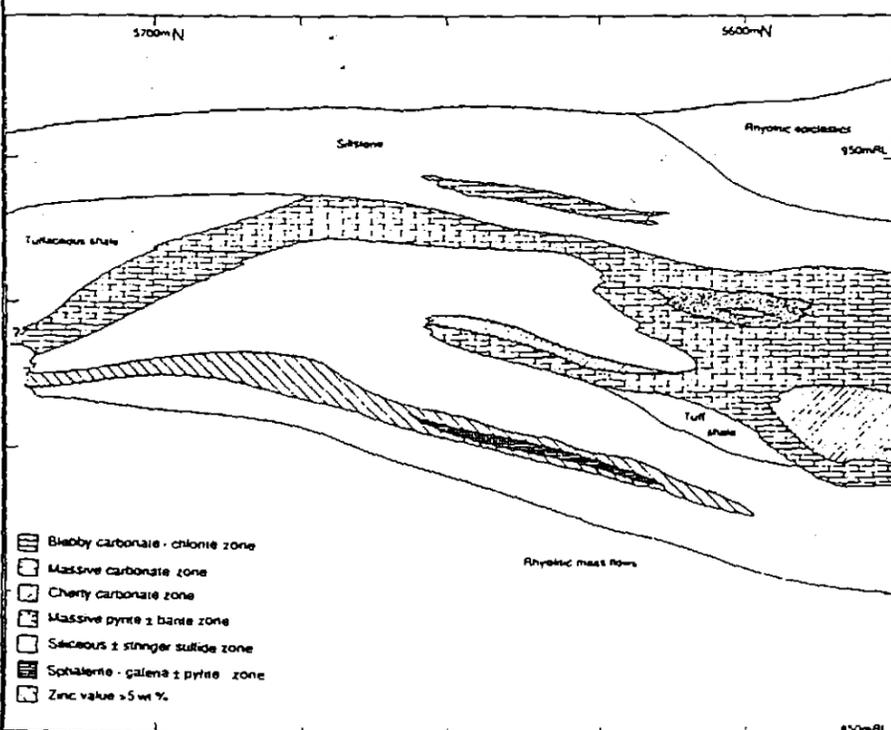


FIG. B. Longitudinal section of the South Hercules deposit, western Tasmania.

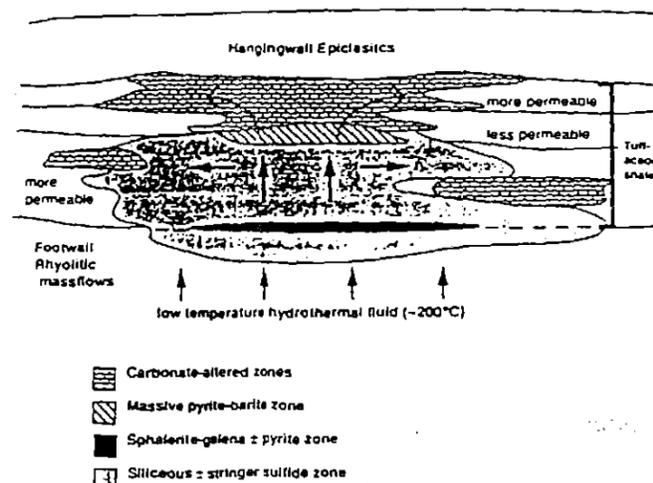


FIG. E. Idealized diagram showing a model for the formation of the South Hercules deposit. Initial subsea-floor replacement occurred at the contact of footwall rhyolitic mass flows and host tuffaceous siltstones. The replacement process is constrained by the variation in permeability of the host volcanoclastic package below the sea floor. The mineralizing fluids cooled and increased in pH as they mixed with seawater toward the upper and outer parts of the carbonate alteration system.

**MACMIN N.L.**

**HERCULES DEPOSIT**  
**GENERAL CHARACTERISTICS**

Compiled: Oct. 1992, P. McNeil 3.4

5 cm



4. GEOLOGY OF E.L. 5/94 LEWIS RIVER (Figures 3 & 4 mainly from Large et al., 1987)

*In the Elliott Bay area, correlates of the Mt. Read Volcanics have been referred to as the Lewis River Volcanics (White, 1975). They strike generally north-south, dip 60° to 80° west, and have a maximum outcrop width of about 12 km (Figure 3). A belt of Tertiary sediments separates the Elliott Bay sequence in the south from the narrower D'Aguiler Range sequence to the north. The eastern margin of the volcanics appears to be faulted against Precambrian metamorphics at Elliott Bay, but in the D'Aguiler Range area a conformably underlying sequence of epiclastics, shale, and conglomerate rests unconformably on Precambrian basement (Martin, 1974). On the western side, the volcanics at Elliott Bay are conformably overlain by a volcano-sedimentary sequence which, in turn, is faulted against or underlies (?) a thick sequence of marine sediments and mafic lavas and pyroclastics comprising the Mainwaring Group.*

*The main volcanic sequence is unconformably overlain by a volcanoclastic unit passing up into a thick siltstone followed conformably by the siliciclastic Owen Conglomerate at Mt. Osmund (Figure 3).*

*The Lewis River Volcanics are a mixture of quartz-feldspar porphyritic felsic pyroclastics, lavas, epiclastics, and porphyritic intrusions, with minor intercalated conglomerates and shales. Lack of marker horizons prevents establishment of detailed stratigraphic correlation, but broad-scale units have been defined by the mapping (Large, 1981). Several granitoid bodies of Cambrian age intrude the sequence.*

*The Elliott Point Porphyry occurs along the eastern margin of the volcanic belt (within E.L. 5/94) at Elliott Bay (Figure 3) and is a massive chloritic quartz-feldspar-biotite porphyry up to 3 km thick. It apparently has a faulted contact with the Precambrian basement to the east. The porphyry has a distinctive coarse-grained foliated texture and is interpreted to be a subvolcanic intrusive sill. The volcanics adjacent to the porphyry are commonly intensely chloritized.*

*The Hudson River Pyroclastics outcrop to the west of the Elliott Point Porphyry and consist of rhyolitic lavas, volcanoclastics, and tuffaceous sediments. The basal sedimentary-epiclastic sequence of the D'Aguiler Range area can probably be regarded as the lower part of this sequence. The tuffaceous sediments, which include well-sorted sandstones and fine-grained siltstones, are prominent on the coast at Elliott Bay, suggesting a submarine environment for at least part of the volcanic pile.*

*The Wart Hill Pyroclastics constitute the western half of the volcanic belt and conformably overlie the Hudson River Pyroclastics, (but outcrop outside E.L. 5/94). The boundary between these two units is not well defined and is interpreted as the change from a dominantly chloritic alteration assemblage to a dominantly sericitic alteration assemblage. Compared to the Hudson River Pyroclastics, the Wart Hill Pyroclastics, contain very few thick epiclastic or tuffaceous sedimentary units. They are interpreted to be ash-flow rocks, either of shallow submarine or subaerial origin.*

*The Pleasant Creek Formation conformably overlies the Wart Hill Pyroclastics and consists of fine to coarse epiclastics, mud-flow breccias, shales, and minor quartz porphyritic volcanoclastics. These units are interpreted to represent a facies of dominantly submarine epiclastics developed in a deepening basin to the west of the volcanic pile.*

*The Sassy Creek Argillites consist of phyllitic shales, dolomites, and black shales commonly in fault contact with the Pleasant Creek Formation on its western side; they appear to be conformably overlain by the Mainwaring Group.*

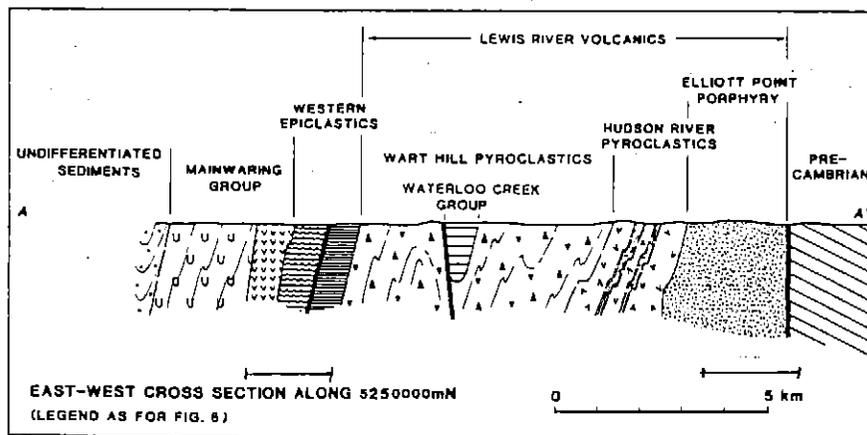
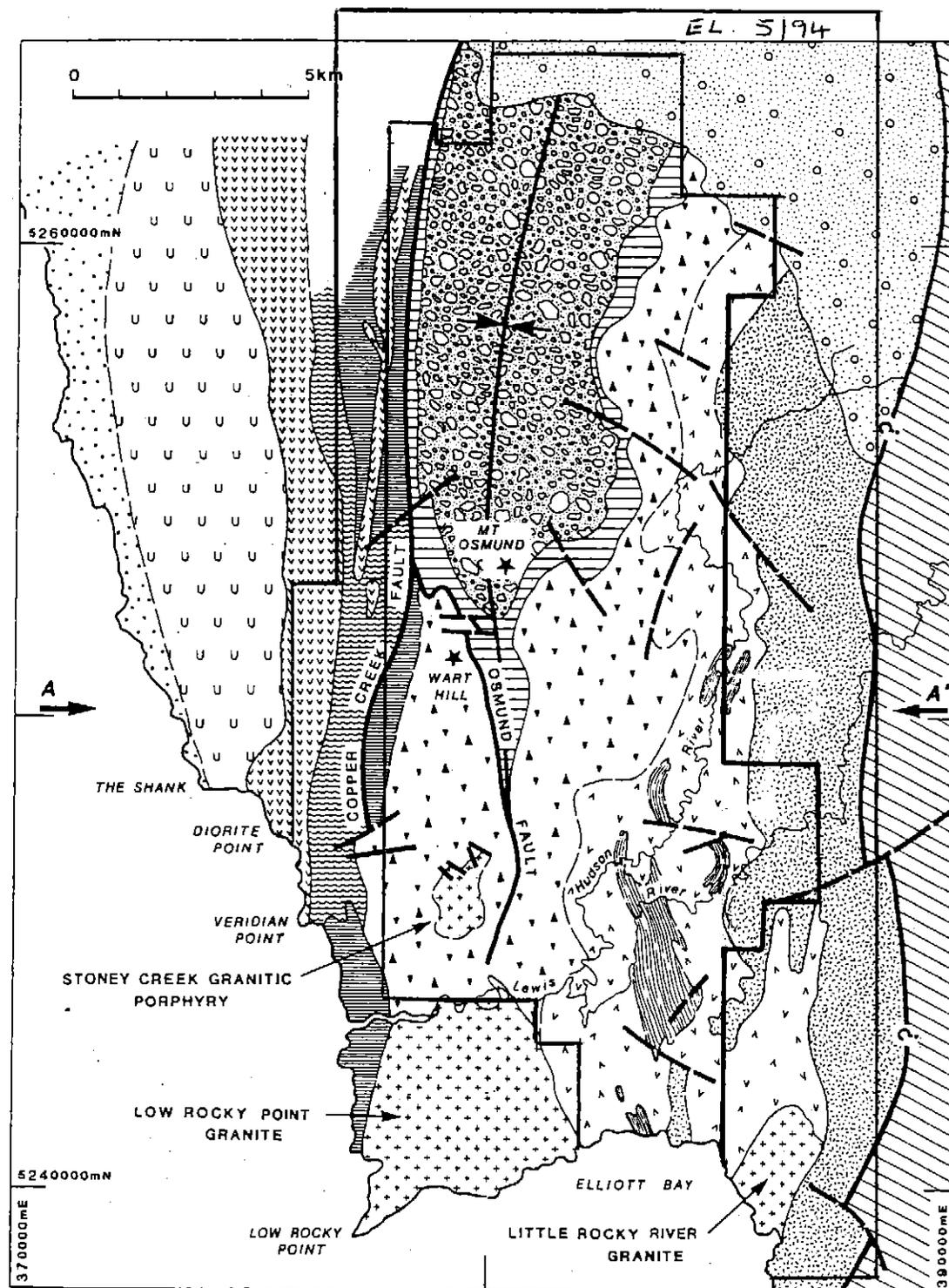
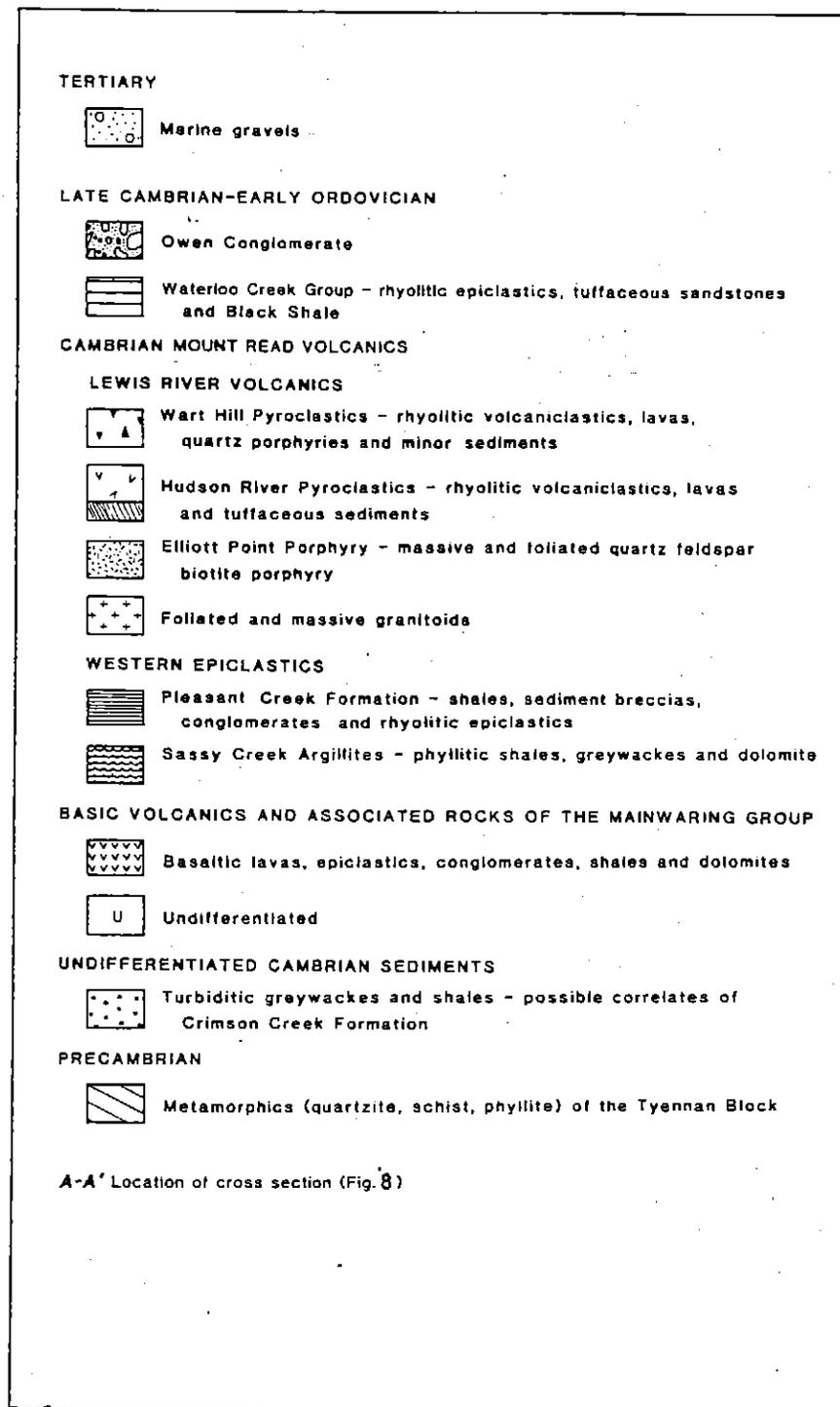
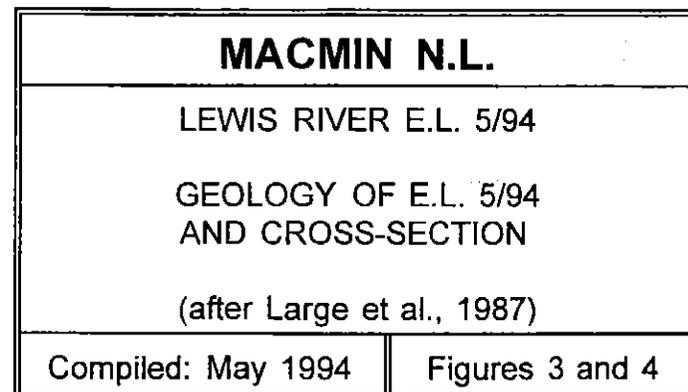


