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## SUMMARY

The Red Hills EL 29/94 contains Central Volcanic Complex sequences and overlying Tyndall Group stratigraphy which are highly prospective for VHMS mineralisation and Henty-style gold mineralisation.

Plutonic exploration on the lease has involved detailed mapping, soil geochemistry, drill hole relogging, ground magnetics and a Moving Loop EM survey over a new AMG grid. This work has confirmed the northern adits copper-rich mineralisation may be the root of a felsic VHMS hydrothermal system which was eroded and redeposited in debris flow hosted volcanoclastics of the lower mineralisation horizon (LMH). Weak gold and base metal values with silica-sericite-pyrite alteration in the overlying basal Tyndall Group Lynchford Member sediments mark the waning phase of the hydrothermal system.

EM anomalism in the Red Hills northern adits area may also indicate the presence of remnant massive sulphides within the stringer zone mineralisation.

Late Cambrian granite-related K-feldspar-chlorite-magnetite  $\pm$  chalcopyrite alteration at Red Hills has overprinted the VHMS alteration and obscured stratigraphic correlations. Auriferous quartz-carbonate veins accompanied subsequent deformation of the Cambrian succession in the Western ridge lava sequence.

## 1.0 INTRODUCTION

Exploration License 29/94 covers an area of approximately 16km<sup>2</sup> central to the Cambrian Mount Read Volcanics Belt (MRV) in Western Tasmania (Figure 1). The tenement was granted to Plutonic Operations Ltd on 22 October 1994.

This report details activities on EL 29/94 from 22 October 1997 to 21 October 1998. Exploration by previous companies has been directed at the copper-gold potential of the chlorite alteration pipe within the Red Hills lava, and at the exhalative base metal and gold potential of the overlying felsic volcanic and black shale package to the west of the lava. The high prospectivity of the latter volcanoclastic sequences is evidenced by the RH5 drill intersection of 2.8m of banded massive sulphide (assaying 34.5% Zn, 11.4% Pb, 0.3% Cu, 250g/t Ag and 6.5g/t Au), and an inferred resource of 1 million tonnes at ~2g/t Au delineated in the vicinity of that drill hole (Purvis et al 1983).