FIG. 8. Geologic cross section in Elliott Bay area along 5252000mN (Australian metric grid).

Geology of the Elliott Bay-Mount Osmund area.

766027



5 cm

The Waterloo Creek Group, unconformably overlying the Wart Hill Pyroclastics near Mount Osmund, is a sequence of volcanoclastic conglomerate, sandstone, and reworked acid volcanics (30-100 m thick) which passes conformably upward into a black shale-sandstone unit (150-300 m thick). These two units are herein referred to as the Waterloo Creek Group, which is followed by typical Owen Conglomerate (Figure 3).

Three granitoid bodies intrude the volcanic pile at Elliott Bay: the Low Rocky Point Granite, the Little Rocky River Granite, and the Stoney Creek granitic porphyry (Figure 3). The Low Rocky Point Granite is described by White (1975) as a composite intrusion consisting of pink granite, cream adamellite, and coarse porphyritic granite. The Stoney Creek granite porphyry was only recently revealed by costeaning and bed-rock auger drilling (Wilson et al., 1982). It crops out poorly in the button grass plains 2 km north of the Lewis River. The Stoney Creek body is mostly granitic porphyry that contains euhedral feldspar phenocrysts from 1 to 5 cm in length, rounded embayed quartz phenocrysts, and altered biotite phenocrysts in an intensely sericitized and cleaved matrix. It may correlate with the porphyritic phase described by White (1975) from the eastern side of the Low Rocky Point Granite. The Little Rocky River Granite is also a composite intrusion consisting of a massive coarse granite porphyry and a strongly foliated medium-grained quartz feldspar porphyry (White, 1975). The latter phase is shown in Figure 3 as part of the Elliott Point Porphyry, with which it appears to be continuous.

Extensive areas of Tertiary gravels and quartz lag deposits obscure the underlying lithologies. This is particularly noticeable in the SW and SE of the area where the Low Rocky Point Granite and the Little Rocky River Granite subcrop. Granite outcrop appears to be mainly confined to the coast and river beds, consequently the majority of the granite boundaries have been inferred. Similarly the southern parts of the Hudson River Pyroclastics in the east and the Western Epiclastics sequence in the west are covered.

According to geologists in the Geological Survey of Tasmania these Tertiary deposits are normally only of the order of 1-3 m thick and do not present a major problem for exploration (K. Corbett pers. comm. to R.D. McNeil).

Quaternary alluvial deposits are present along some river courses and marine sands and gravels extend up to 1 km inland from the coast along Elliott Bay.

#### Structure of the Elliott Bay Area

An east-west cross section through the volcanics centred on Wart Hill is shown in Figure 4. The major structural feature is the Mount Osmund syncline, which folds the Owen Conglomerate and the underlying Waterloo Creek Group. Facing directions in the sedimentary horizons of the Lewis River Volcanics are very rare, but where present, they always indicate a west-facing sequence. Small-scale folds in the finer layered volcanic horizons commonly have south-plunging axes. The change from south-plunging axes in the volcanics to north-plunging axes in the Owen Conglomerate suggests a significant structural event in the Late Cambrian.

A major fault (the Osmund fault), evident on the aerial photographs and shown on the 1:250,000 Port Davey sheet (Williams et al., 1972), cuts along the western edge of the Waterloo Creek Group and extends south in the Wart Hill Pyroclastics, probably faulting out the extension of the Mount Osmund syncline (Figure 3). This fault appears to have controlled alteration and mineralisation within the Wart Hill Pyroclastics and has a structural and stratigraphic setting similar to the Great Lyell fault at Queenstown.

*A second major regional north-south-trending fault (Copper Creek fault) marks the western boundary of the Owen Conglomerate and extends south into the western sedimentary sequence, where it separates the Sassy Creek Argillites and the Pleasant Creek Formation. This structure is also a locus of minor mineralisation.*

#### Mineralisation

Diverse styles and types of mineralisation have been located in the Elliott Bay area by previous explorers. These include bedded massive sulphides, stratabound disseminated Pb, Zn, Ag and vein-style Pb, Zn, As. In addition Ag/Au gossans and stratabound Au in rhyolitic volcanoclastics plus minor Cu mineralisation in magnetite exhalites or in dolomite. Approximate locations are shown in Figure 2.

Several possible sources of gold were suggested by Cyprus (Torrey et al., 1987) in the Elliott Bay area including:-

- massive sulphide pods (e.g. Wart Hill); quartz-chlorite-pyrite-tourmaline alteration zones and veins associated with shears at the margin of porphyritic intrusions at North Lewis River;
- quartz-gossan zones associated with magnetite chlorite alteration at granite margins;
- stratabound replacement of coarse pyroclastic units (e.g. Voyager 24);
- Tertiary gravel sequences (e.g. north Waterloo Creek and upper reaches of the Hudson River; and
- quartz veins by Waterloo Creek and area marginal to Elliott Point porphyry.

#### 5. PREVIOUS EXPLORATION (Summarised in Table 1)

##### **BHP E.L. 13/65 1965-1975**

- Helicopter borne EM survey (H-400) - no follow-up.
- Minor rock-chip and stream-sediment sampling analysed for Cu, Zn, Ni only - no follow-up.

##### **Geopeko E.L. 27/76 1977-1984**

- Followed up all significant aeromagnetic anomalies over the Lewis River volcanics (defined by BHP).
- Followed up approximately 20% of the remaining aeromagnetic anomalies.
- Steam sediment sampled Lewis River Volcanics. Sample density at 10 samples/km<sup>2</sup>. Sampled Mainwaring Group at 8 samples/km<sup>2</sup>. No analytical details.
- Gridding and bedrock geochemistry over easily accessible parts of potential volcanic succession. No analytical details.
- Regional geological mapping at 1:10,000 of Cambrian Volcanics especially chlorite, sericite, silica and pyrite alteration zones.
- Diamond drilling 32 holes totalling 3,646m. The majority of this is outside Lewis River E.L. except for 'two short holes' at Penders.

**Cyprus E.L. 40/85**• **1986**

Dighem E.M. (500 line km) flown on eastern and western volcanic belts. The area surveyed barely overlaps the western side of the eastern flank of E.L. 5/94, however the north-west section of the licence was completely covered. None of the follow-up targets are within the Lewis River E.L.

• **June 1986 - June 1987**

Regional exploration to assess gold mineralisation potential at the margins of the Cambrian intrusions identifying;

- regional geological mapping of selected areas at 1:10,000;
- -80# sediment and pan concentrate geochemical sampling for Au, Cu, Pb, Zn, As, Ag, Au - (many -80# analysed Hg also);
- rockchip geochemical sampling (analysed Cu, Pb, Zn) and
- airphoto structural interpretation.

• **June 1986 - June 1987**

Prospect evaluation

- follow up Dighem anomalies;
- follow up aeromagnetic anomalies;
- follow up geological and geochemical anomalies from Cyprus stream and rock-chip sampling programme. Analysed for Cu, Pb, Zn, Ag, As, and Au; and
- evaluation of old prospects mainly for gold potential but also polymetallic massive sulphides.

• **June 1987 - June 1988**

- airphoto and magnetic lineament interpretation;
- prospect evaluation of the Au potential around the Low Rocky Point Granite contacts by stream sediment sampling and soil sampling and rockchip geochemistry. (Analysed Cu, Pb, Zn, Ag, As, and Au).

**Aberfoyle as Joint-Venture Partners E.L. 40/85**• **1991**

- Airborne EM (Questem) to locate conductive targets at >100m depth for massive sulphides. No bedrock-derived anomalies were found within the Lewis River E.L.

Table 1: Summary of Previous Exploration

COMPANY	YEAR	WORK
<b>GEOPHYSICS</b>		
BHP	1975	Helicopter-borne E.M. (H-400) No follow-up.
Geopeko	1977-1984	Follow-up all significant aeromag anomalies over Lewis River volcanics. (defined in previous BHP airborne survey).
Geopeko	-	Follow-up 20% of EM anomalies from BHP airborne survey.
Cyprus	1986	Dighem survey 500 line km of EM. Covered NW part of Lewis River E.L. and western margin of eastern section. None of the follow-up targets were within the Lewis River E.L.
Cyprus	1988	Computer processed magnetic imaging, linearments superimposed on photographic lineament map.
Aberfoyle	1991	Questem E-M to penetrate >100m. no bedrock anomalies found in area applied for.
<b>GEOCHEMISTRY</b>		
BHP	1965-1975	Minor sparse stream-sediment and rock-chip surveys analysed for Cu-Zn-Ni.
Geopeko	1977-1984	Stream sediment sampling over Lewis River Volcanics at 8 samples/km <sup>2</sup> . No details of elements analysed.
Geopeko	1977-1984	Gridding and bedrock geochemistry over easily accessible part of potential volcanic succession (no analytical details).
Cyprus	1986-1987	Drainage geochemical sampling of -80# sediment and panned concentrates. Rock-chip geochemical sampling analysed Cu, Pb, Zn, Ag, As, Au.
<b>GEOLOGY</b>		
Geopeko	1977-1984	Regional geological mapping of Cambrian Volcanics at 1:10,000 especially alteration zones with chlorite, sericite, silica and pyrite.
Cyprus	1986-1987	Regional geological mapping of selected areas at 1:10,000 and compilation at 1:25,000.
Cyprus	1987-1988	Airphoto interpretation of structure.

6. ANOMALOUS AREAS WITHIN E.L. 5/946.1 Low Rocky Point Granite (Figure 4a)

This area in the southwest corner of the E.L. includes several old Geopeko prospects (Voyager 1, 3A, 5, 6, and 11) along the western (Fig. 5), eastern (Fig. 5a) and northern margins (Voyager 6, Fig. 8) of the Low Rocky Point Granite.

Moderate to highly anomalous Au in stream sediment (-80# and pan concentrate) samples has not been followed up by previous explorers and the source of Au in these samples has not been located.

Previous Work

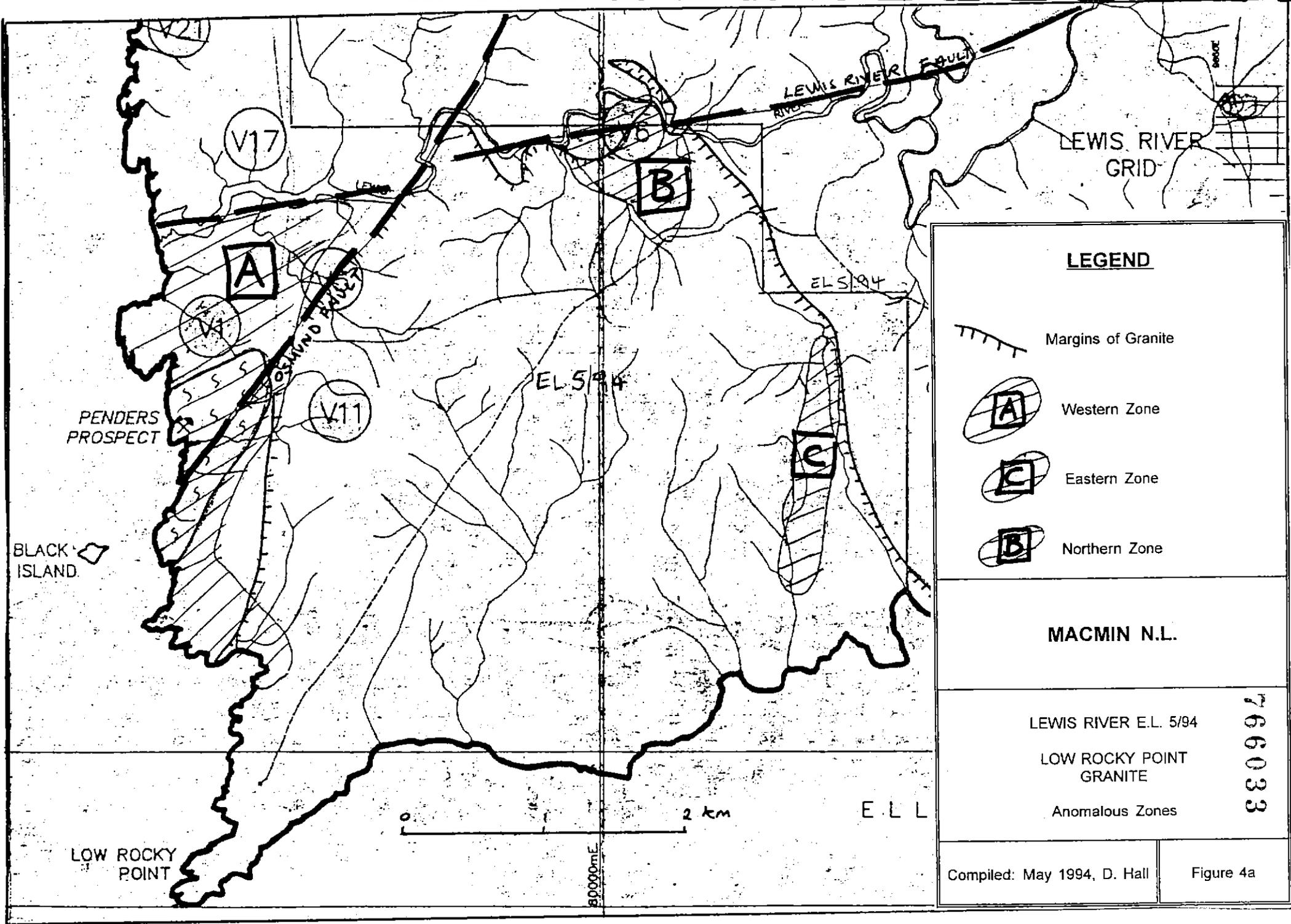
Rockchip and stream geochemical samples collected by Cyprus in 1986-87 plus favourable geology and alteration encouraged Cyprus to complete further stream, soil and rockchip sample surveys.

A 4 km long zone of moderate to highly anomalous stream sediment -80# and/or pan concentrate samples occurs along the **western** granite contact. (Figure 5)

Western contact anomalous stream sediment samples

Pan Concentrate	
grains	Au ppm/dup
4	0.13
0	0.43
5	45.35/38.6
50	365/250
5	4.5/8.4
12	41.7
1	56.1/3.5
-80#	
	Au ppm
	1.48
	0.95
	0.19

Along the **western contact** of the granite (Figure 5), three grid lines were soil sampled immediately east of Penders and another further south. Soil samples were collected from a well-developed B/C horizon which gave values of <0.008 to 0.07 ppm Au (up to 35 ppm Cu, 15 ppm Pb, 45 ppm Zn and 4 ppm As). In particular 2 anomalies occurred at the western end of line 11600N (0.03, 0.07 ppm Au) and spiky anomalous Au values adjacent to and upstream from the highly anomalous Au sample at Penders. There was no accompanying base metal anomaly.



**LEGEND**

-  Margins of Granite
-  Western Zone
-  Eastern Zone
-  Northern Zone

**MACMIN N.L.**

LEWIS RIVER E.L. 5/94  
 LOW ROCKY POINT  
 GRANITE  
 Anomalous Zones

766033

Compiled: May 1994, D. Hall

Figure 4a

766034

43000mN

42000mN

41000mN

77000mE

78000mE

150

7

RIVER

LEWIS

10d

5a

10d

10d

7

PENDERS

MASSIVE & BANDED  
MAGNETITE-PYRITE-CHLORITE  
BEDS

Rock Chip Samples

- 171284-287
- 202720-732 (A) } Strip
- 202733-736 (B) } Samples
- 202924-925 (Thin Sections)

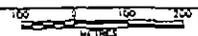
BLACK  
ISLAND

WAVE-CUT  
PLATFORM

CYPRUS MINERALS AUST. CO. & POSIDON LTD.

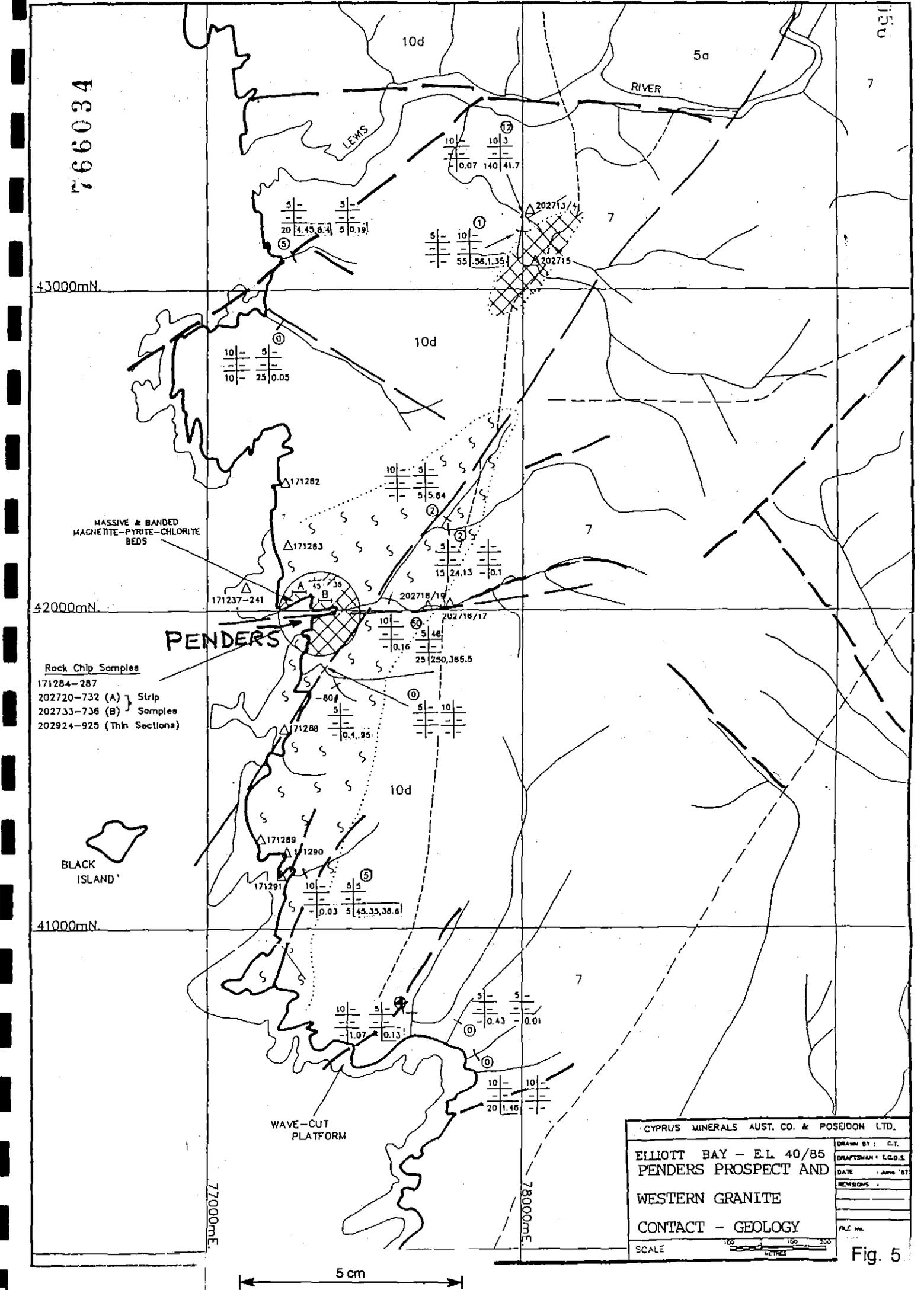
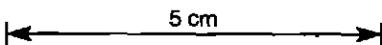
ELLIOTT BAY - E.L. 40/B5  
PENDERS PROSPECT AND  
WESTERN GRANITE  
CONTACT - GEOLOGY

SCALE



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DRAFTSMAN :	L.C.D.S.
DATE :	June '67
REVISIONS :	
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Fig. 5



766035

TERTIARY \_\_\_\_\_

1 Quartzose Gravel

JURASSIC \_\_\_\_\_

2 Dolerite

LATE CAMBRIAN - EARLY ORDOVICIAN \_\_\_\_\_

3 Owen Conglomerate - undifferentiated

3a - coarse quartzose sandstone

3b - siltstone

4 Waterloo Creek Group - undifferentiated

4a - hematitic volcanoclastic conglomerate

4b - tuffaceous coarse sandstone and grit

4c - black shale ± pyrite

4d - fine-med. grained rhyolitic volcanoclastic

CAMBRIAN - MT. READ VOLCANICS \_\_\_\_\_

5 Wart Hill and Hudson River Volcanics - undifferentiated

5a - fine to med. grained rhyolitic volcanoclastic

5b - rhyolitic quartz-feldspar porphyry (lavas and intrusives)

5c - dacitic porphyry

5d - coarse rhyolitic volcanoclastic

5e - siltstone

5f - siliceous conglomerate

5g - greywacke and siltstone

CAMBRIAN INTRUSIVES \_\_\_\_\_

6 Elliott Point Porphyry

7a Granite

7b Microgranite

7c Porphyritic Microgranite

CAMBRIAN - WESTERN EPICLASTICS \_\_\_\_\_

10 Western Epiclastics - undifferentiated

10a - andesitic - basaltic volcanics

10b - brown-grey tuffaceous siltstone and quartzose conglomerate

10c - black shale ± pyrite

10d - fine to medium grained rhyolitic volcanics

10e - gabbro

10f - coarse rhyolitic volcanoclastic sandstone

CAMBRIAN - MAINWARING GROUP \_\_\_\_\_

Mainwaring Group - undifferentiated

- gabbro

- andesite-basaltic volcanics

- dolomite

- black shale ± pyrite

- siltstone and sandstone

PRECAMBRIAN \_\_\_\_\_

Metamorphics - quartzite, schist and phyllite

Geological contact

Unconformity

Fault

Strike and dip of schistosity

Strike and dip of bedding - facing indicated

Plunging syncline

Old workings

ALTERATION - Pervasive and vein controlled \_\_\_\_\_

Chlorite - magnetite

Sericite

Sericite - quartz

Chlorite - pyrite

Quartz - chlorite - pyrite - taumaline

Quartz - sericite - talc ± chlorite

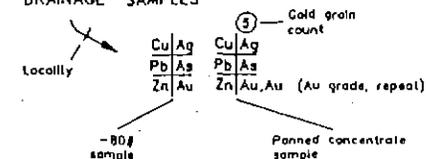
Quartz - chlorite

Quartz vein

Alteration boundary

GEOCHEMISTRY \_\_\_\_\_

DRAINAGE SAMPLES



ROCK CHIP SAMPLES

Δ 202567 - Sample location and number

Δ 202569 - Sample location number and assays  
Cu/Ag  
Pb/As  
Zn/Au

Δ 202569 TS - Thin section sample

○ v33/1 - Diamond drill hole location

DETECTION LIMITS (ppm)

	Cu	Pb	Zn	Ag	As	Au
Rocks	5	5	5	0.5	1	0.005
-80# plus panned concentrates	5	5	5	0.5	1	0.008
Soils	5	5	5	0.5	1	0.01 (AAS) 0.008 (Fire assay)

- = Below limit of detection

5 cm

7299

87-2696 Vol 4/4

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ELLIOTT BAY - E.L. 40/85

LEGEND FOR PROSPECT MAPS

SCALE 1:50,000

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CHECKED BY: I.C.S.