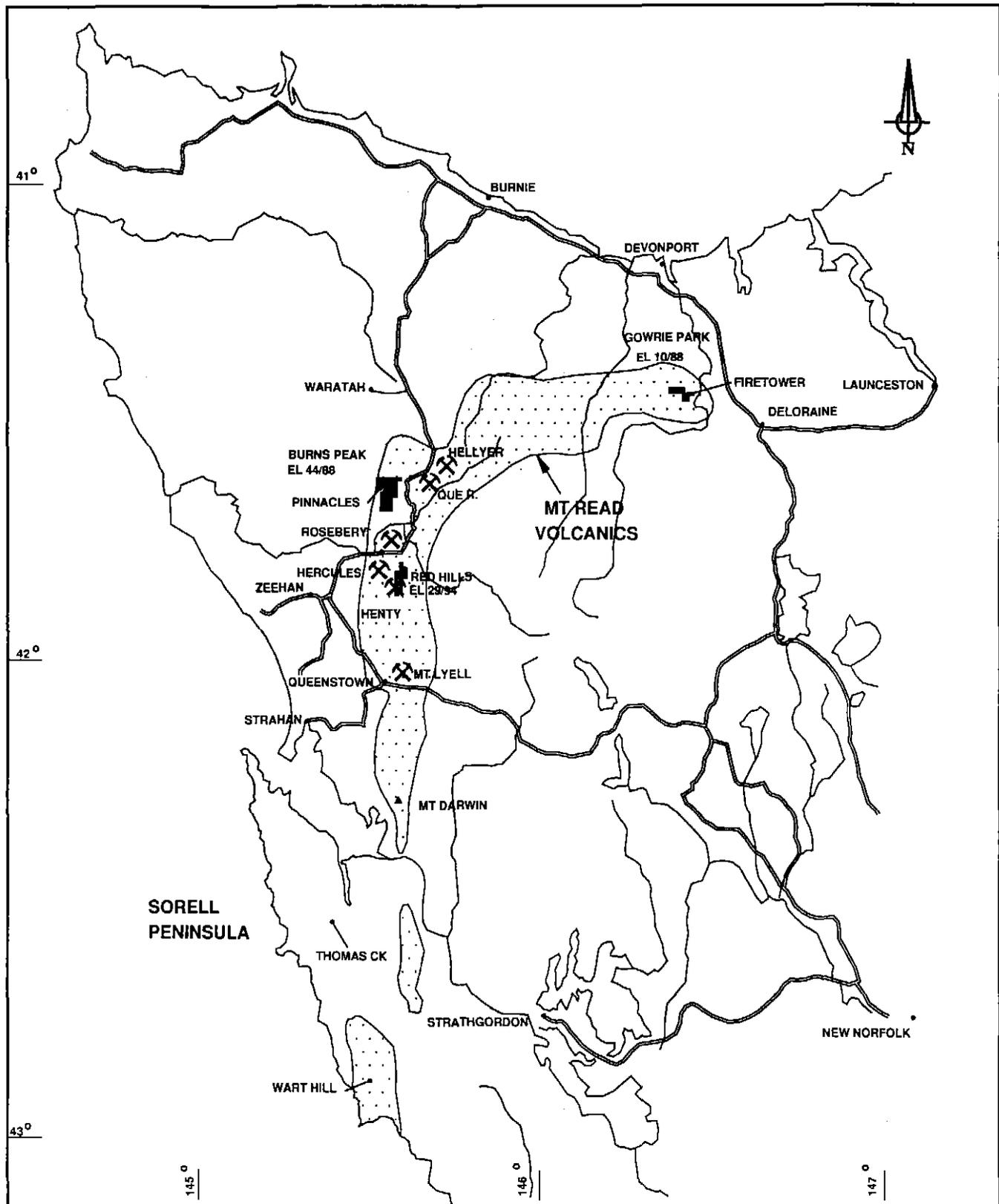
An important feature of the Volcanic Hosted Massive Sulphide (VHMS) deposits of the MRV is their stratigraphic setting. Most deposits of this type occur at or near the boundary between the Central Volcanic Complex (CVC) sequences and Tyndall Group (TG) or equivalent stratigraphy (The White Spur Formation, Southwell Subgroup). This boundary represents a change in volcanism from feldspar-phyric (CVC) to quartz-feldspar-phyric (TG) volcanics. The exploration potential of EL 29/94 rates very high for VHMS as both CVC and TC stratigraphy exists within this mineralised and structurally complex area.

## 2.0 LOCATION AND ACCESS

EL 29/94 lies several kilometres east of Mt Read in Western Tasmania, within a 2-3km corridor extending north from Lake Westwood and Julia Peak to the southernmost slopes of Mt Murchison (Figure 2).

Access to the license area is by public roads to RGC's Henty Gold Project Mining Lease and then by four wheel drive all weather vehicle tracks to the Red Hills area. This access has been improved to a standard suitable for truck mounted drill rig by minor blasting and flattening of a troublesome steep section east of the Henty Fault zone. Foot access is also possible from the Henty-Anthony Road, which passes along the eastern margin of the license. During May to November, the efficiency of field work is heavily weather dependent due to the elevated and exposed nature of the area. A short induction of Plutonic personnel was required by Henty Gold Project to allow egress through their mining lease to the EL area.

EL 29/94 occupies an environmentally sensitive area, in mountain country within the South West Conservation Area. Vegetation is composed of large expanses of button grass and intermittent low scrub with local mature rainforest in more protected areas. The latter containing significant stands of King Billy Pine, particularly in the gully south and west of the Red Hills summit. Concern for the preservation of indigenous tree species, particularly



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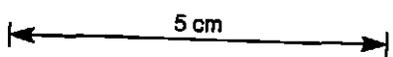


FIGURE 1

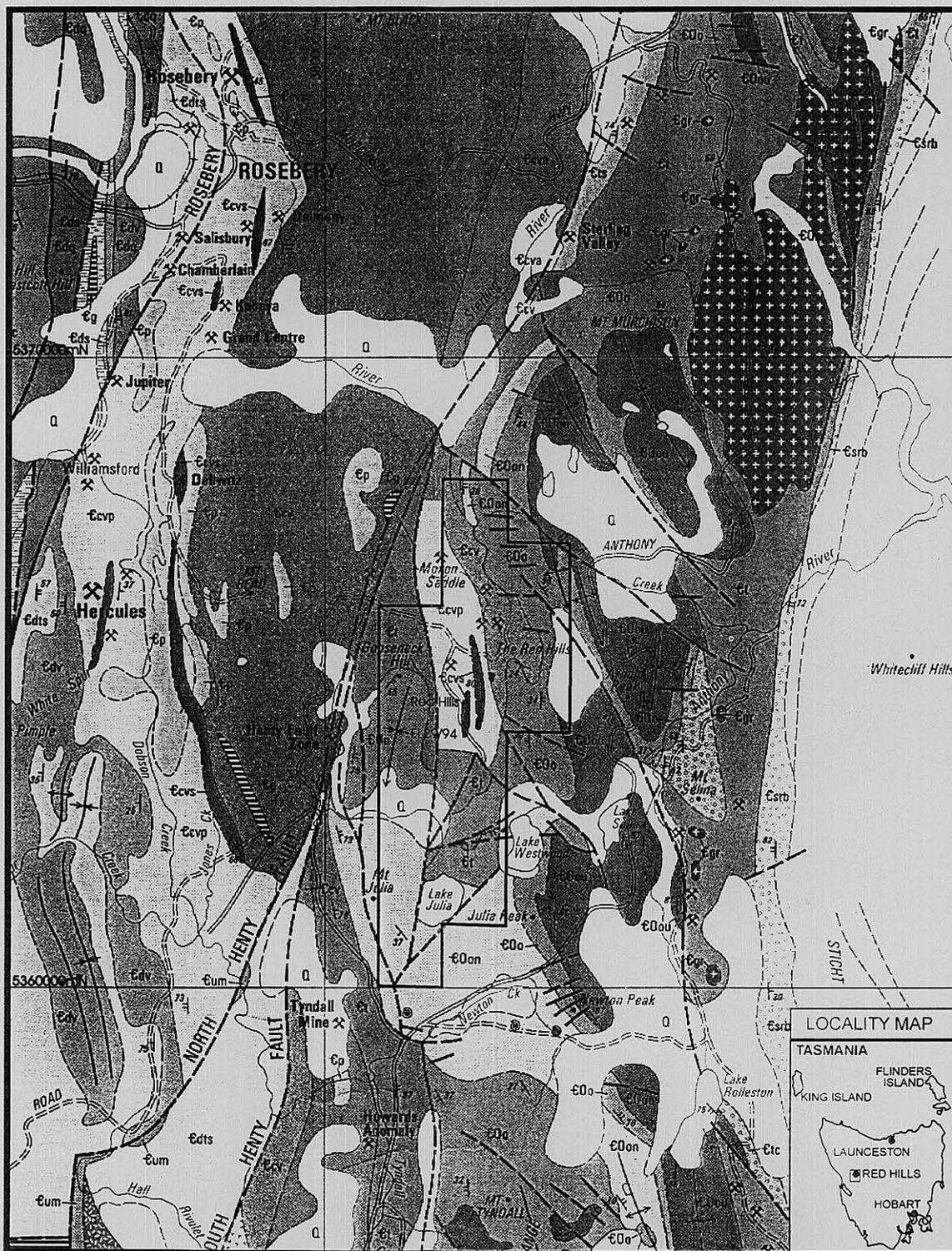
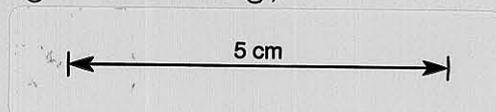


FIGURE 2: Whole Tenement Regional Geology



the King Billy Pine was expressed during the approval process for gridding over the central target area. Particular care has been taken to avoid cutting of these tree species during subsequent gridding. Measures were also undertaken to avoid the introduction and or spread of *Phytophthora cinnamomi* (die back) disease.

### 3.0 TENURE

Exploration license 29/94 consists of 16km<sup>2</sup> at Williamsford in the north west of Tasmania. The lease was granted to Plutonic Operations Ltd on 22 October 1994.