DATE: April '87

REVISIONS: \_\_\_\_\_

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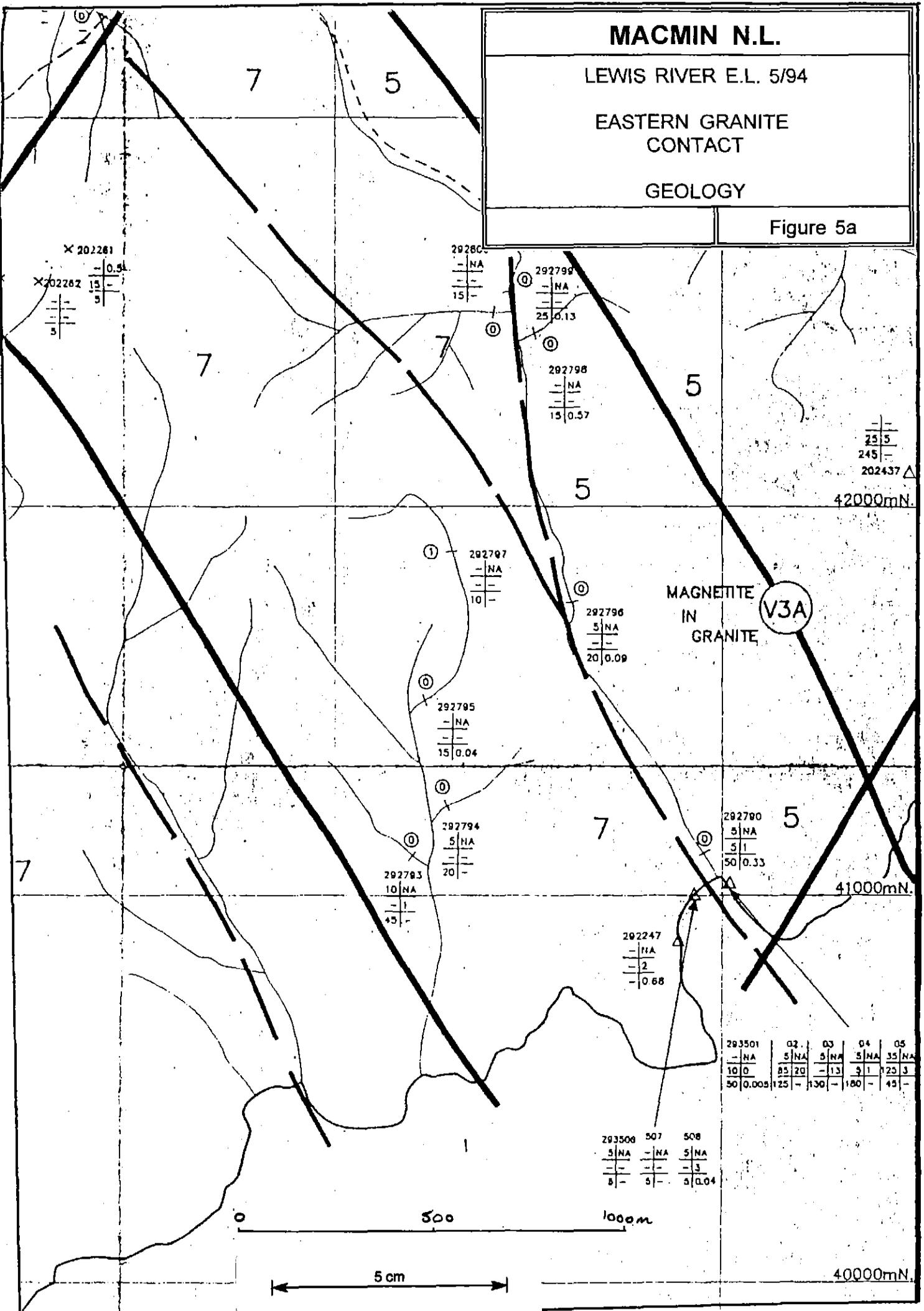
**MACMIN N.L.**

LEWIS RIVER E.L. 5/94

**EASTERN GRANITE CONTACT**

**GEOLOGY**

Figure 5a



At the **eastern contact** (Figure 5a), eleven creek sites were sampled, the -80# sediment assayed and gold grains in pan concentrate counted (No assays of pan concentrates). Seven of these samples were just above the detection limit (0.008 ppm Au) and the remaining 4 had > 0.10 ppm Au (maximum 0.57 ppm: sample 292 798, this is a high value for -80# sample). No Au was seen in pan concentrates, so the Au is presumed to be very fine. There is no outcrop at the anomalous sites.

Nine rockchip samples were collected from the eastern margin. (Table 2) The best Au assay results came from a sample of quartz-pyrite-specular haematite vein (0.680 ppm).

Along the northern granite contact the Voyager 6 prospect produced a gold assay of 7.25 g/t Au from a rockchip sample from a narrow quartz-sulphide vein. (Further details in section 6.2)

### Geology

Along the western contact the Low Rocky Point Granite has intruded Rhyolitic Volcanic rocks (Western Epiclastics), both of Cambrian age.

The north-south contact is sheared and chlorite alteration is present on both sides of the contact. In addition chlorite-magnetite alteration is present where the Osmond Fault cuts either lithology. At Voyager 5 pyrite and arsenopyrite-bearing quartz veins have been observed. Within the volcanic rocks at granite contacts quartz pyrite veins with minor bornite and chalcopyrite occur which contain blobs of chlorite and well-developed chlorite-pyrite haloes.

At the eastern contact rhyolitic volcanic rocks of the Wart Hill and Hudson River Volcanic Sequence (Mt. Read Volcanics) abut the granite. The contact is faulted along 2km in a NNW direction from the coast. Lithologies outcropping along the coast are hornfelsed and highly sheared and at the contact they are silicified, contain abundant quartz stockworks and minor haematite-pyrite-quartz veins and are locally carbonate altered. The granite is sheared, foliated and brecciated and along the contact quartz-pyrite-specular haematite veins are common. A cover of Tertiary gravels obscures outcrop over most of this area however in a creek cutting the contact some volcanoclastic rocks contain patchy chlorite alteration.

### Conclusion

#### Western Contact (Figure 5)

The 4 km long zone of anomalous stream sediment values confirms that gold mineralisation is present along the granite contact. Apart from the Penders prospect none of the anomalous geochemical samples have been followed up. Many of these samples lie close to or on the Osmond Fault interpreted by Aberfoyle to correspond with a major crustal discontinuity and as such may be a locus of alteration and mineralisation, however most of these anomalous samples have not been followed-up and the whole area warrants more detailed sampling to identify the source of gold. Detailed geological mapping would be useful if outcrop permits.

#### Eastern Contact (Figure 5a)

Anomalous Au in -80# samples (0.33 ppm, 0.57 ppm, 0.13 ppm) from widely-spaced sampling suggests more detailed stream sediment sampling may delineate further anomalies. Anomalous Au is also present in pyrite-quartz-haematite veins.

There is no Au in pan concentrates from these areas which suggests the possibility of fine Au.

TABLE 2

LOW ROCKY POINT GRANITE - Eastern Contact Rockchip Geochemical Samples

Sample	Cu	Pb	Zn ppm	As	Au	Description
292247	<5	<5	<5	2	0.680	Quartz-pyrite-specular hematite vein
293501	<5	10	50	<1	0.005	Silicified fine volcaniclastic with quartz-carbonate-pyrite-hematite veins
293502	5	85	125	20	<0.005	Quartz vein
293503	5	<5	130	13	<0.005	Quartzose, hematite veined hornfelsed tuff
293504	5	5	180	1	<0.005	Quartz-specular hematite vein
293505	35	125	45	3	<0.005	Quartz stockwork in felsic tuff
293506	5	<5	5	<1	<0.005	Specular hematite, pyrite, chlorite-bearing foliated granite
293507	<5	<5	5	<1	<0.005	Granite breccia with specular hematite matrix
293508	5	<5	5	3	0.040	Quartz-specular hematite-pyrite-sericite vein

## 6.2 Voyager 6

### Previous Work

Fifteen sites were sampled for -80# and pan concentrate samples, the majority of which were within the granite. High Au values of 0.42, 0.85, 0.9, 0.57, 0.1 ppm Au were obtained from -80# samples (Figure 8a) and 22.6 ppm Au from pan concentrates (Figure 8b).

Gold was not observed in pan concentrates which once again suggests the gold is very fine.

The majority of anomalous stream sediment values are from streams interpreted to drain the southern extension of the Osmund Fault Zone. Similar streams west of Voyager 6 lying within the Zone contain anomalous Au.

An aeromagnetic anomaly along the northern contact of the granite was gridded, mapped, soil and rockchip sampled (not always analysed for Au) and surveyed by VLF-EM and magnetics by Geopeko. Gossanous tuff rockchips gave gold assay values of 0.74 g/t Au. (see Table 3).

Sixteen rockchip samples were collected from good exposure along the south bank of the Lewis River. A number of the samples were 5m strip samples (Figure 8). Up to 7.25 ppm Au was assayed from quartz-limonite gossanous veins in chlorite-sericite altered tuff adjacent to granite contacts.

### Geology (Figure 8)

A narrow projection of granite protrudes northwards into felsic volcanics at this prospect. The contact is apparently locally sheared but poorly exposed. At the contact the granite is weakly sericitised with haematite veinlets. Volcanics along the contact are intensely chloritised, sericitised and limonitic and contain magnetite-chlorite and quartz-gossan veinlets. The Lewis River Fault zone cuts this prospect.

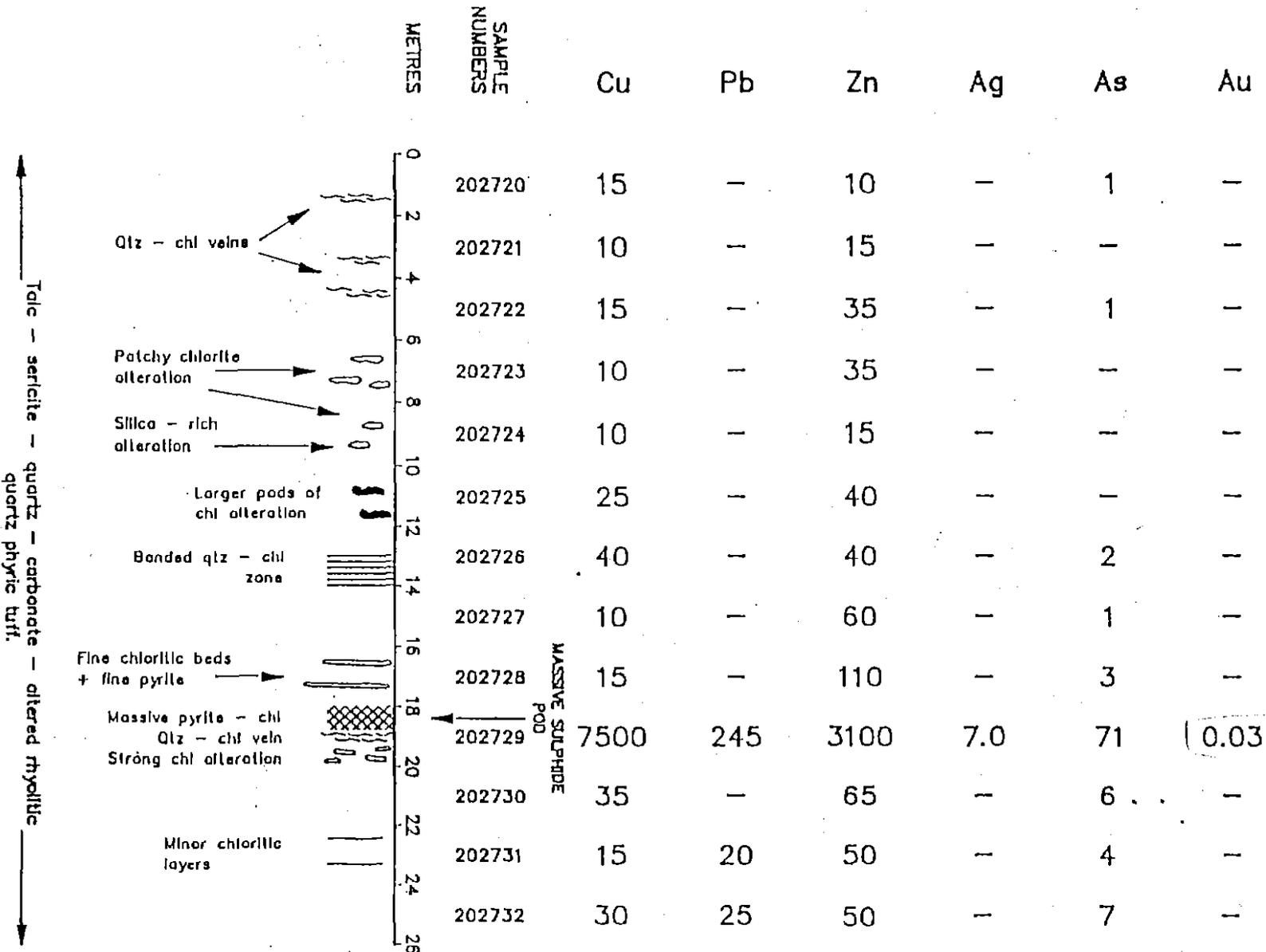
### Conclusions

Along the margin of the granite gold mineralisation is present in veins within altered volcanic rocks. Fine gold in -80# sediment samples from the granite occurs in creeks draining the inferred Osmund Fault Zone.

Aberfoyle recommended further investigation as similar features (complex magnetics, streams, rocks and soils anomalous in Au) are present all around the margins of the granite at Voyager 6, Penders, and Magnetic Anomaly 3 indicating the presence of intrusive related Au mineralisation all around the granite margins in this area, however they never carried out any further exploration. The granite margins certainly warrant further detailed mapping and stream sediment sampling as Au is clearly being shed from near the contact.

## 6.3 Penders Prospect (Figure 5)

Penders (Voyager 1) lies on the western coastline 3 km north of Low Rocky Point. Penders lies at the centre of the 4 km long zone of anomalous creek geochemistry along the western margin of the granite.