### 4.0 GEOLOGY

Tasmanian Mines Department mapping of the Red Hills area (McNeill, 1987) shows the geology is dominated by feldspar and lesser feldspar-quartz phyric volcanics and lavas, assigned to the Central Volcanic Complex (CVC). The overlying quartz-feldspar-phyric lavas, volcanics and epiclastics of the Tyndall Group (TG) outcrop to a lesser extent along the eastern and western margins of the lease, as well as in the south. The unconformably overlying Cambro-Ordovician Owen Conglomerate has a similar distribution.

The CVC volcanics are differentiated into two principal volcanic packages comprising felsic lava and a volcanoclastic dominated sequence. The dominantly feldspar-quartz phyric lava of rhyolitic to rhyodacitic composition, outcrops as a prominent high ridge in the east with a small outlier, the 'Western Ridge' located west of the RH5 area. These 'Red Hills lavas' are evident as a belt of pervasively altered near un-differentiable reddish felsic volcanics, the reddish colour presumably resulting from widespread K-feldspar alteration with iron stained zones which are variably silica-chlorite altered. This intense alteration commonly masks the primary volcanic textures and prevents adequate subdivision of the sequence.

The bulk of the volcanics to the west of the 'Red Hills lavas' are classed as dominantly feldspar-phyric felsic pyroclastic units, including ignimbritic units (McNeill, 1987). These volcanics are locally weakly quartz-phyric and are further subdivided here to comprise both the CVC and TG. This subdivision results from recent re-definition of TG stratigraphy.

In terms of the regional geological setting, the Red Hills stratigraphy is here loosely and informally correlated from oldest as upper CVC (sub Lower Mineralised Horizon; LMH), Lynchford Member of the TG (LMH up to and including the "Black Shale"), Mount Julia Member and Zig Zag Hill formation. The nature of these units and these tentative correlations is discussed below in terms of volcanic facies associations.

A strong structural overprint in the form of a moderate to strong foliation with shearing and later brittle style faulting has disrupted the volcanics.

The understanding of the Red Hills geology relies largely upon mapping of volcanic facies and structural interpretation as few marker horizons are recognized in the lower portion of the volcanic sequences. The volcanics are very difficult to characterize due to the extent of alteration and locally strong foliation development. However, outcrop is good in most areas, except where forest cover and glacial scree or alluvium obscures the volcanics in the south and south west of the tenement (Herrman 1996). A series of variably open to tight almost isoclinal northerly trending and southerly plunging folds are recognized in the Red Hill grid area. This is mainly evident from logging of drill core in the central (RH5) area where a prominent black shale-volcaniclastic siltstone horizon is the locus for a major synform referred to as the shale syncline.

VHMS mineralisation has been identified along two principal horizons / stratigraphic positions, at the base of a major black shale unit and along Lower Mineralised Horizon (LMH), containing the RH5 intersection. The LMH is commonly marked by altered polymict breccias and siliceous exhalatives with silicification extending up to the shale horizon possibly reflecting the migration of the hydrothermal system upward through the intervening high density turbidite deposited volcaniclastic sandstones between the principal VHMS horizons.

## **STRATIGRAPHY**

### **Felsic Lava and Volcano-Sedimentary Associations**

The Felsic lava and Volcano-sedimentary associations are stratigraphically the oldest in the Red Hills area. Outcrop distribution is extensive along the eastern, northern and central western portions of the license area. They are host to VHMS mineralisation, incorporating the Lower Mineralised Horizon (LMH) and extending up to the base of the black shale mineralised horizon. This facies association apparently incorporates the CVC/TG boundary at approximately the LMH position, which marks the first appearance of quartz phenocrysts in the host volcanics.

Identification of these volcanic facies is problematical along the 'Red Hills' ridge in the east of the tenement area as outcrops often show strong alteration masking the primary volcanic features. These volcanics have traditionally been identified as dominantly 'lava' (eg. McNeill, 1987, Jenkins; 1991; Purvis et al, 1983). However, recent mapping demonstrates the volcanics contain a significant volcaniclastic as well as coherent lava component with the previous interpreted lava distribution reflecting the bounds of a large alteration system. The alteration comprises pervasive and domainal K-feldspar, chlorite and lesser silica alteration resulting in distinctive red stained outcrop.