SAMPLE NUMBERS	Cu	Pb	Zn	Ag	As	Au
202720	15	-	10	-	1	-
202721	10	-	15	-	-	-
202722	15	-	35	-	1	-
202723	10	-	35	-	-	-
202724	10	-	15	-	-	-
202725	25	-	40	-	-	-
202726	40	-	40	-	2	-
202727	10	-	60	-	1	-
202728	15	-	110	-	3	-
202729	7500	245	3100	7.0	71	0.03
202730	35	-	65	-	6	-
202731	15	20	50	-	4	-
202732	30	25	50	-	7	-

CYPRUS MINERALS AUST. CO. & POSEIDON LTD.  
 ELLIOTT BAY - E.L. 40/85  
 PENDER'S PROSPECT  
 ROCK CHIP GEOCHEMISTRY  
 STRIP 'A'

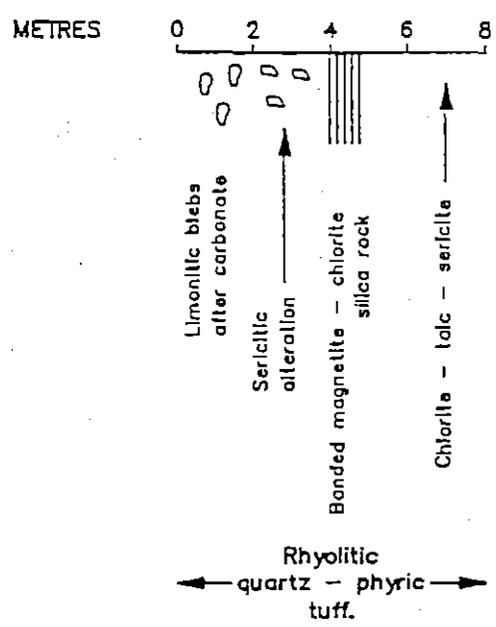
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 DATE: May '87  
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 Fig. 6

SCALE 1:200



SAMPLE NUMBERS	Cu	Pb	Zn	Ag	As	Au
202733	20	-	55	-	1	-
202734	550	-	110	-	7	-
202735	80	70	185	-	8	( 0.005 )
202736	50	-	55	-	1	-



5 cm

CYPRUS MINERALS AUST. CO. & POSEIDON LTD.	
ELLIOTT BAY - EL 40/85	
PENDERS PROSPECT	
ROCK CHIP GEOCHEMISTRY	
STRIP 'B'	
SCALE 1:200	
DRAWN BY: C.T.	FILE NO.
DRAFTSMAN: T.G.D.S.	
DATE: May '87	
REVISIONS:	

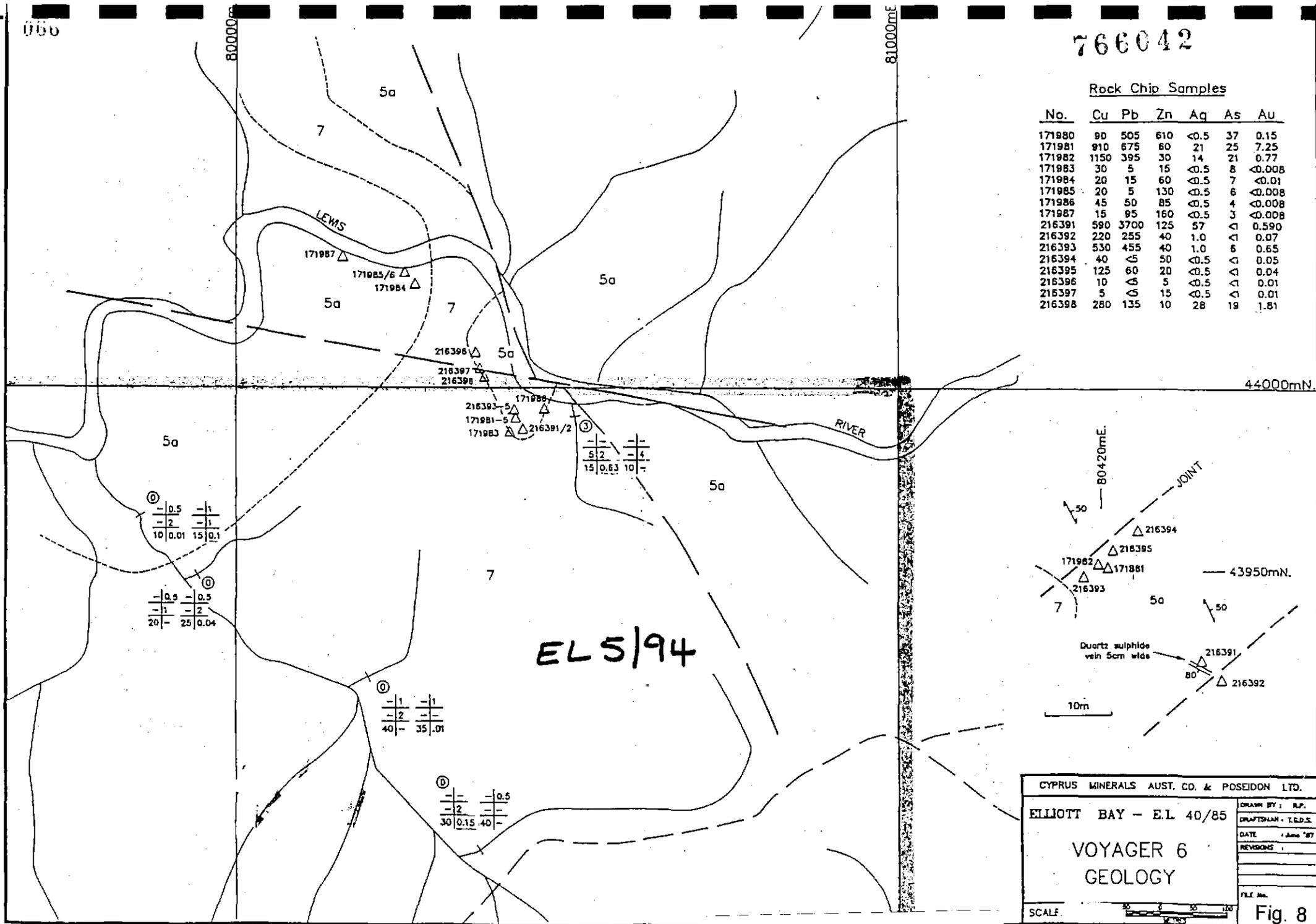
Fig. 7

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Rock Chip Samples

No.	Cu	Pb	Zn	Ag	As	Au
171980	80	505	610	<0.5	37	0.15
171981	910	675	60	21	25	7.25
171982	1150	395	30	14	21	0.77
171983	30	5	15	<0.5	8	<0.008
171984	20	15	60	<0.5	7	<0.01
171985	20	5	130	<0.5	6	<0.008
171986	45	50	85	<0.5	4	<0.008
171987	15	95	160	<0.5	3	<0.008
216391	590	3700	125	57	<1	0.590
216392	220	255	40	1.0	<1	0.07
216393	530	455	40	1.0	6	0.65
216394	40	<5	50	<0.5	<1	0.05
216395	125	60	20	<0.5	<1	0.04
216396	10	<5	5	<0.5	<1	0.01
216397	5	<5	15	<0.5	<1	0.01
216398	280	135	10	28	19	1.81



EL 5/94

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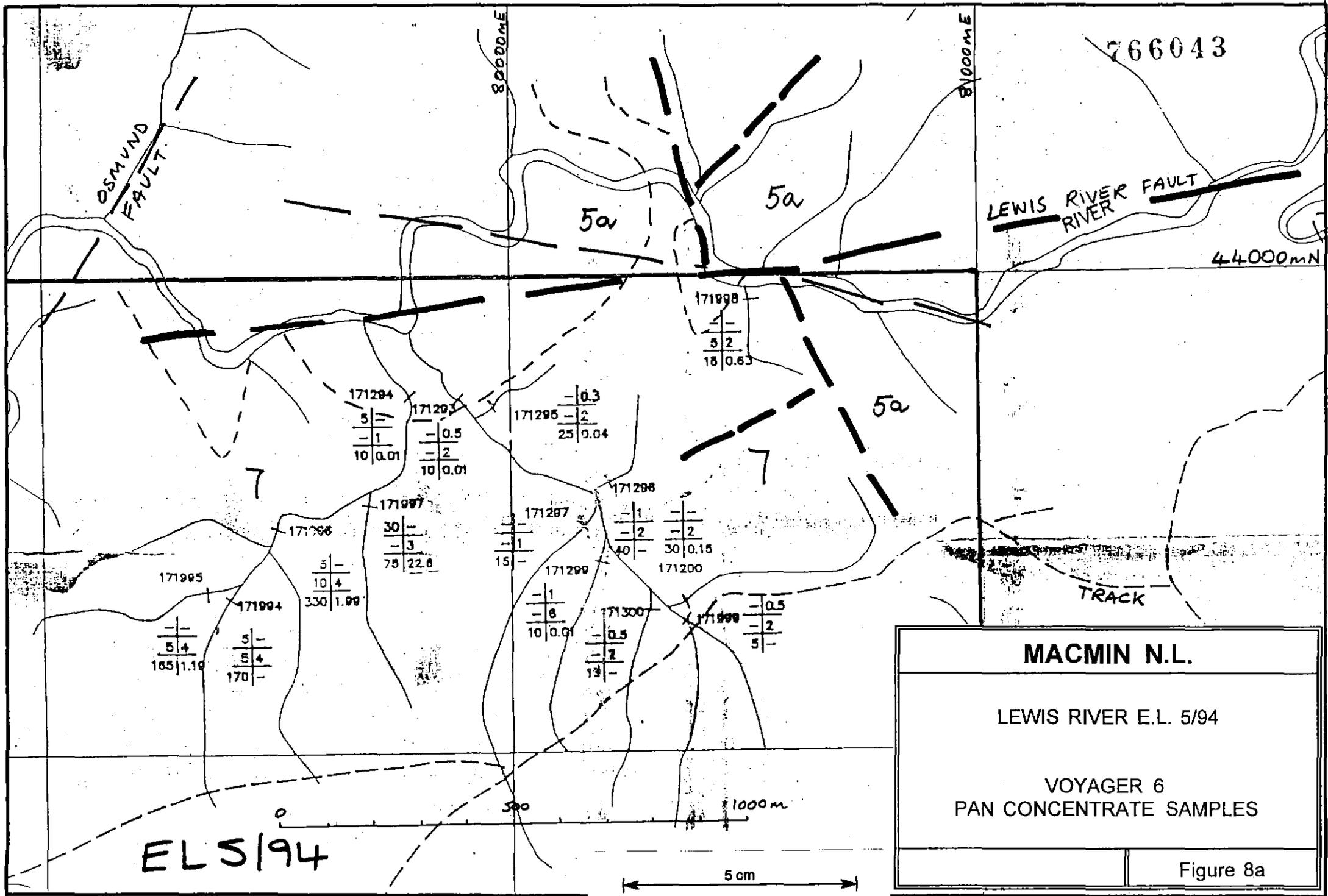
ELLIOTT BAY - E.L. 40/85

VOYAGER 6  
GEOLOGY

SCALE: 1:1000

Fig. 8

DRAWN BY:	R.P.
DRAFTSMAN:	T.E.O.S.
DATE:	1 June '87
REVISIONS:	
FILE No.	

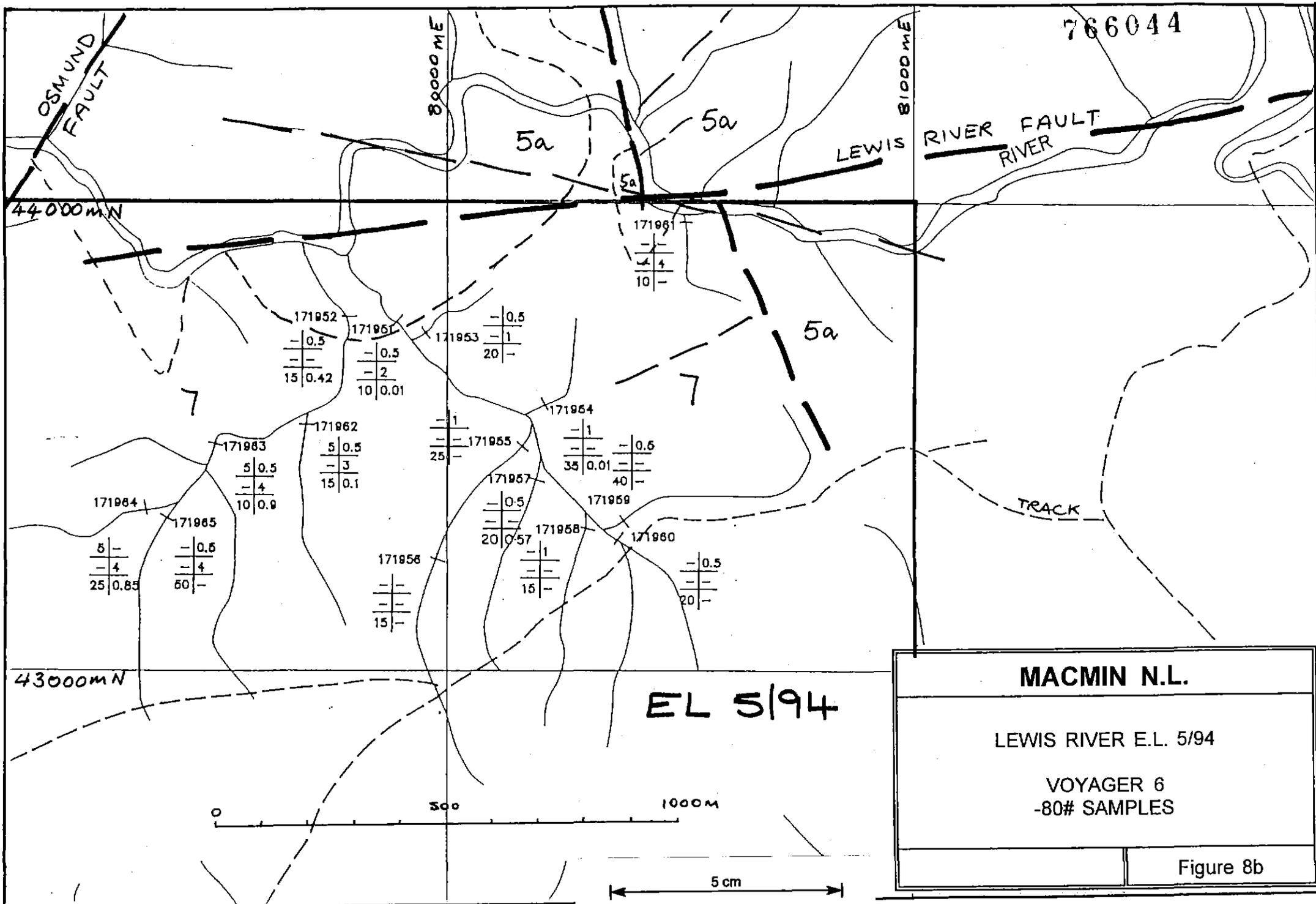


**MACMIN N.L.**

LEWIS RIVER E.L. 5/94

VOYAGER 6  
PAN CONCENTRATE SAMPLES

Figure 8a



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**MACMIN N.L.**

LEWIS RIVER E.L. 5/94

VOYAGER 6  
-80# SAMPLES

Figure 8b

TABLE 3 VOYAGER 6 - ROCKCHIP SAMPLES (PPM)

Sample	Cu	Pb	Zn	Ag	As	Au	Description
171980	90	505	610	<0.5	37	0.15	Pughy chloritic shear in rhyolitic tuffs within 50 m of granite contact
171981	910	675	60	21	25	7.25	Limonitic quartz vein in sericitized rhyolitic tuffs
171982	1150	395	30	14	21	0.77	Limonitic quartz vein in sericitized rhyolitic tuffs
171983	30	5	15	<0.5	8	<0.08	Specular hematite veinlets in sericitized coarse grained granite
171984	20	15	60	<0.05	7	<0.1	Fractured, limonitic, chloritic quartz phyric rhyolitic tuff
171985	20	5	130	<0.5	6	<0.008	Chloritic quartz phyric tuff with finely disseminated magnetite
171986	45	50	85	<0.5	4	<0.008	Same location 171985, massive magnetite
171987	15	95	160	<0.5	3	<0.008	Chloritic quartz phyric tuff with patches of limonite sub/schistosity
216391	590	3700	125	57	<1	0.59	Quartz sulphide vein 297.8 <5 cm wide
216392	220	225	40	1	<1	0.7	Limonitic and quartz veined quartz phyric tuff 5 m chip sample
216393	530	455	40	1	6	0.65	Limonitic and quartz veined quartz phyric tuff 5 m chip sample Resample of 171981 and 171982
216394	40	<5	50	<0.5	<1	0.05	Limonitic and quartz veined quartz phyric tuff 5 m chip sample Resample of 171981 and 171982
216395	125	60	20	<0.5	<1	0.04	Limonitic and quartz veined quartz phyric tuff 5 m chip sample Resample of 171981 and 171982
216396	10	<5	5	<0.5	<1	0.01	Quartz hematite/magnetite veining on granite/tuff contact

### Previous Work

Penders was mined for copper and iron early this century. Although there are no available records of production several shafts and ore stockpiles remain. The old workings lie 200-300 m north of where the Osmund Fault cuts the coastline.

Geopeko carried out gridding, mapping, soil sampling, rockchip sampling, VLF-EM, Turam EM Magnetic and IP surveys between 1976 and 1980.

Two short AQ diamond holes were drilled in 1978-79 1 km north of Penders to intercept magnetic VLF-EM anomalies. These holes intersected a magnetite-pyrite 'chemical' sediment with traces of scheelite.

Aberfoyle sampled 12 sites for stream sediment and pan concentrate in 1986-87. Best gold values were 1.07 ppm Au for -80# and 365.5 ppm Au for pan concentrate (corresponding with grain count of 50 grains of coarse Au). This highly anomalous pan concentrate sample was collected immediately east of the old workings below the granite contact. Two pan concentrate samples further north from a similar site below the granite contact returned 24.13 ppm and 41.7 ppm. One -80# sample collected within the granite gave a value of 1.07 ppm Au. **No source has been located for the Au.**

Thirty-nine rockchip samples were assayed giving values up to 0.675 ppm Au from grab samples of sulphide-rich rocks within the old workings (Table 4). Two-metre strip samples over the sulphide rich beds 'A' and 'B' and adjacent alteration zones returned low values apart from sulphide-rich samples. (Figures 6 & 7)

Quartz-pyrite ± bornite ± chalcopyrite veins with chlorite haloes in highly-sheared rocks were located during follow-up of anomalous gold stream values immediately west of the old workings. These samples contained no gold and the source of anomalous coarse gold in streams has not been located.

### Potential

From reconnaissance mapping and rockchip sampling a number of geological features which may be prospective for gold have been identified by Aberfoyle;

- a major deformation zone (the southern extension of the Osmund Fault);
- the contact between the Low Rocky Point granite and Western Epiclastic rocks; and
- Penders magnetite-pyrite beds (Geopeko reported values >0.05 g/t Au).

### Geology (Figure 5)

The Penders Prospect lies within a zone of chlorite-pyrite alteration in highly deformed fine to medium grained quartz-feldspar porphyritic rhyolitic tuffs and lavas of the Western Epiclastic sequence (Penders Tuffs). There are 2 predominant schistositys, the second, crenulation cleavage, commonly shows quartz-chlorite and quartz vein development.

The Low Rocky Point Granite intrudes the volcanic sequence west of Penders. Both the volcanics and granite are interpreted to be cut by the Osmund Fault although there is little evidence of faulting within the granite. Intrusion may post date faulting.

Chlorite alteration is widespread within the volcanic rocks and appears to be spatially related to the Osmund Fault. It is also locally pervasive within the granite particularly at the contacts. Within the Osmund Fault chlorite-magnetite veinlets are common.

TABLE 4 PENDERS PROSPECT - ROCKCHIP SAMPLES (PPM)

Sample	Cu	Pb	Zn	Ag	As	Au	Description
171282	225	215	560	1	83	0.01	Silicified rhyolitic tuff minor py and malachite
171283	1950	10	505	-	94	0.065	Limonite-chlorite vein (0.5m)
171284	2.65%	220	940	27	450	0.675	Pyrite-magnetite-chlorite chalcopyrite massive sulfide as for 284
171285	9350	310	1800	20	550	0.2	
171286	435	70	630	1.5	31	0.02	Banded magnetite-pyrite chlorite bed (1.5m)
171287	590	-	160	2.5	6	-	Chloritic siltstone-minor py
171288	30	-	35	1	10	-	Carbonate-chlorite altered tuff with dissem pyrite
171289	15	5	50	0.5	2	-	Limonitic-chlorite tuff
171290	25	-	10	1	7	-	Chlorite-sericite-talc pyrite altered tuff
171291	30	-	30	1.5	32	0.04	Massive pyrite-quartz pod, 80% py
202713	85	5	15	-	43	-	Gossanous py-arsenopyrite quartz vein
202714	10	-	-	-	2	0.005	Quartz stockworked, quartz phyrlic tuff
202715	5	-	10	-	1	-	Chlorite altered, quartz stockworked tuff
202716	10	-	10	-	1	-	Sheared granite with quartz-chlorite veins
202717	540	-	10	-	1	-	Chloritic microgranite with veins and dissem bn-cpy-py
202718	15	-	10	-	1	-	Chloritic tuff with veins and dissem of pyrite
202719	25	-	5	-	1	-	chloritic tuff with veins and dissem of pyrite
202737	1400	15	90	-	16	0.01	Quartz-chlorite-pyrite veins-minor cpy-malachite
202738	135	-	10	-	1	-	Quartz-chlorite vein
202739	770	-	40	-	58	0.01	Quartz-chlorite vein with trace malachite
202740	240	-	40	-	9	-	Quartz-chlorite vein
202741	8400	75	90	3	16	0.01	Quartz-chlorite vein with malachite and cpy

Around the old workings alteration appears to occur in conformable beds parallel to massive sulphide pods.

#### Mineralisation

Two beds containing mineralisation are present in the area of old workings.

The western most [Strip 'A'] (Figure 6) consists of a steeply NW dipping shear zone with lenticular pods (2m x 30cm) of massive pyrite-chlorite ± magnetite ± chalcopyrite rock, and is 1m wide. Talc-sericite-quartz-carbonate alteration within bedded zones of chlorite extends up to 20m on either side of the sulphide bed.

The eastern most bed [Strip 'B'] (Figure 7) is a 1 m thick banded magnetite-rich chlorite ± pyrite rock with similar alteration to that found around Strip 'A'.

Similar beds of fine chloritic mudstone and locally pyritic mudstone are intercalated with volcanic rocks further south along the coastline.

Further mineralisation occurs at the western margin of the granite. South of the Lewis River a small vein of quartz-pyrite ± arsenopyrite was located (sample 202713). West of the old workings along the granite contact there are veins of quartz-pyrite ± bornite ± chalcopyrite. Blobs of chlorite are found within the veins and they are surrounded by well-defined chlorite-pyrite alteration haloes.

#### Conclusions

The sulphide pods at Penders were suggested by Aberfoyle to be syngenetic 'chemical' precipitates and not prospective for gold.

Anomalous gold geochemistry (e.g. 365 ppm Au in -80#, 50 grains coarse Au in pan concentrate) from streams draining the western side of Low Rocky Point Granite have not been explained and the granite contact and Osmund Fault are considered to be highly prospective as they are possible conduits for mineralising fluids. (Torrey et al., 1988)

If outcrop permits more detailed mapping along the granite boundary would be beneficial, particularly in the vicinity of the 365 ppm Au in pan concentrate sample.

#### 6.4 **Wanderer South**

This prospect is located in the north-west part of the E.L. area at the headwaters of the Wanderer and Urquart Rivers. The area is covered by impenetrable vegetation - typical of the Western Epiclastics and access is via two helipads and cut access tracks.

#### Previous Work

The airborne magnetics and Dighem surveys by previous E.L. holders covered this prospect. Aberfoyle followed up the Dighem anomalies in 1987 with stream geochemistry (13 pan concentrates/-80# samples) where the best gold values were 22 ppm (8 grains) in pan concentrates and 0.13 ppm in -80# collected from streams draining quartz-epidote veined basic volcanics with native copper. Soil grid sampling gave no samples anomalous in gold. Poor exposure limited rockchip sampling however 3 samples returned <0.008 ppm Au. Magnetics and MAXMIN produced lithological anomalies highlighting black pyritic shales and probably pyrrhotite and magnetite-rich lithologies in the basic-intermediate volcanics.

### Geology (Figure 9)

Most lithologies have been mapped from bedrock cuttings in auger samples since outcrop is poor although the soil cover is generally less than 5cm thick.

The Western Epiclastics, a sequence of predominantly fine-medium grained rhyolitic volcanoclastics with lenses of andesitic-basaltic volcanics. This passes westwards into a sequence of alternating andesitic-basic volcanics and black pyritic shales, with gabbroic intrusives common in the volcanics.

### Mineralisation

There is a variety of mineralisation at this prospect:-

- pyritic shales at 900-950W on Line 6 and 425-460W on Line 5;
- disseminated fine pyrite in rhyolitic volcanoclastics at 700W on Line 6;
- quartz pyrite veining associated with clay-rich soils at 825W on Line 5 (outside E.L.);
- quartz-epidote veining and minor native copper in basic volcanics at 1480W on Line 6 (outside E.L.);
- gabbroic intrusives with disseminated pyrrhotite; and
- ilmenite sands in streams draining a shale-basic volcanic contact at 1050W on Line 6 and at 550W on Line 5.

### Conclusions

Aberfoyle concluded that the Dighem anomalies were adequately tested and not associated with significant mineralisation. Quartz sulphide veins within anomalous gold at Wanderer North were mentioned in Aberfoyle report (within Lewis River E.L. but outside Aberfoyle E.L. No other information available). Field examination to locate Wanderer North may be worthwhile.