Volcaniclastic textures in the Red Hills lavas are obviously most readily apparent outside the bounds of the alteration, but relicts of these textures can be identified within the 'lavas'. For example, volcaniclastic siltstone rafts and disrupted beds are evident at 2300E, 6130N and similar examples are located

nearby at 2380E, 6040N. Another example is facing within thin graded beds in the basal portion of drill hole RH16. Despite these observations the nature of the outcrop precludes an accurate volcanic facies interpretation within the more altered rocks.

### **Felsic Lava and Breccia Association (RHL)**

Coherent lavas are expressed as massive and sometimes blocky outcrop with uncommon flow banding and rare spherulitic texture providing unequivocal evidence of their eruptive nature. Hand specimen reveals a cream to light tan coloured, flinty feldspar-phyric rock with aphanitic groundmass. The mineral composition suggests dacite or rhyodacite as indicated by McNeill (1987).

Lava outcrop is dominantly north of 5000N where coherent lavas are flanked by compositionally similar monomict block breccias in units varying from 20 to 50 metres thickness. The breccias exhibit open framework to near close packed textures with sub-rounded to angular clasts of feldspar-phyric coherent felsic (lava) and flow banded lava. Their matrix is feldspar-phyric and may display a chloritic pumiceous texture. Jig saw fit is not evident, suggesting these breccias represent a partly reworked hyaloclastite facies related to seafloor extrusive lava emplacement.

The precise stratigraphic positioning of the dacitic lavas suits at Red Hills is problematic and there is evidence of intermittent extrusive activity during the entire deposition of the CVC package. Lavas are well exposed along the western ridge (5100N; 2000E), along strike to the north of 6100N and on the Red Hills ridge, east of the small shale syncline. The lavas may have been extrusive early in the CVC sequence but were definitely emergent during the formation of the lower mineralised debris flow, as this unit clearly bears juvenile lava clasts. Even later activity is evidenced by probable sills within the basal portion of the black shale horizon reported by Herrmann (1996).

The dominant lithologies within this association are pumiceous weak to moderately feldspar-phyric felsic volcanoclastic sandstones and lithic volcanoclastic sandstones. Polymict volcanoclastic breccia is intimately associated with the lava facies and has been correlated with the Lower Mineralised Horizon (LMH) or the volcanic sequence directly beneath it. Sparsely distributed rock types comprising the LMH include pale green and grey volcanoclastic siltstones, and grey chert. The commonly massive volcanoclastic sandstone units within this facies association were probably formed by high-density turbiditic flows.

In the northern-central portion of the Red Hills area, the stratigraphy of the volcanoclastic association can be roughly divided into three principal components, which are allotted partly on the basis of both distribution of mineralisation and volcanic facies. Recognized sequences in order from oldest to youngest include the footwall volcanics, the LMH and sub black shale massive volcanoclastic sandstones. Few characteristics readily differentiate each sub division and among these only the LMH represents a reliable marker horizon in the local context.

## **Footwall Volcanics**

Pumiceous lithic felsic volcanoclastic sandstones are common throughout the footwall to the LMH. This lithology is matrix dominated and commonly displays lithics of felsic lava up to 40cm, but mostly 5 to 10cm in diameter. A relationship to the lava margin block breccias is illustrated by gradation outward from this facies to pumiceous lithic volcanoclastic sandstone containing clasts of the same composition. However a direct genetic link is not implied as the matrix differs between these volcanoclastics. Sparsely distributed quartz phenocrysts are locally evident within the pumiceous lithic volcanoclastic sandstone matrix, but are apparently absent in the lava and proximal breccia facies. These facies immediately adjacent to the coarse lava breccias may incorporate and re-deposit lava hyaloclastite slightly more distal to the coherent lava flows.

Best examples of this lithology are evident west of the shale syncline, near 1800E, 5200N. Weak silicification is apparent in outcrop here as spidery dendritic veinlets. These rocks possibly represent less altered equivalents of the massive de-textured volcanics in the eastern Red Hills area. Key features for tentative correlation are the occurrence of disseminated magnetite and poorly expressed relict breccia textures with rarely observed quartz phenocrysts.