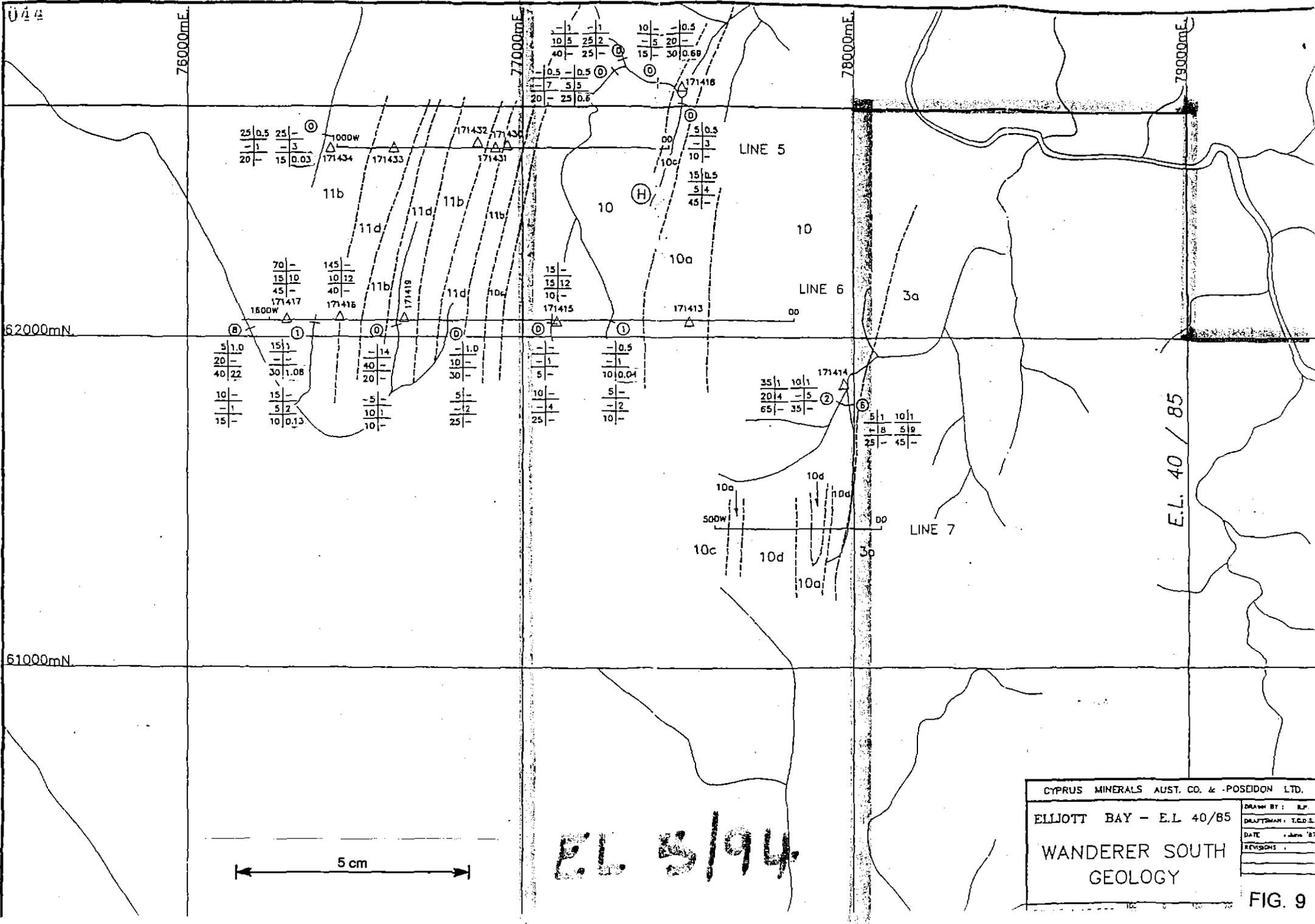
## 6.5 **Voyager 18-33 Coastal Section**

These zones are located along the western coastline between Diorite Point in the north and Veridian Point in the south.

### Previous Work

A stratigraphic horizon with dolomitic siltstones containing disseminated 'replacement' copper mineralisation was located by Geopeko. Rockchip sampling gave grades of up to 0.1% Cu but the samples were not assayed for Au. Further rockchip sampling (22 samples) and geological mapping carried out by Aberfoyle returned only 1 gold analysis above the detection limit.

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E.L. 5/94

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ELLJOTT BAY - E.L. 40/85	DRAWN BY: R.P.
WANDERER SOUTH GEOLOGY	DRAFTSMAN: T.C.S.
	DATE: 1 June '87
	REVISIONS:

FIG. 9

Geology (Figure 10)

The coastal strip between V18 and V23 is underlain by Mainwaring Group rocks including siltstones, dolomitic siltstones, green volcanoclastic sandstone of andesite derivation and andesitic-basaltic lavas. Epidote is commonly developed and many rocks are calc-silicate rich. Quartz and siderite veining is also common. Quartz and quartz-epidote boudins are present in dolomitic horizons. North of Copper Creek mouth a possible hydrothermal breccia with an epidote matrix has been located. Stockworked zones up to 500 m<sup>2</sup> without associated alteration haloes are present at several localities.

Conclusions

Rockchip results gave values ranging from 5 ppm-2.15% Cu, <5-30 ppm Pb, 15-375 ppm Zn, 1-36 ppm As and <0.008-0.055 ppm Au. One sample contained Au above the detection limit and 2 samples contained more than 1000 ppm Cu. The low Au values reduce the interest of this area.

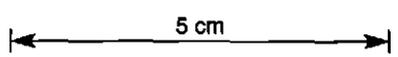
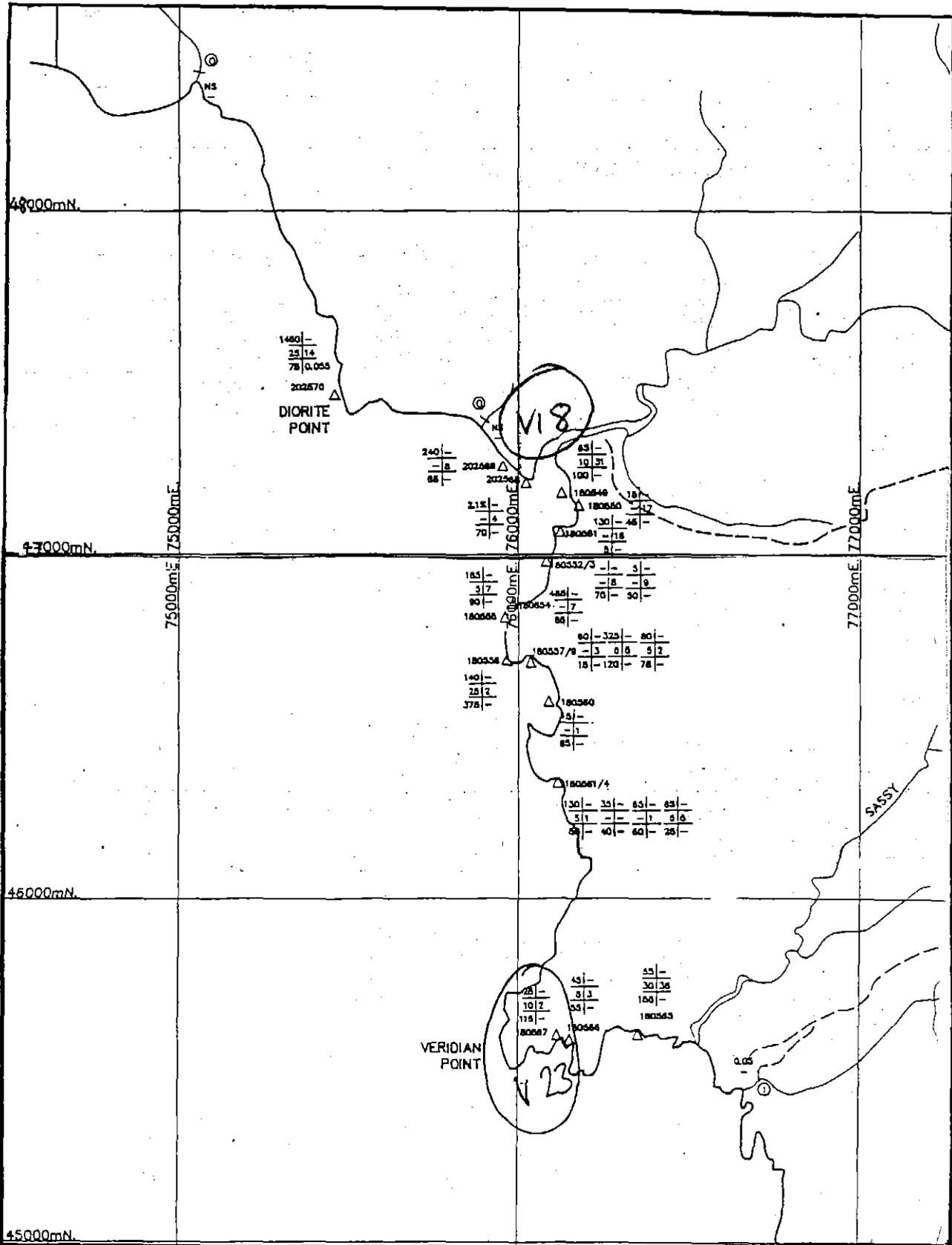
6.6 **Three Creeks Anomaly**Previous Work

Stream sediment/pan concentrate sampling in this area produced a majority of moderate to highly Au anomalous samples.

Three Creeks anomalous stream sediment samples

Pan Concentrate	
grains	Au ppm
8	10.7
5	1.2
6	2.95
3	34.8
2	2.03
10	51.7
3	3.2
14	30.3
5	39.3
13	8.9
20	24.3/15.6
23	25

This roughly circular 2 km diameter area also contains 2 aeromagnetic anomalies originally found by a Geopeko survey (Figure 11).



<b>MACMIN N.L.</b>	
LEWIS RIVER E.L. 5/94	
VOYAGER 18-33 COASTAL SECTION SAMPLE LOCATIONS	
(from Cyprus Minerals)	
	Figure 10

Geology (Figure 11)

The area sampled is underlain by undifferentiated Wart Hill and Hudson River Volcanics (5), equivalents of the Mt. Read Volcanics. These Volcanics are flanked to the east and west by intrusive Elliott Point Porphyry. Most of the Wart Hill and Hudson River Volcanics is overlain by a cover of Tertiary gravel and sand deposits. A major NNE/SSW trending fault passes through the west of this anomalous area and several short NW/SE faults are inferred to adjoin it.

Conclusions

The Three Creeks area constitutes a very high priority anomaly. The high Au grain count in the pan concentrates demonstrates the presence of coarse gold. This area also lies immediately east of the Lewis River prospect in Aberfoyle's E.L. but does not appear to have had any follow-up possibly due to the presence of Tertiary gravel cover.

6.7 **Upper Hudson River Anomaly**Previous Work

This anomalous area is defined by several moderate to highly anomalous pan concentrate samples collected near the junction of tributaries and the Hudson River. Gold values range from 5 to 456 ppm (Au analysis) and gold grain counts ranged from 3 to 20 (Figure 12).

Upper Hudson River anomalous stream sediment samples

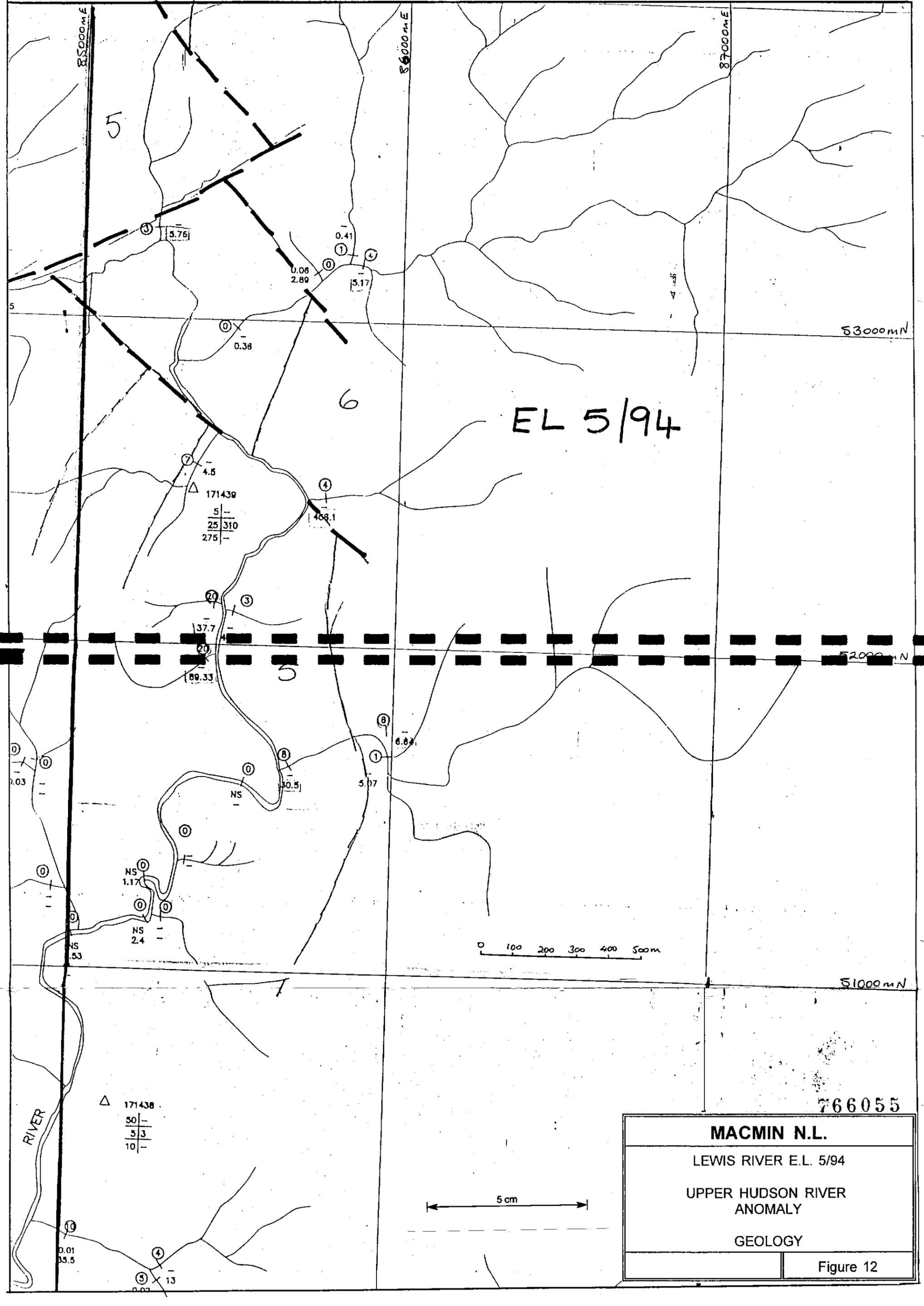
Pan Concentrate	
grains	Au ppm
6	6.64
8	30.5
20	89.33
3	4.24
20	37.7
4	4.56
7	4.5
4	5.17
0	2.89
3	5.75

Geology (Figure 12)

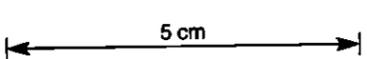
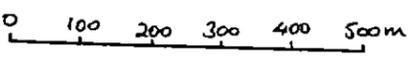
The anomalous samples were collected from streams underlain by Wart Hill and Hudson River Volcanics close to its easterly boundary with the Elliot Point Porphyry.

Three short NW/SE trending faults cut the northern part of the anomalous area.





EL 5/94



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<b>MACMIN N.L.</b>	
LEWIS RIVER E.L. 5/94	
UPPER HUDSON RIVER ANOMALY	
GEOLOGY	
	Figure 12

### Conclusions

The anomalous pan concentrate samples were collected over an area approximately 1 km by 0.5 km and do not appear to have been followed up at all. Two samples with a Au grain count of 20 cannot be ignored and the area requires further sampling and geological mapping.

#### 6.8 **Air Magnetic Anomaly 3** (Figure 13)

##### Previous Work

Six magnetic traverse lines (2.1km) outlined the anomaly in more detail. Soil samples were collected over the centre of the anomaly with anomalous results at the eastern end (5100 ppm Cu, 98 ppm Pb, 10 ppm As, 0.03 g/t Au). Anomalous pan concentrates in this area include 0.33 ppm/2 grains of Au; 9.9 ppm/9 grains and 2.53 ppm/6 grains.

##### Conclusions

The magnetic and soil geochemical anomalies are coincident and appear to be centered over the granite/rhyolitic tuff contact. The magnetic anomaly is suggested to be >100m depth and possibly lies at the granite-tuff contact suggesting the contact dips southwest.

Aberfoyle recommended detailed soil sampling and ground magnetics.

The moderately anomalous pan concentrates suggest Au may be associated with the granite contact and further sampling is recommended.

#### 6.9 **Porphyry Dolerite Contact** (Figure 14)

##### Previous Work

A -80# stream sediment geochemical survey was carried out by Geopeko over the airmagnetic anomaly. Aberfoyle surveyed a 800m line and soil sampled and carried out ground magnetics and MAXMIN.

Of 4 stream sediment and pan concentrate samples collected downstream of the contact one pan concentrate sample contains anomalous Au (230 ppm) and one -80# returned 0.88 ppm Au. The exact sample location of the 230 ppm Au pan concentrate sample (202617) is unclear from the Cyprus map (Figure 15). A single sample line was soil sampled and while all Au and Ag values were below the detection limit, base metal values were up to 100 ppm.

##### Geology

A major fault suggested to have been active early Cambrian to Tertiary is at the centre of this prospect.

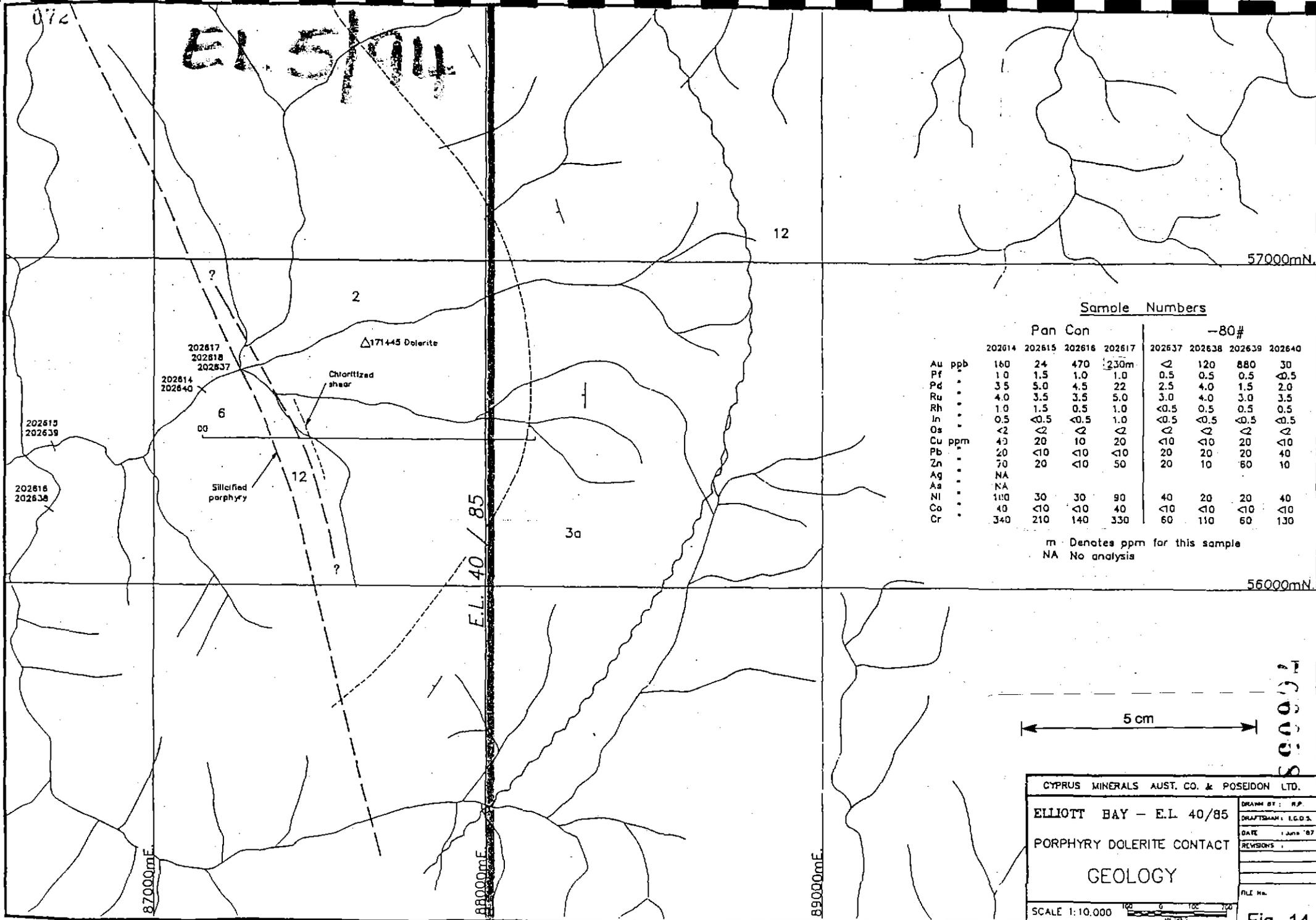
The main lithologies in the area are - the Elliott Point Porphyry; a wedge of Precambrian phyllite and quartzite suggested to be the original porphyry Precambrian contact; medium-grained possibly Jurassic dolerite; west dipping basal Ordovician (?) sandstones.

A ridge coincident with the Eastern Elliott Point porphyry/dolerite contact is interpreted to be silicification.



072

E.L. 5/04



Sample Numbers

	Pan Con				-80#			
	202614	202615	202616	202617	202637	202638	202639	202640
Au ppb	160	24	470	230m	<	120	880	30
Pf	10	1.5	1.0	1.0	0.5	0.5	0.5	<0.5
Pd	35	5.0	4.5	22	2.5	4.0	1.5	2.0
Ru	4.0	3.5	3.5	5.0	3.0	4.0	3.0	3.5
Rh	10	1.5	0.5	1.0	<0.5	0.5	0.5	0.5
In	0.5	<0.5	<0.5	1.0	<0.5	<0.5	<0.5	<0.5
Os	<2	<	<	<	<	<	<	<
Cu ppm	43	20	10	20	<10	<10	20	<10
Pb	20	<10	<10	<10	20	20	20	40
Zn	70	20	<10	50	20	10	60	10
Ag	NA							
As	NA							
Ni	110	30	30	90	40	20	20	40
Co	40	<10	<10	40	<10	<10	<10	<10
Cr	340	210	140	330	60	110	60	130

m Denotes ppm for this sample  
NA No analysis

5 cm

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ELLIOTT BAY - E.L. 40/85

PORPHYRY DOLERITE CONTACT

GEOLOGY

SCALE 1:10,000

DATE 1 Jun 87

REVISIONS

FILE No.

Fig. 14

Conclusions

Apart from the solitary 230 ppm Au in a pan concentrate, geochemical values are generally more moderately anomalous e.g. 0.12 ppm Au and 0.88 ppm Au in -80#, making this a second-ranking anomaly, warranting further sampling after the higher priority anomalies.

7. PROSPECTIVITY FROM LINEAMENT ANALYSIS

Magnetic lineaments located by airphoto and magnetic lineament interpretation have been interpreted by Aberfoyle to correspond with fundamental crustal discontinuities possibly re-activating over a long period. (Wallace, 1991). They may be potential zones of fluid migration, alteration and mineralisation.

The major lineaments are interpreted to be major faults, most notably the Osmund, Lewis River and Copper Creek faults. They form distinct topographic features of lateral extent.

The Cambrian Intrusives and Felsic Volcanics are the most structurally complex and appear to have the greatest economic potential.

Conjugate sets of N to NNW and NE to NNE lineaments within these lithologies are also considered to correspond with strong structural discontinuities which may have been active during the Cambrian, Ordovician and Devonian. (The majority of prospects associated with these are not within E.L. 5/94.)

8. POTENTIAL

The base-metal potential of the Lewis River E.L. could be considered to have been well-tested by the former licence holders.

**The gold potential in many areas has not been adequately tested and many anomalous gold samples, particularly stream sediment and pan concentrate samples remain unexplained.**

**In particular the Three Creeks area of moderately anomalous stream geochemical samples (Au) coincident with Airmagnetic anomalies 1 and 2, and the general anomalism around the periphery of the Low Rocky Point Granite deserve further exploration effort.**

\*\*\*\*\*

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\*\*\*\*\*

TERTIARY \_\_\_\_\_

1 Quartzose Gravel

JURASSIC \_\_\_\_\_

2 Dolerite

LATE CAMBRIAN - EARLY ORDOVICIAN \_\_\_\_\_

3 Owen Conglomerate - undifferentiated  
 3a - coarse quartzose sandstone  
 3b - siltstone

4 Waterloo Creek Group - undifferentiated  
 4a - hematitic volcanioclastic conglomerate  
 4b - tuffaceous coarse sandstone and grit  
 4c - black shale ± pyrite  
 4d - fine-med. grained rhyolitic volcanioclastic

CAMBRIAN - MT. READ VOLCANICS \_\_\_\_\_

5 Wart Hill and Hudson River Volcanics - undifferentiated  
 5a - fine to med. grained rhyolitic volcanioclastic  
 5b - rhyolitic quartz-feldspar porphyry (lavas and intrusives)  
 5c - dacitic porphyry  
 5d - coarse rhyolitic volcanioclastic  
 5e - siltstone  
 5f - siliceous conglomerate  
 5g - greywacke and siltstone

CAMBRIAN INTRUSIVES \_\_\_\_\_

6 Elliott Point Porphyry  
 7 Granite  
 8 Microgranite  
 9 Porphyritic Microgranite

CAMBRIAN - WESTERN EPICLASTICS \_\_\_\_\_

10 Western Epiclastics - undifferentiated  
 10a - andesitic - basaltic volcanics  
 10b - brown-grey tuffaceous siltstone and quartzose conglomerate  
 10c - black shale ± pyrite  
 10d - fine to medium grained rhyolitic volcanics  
 10e - gabbro  
 10f - coarse rhyolitic volcanioclastic sandstone

CAMBRIAN - MAINWARING GROUP \_\_\_\_\_

Mainwaring Group - undifferentiated  
 - gabbro  
 - andesite-basaltic volcanics  
 - dolomite  
 - black shale ± pyrite  
 - siltstone and sandstone

PRECAMBRIAN \_\_\_\_\_

Metamorphics - quartzite, schist and phyllite

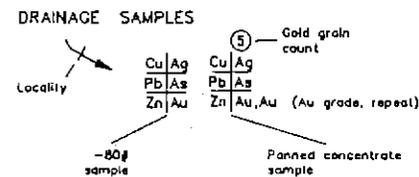
- Geological contact
- ~ Unconformity
- Fault
- SE Strike and dip of schistosity
- SW Strike and dip of bedding - facing indicated
- ∩ Plunging syncline
- ⌘ Old workings

ALTERATION - Pervasive and vein controlled \_\_\_\_\_

- Chlorite - magnetite
- Sericite
- Sericite - quartz
- Chlorite - pyrite
- Quartz - chlorite - pyrite - tourmaline
- Quartz - sericite - talc ± chlorite
- Quartz - chlorite

- Quartz vein
- Alteration boundary

GEOCHEMISTRY \_\_\_\_\_

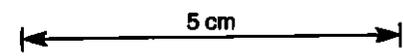


- ROCK CHIP SAMPLES
- △ 202567 - Sample location and number
  - △ 202569 - Sample location number and assays  
 Cu|Ag  
 Pb|As  
 Zn|Au
  - △ 202569 TS - Thin section sample
  - V33/1 - Diamond drill hole location

DETECTION LIMITS (ppm)

	Cu	Pb	Zn	Ag	As	Au
Rocks	5	5	5	0.5	1	0.005
-80# plus panned concentrates	5	5	5	0.5	1	0.008
Soils	5	5	5	0.5	1	0.01 (AAS) 0.008 (Fire assay)

- = Below limit of detection



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ELLIOTT BAY - E.L. 40/85	DRAWN BY:
LEGEND FOR PROSPECT MAPS	DATE: 1 April 87
	REVISIONS:
	FILE NO.:
SCALE 1:_____	