Most lithologies within the footwall to the LMH display little internal stratification. However, in the central north and at 2060E, 5680N highly disrupted beds and clasts of grey volcanoclastic siltstone are observed to form a mappable horizon. Elongate banded clasts/rafts (to 1.5m) of siltstone present within pumiceous lithic volcanoclastic sandstone were possibly formed as flow base rip up clasts. This feature in conjunction with rare thinly bedded outcrops (eg. 2380E, 5690N) which may represent flow top stratification, are pointers to a high-density turbiditic origin for at least part of these volcanoclastics. Spatial distribution of these features indicates that individual units maybe up to 100m or more in thickness.

## **Lower Mineralised Horizon and Polymict Volcanoclastic Breccias**

The Lower Mineralised Horizon (LMH) represents the lowest stratigraphic horizon at which VHMS exhalative mineralisation has been identified and is considered to mark the approximate position of the CVC/TG boundary. The LMH is often represented by a mineralised breccia unit, but also incorporates equivalent lateral facies variants in the form of lithic volcanoclastic sandstones. The polymetallic massive sulphide intersection in RH5 is interpreted to lie within the latter facies.

This unit is most easily recognized in drill core from the variety of clast types up to block size. These include:- cherty siliceous clasts, semi massive sulphide, carbonate clasts and juvenile lava clasts, the latter being most common. The clast types present clearly point to an intimate association with emergent lava facies and indicate erosion of a sea floor VHMS system.

The breccia units vary considerably in thickness from greater than 20m to as little as 2 metres. Facies variation is also apparent with the LMH commonly expressed as a breccia to the west of the central shale syncline whereas to the east it is notably thinner and less clast rich. Here, the LMH is more typically represented by lithic volcanoclastic sandstone in RH5 and approximately 1m of breccia accompanied by a similar width of py-shp-gal semi-massive sulphide in RH16. This thinning to the east may represent a relative topographic high in the west with a more distal depositional setting eastwards. A unique example of a near totally monomict gold mineralised silica-pyrite clast bearing breccia within RH16 (197-227m) to the west of the syncline illustrates that the breccias are localized in channels proximal to an eruptive source.

Outcrop of apparently monomict lava clast bearing volcanoclastic breccia, very similar to the lava facies association, is found to directly correlate with weakly polymictic breccia at depth in some drill holes. This applies particularly to the west side of the syncline where the unit position is more reliably extrapolated to surface, whereas to the east the mineralised horizon is difficult to identify in outcrop. This is partly related to the previously mentioned thinner and less clast rich expression here. However a principal outcrop at 2340E, 5525N displays a 1m thick close packed hematite-veined volcanoclastic breccia, enclosed by weak to moderately silicified (veinlets and pervasive) weakly banded quartz-feldspar phytic volcanoclastic sandstone. The outcrop is weakly foliated and banded, and in hand specimen reveals a cream coloured, medium to coarse-grained texture. Elevated gold in soils (1.2ppm) immediately south of this zone may be related to a more hydrothermally altered zone in the LMH. The overlying felsic sequence to the west at 2475E, 5350N is notably silica-sericite-pyrite altered, therefore this area may be relatively proximal to a hydrothermal fluid source.

### **Grey Chert**

Grey exhalative chert/siliceous siltstone? commonly lies stratigraphically above or is incorporated within mineralised debris flow units. Exposure at seafloor is clearly shown by eroded grey cherty clasts within breccia units. An alteration style texturally identical to this unit is also commonly developed at the base of shale horizon, where grey "cherty" alteration forms irregular matrix pervasive zones indicating formation via alteration/replacement, whereas the massive cherts possibly represent an exhalite.

### **Massive Volcanoclastic Sandstones (Sub-black Shale)**

The interval between the LMH and the base of the black shale unit is characterized by non-descript feldspar  $\pm$  quartz-phyric volcanoclastic sandstones with volcanoclastic textures only locally evident. On surface these rocks present as massive fine-grained light green to cream and foliated 'ashy' appearing felsic volcanic.

The volcanoclastic sandstones are evident within drill core as a massive homogeneous medium grained felsic volcanic possessing little or no apparent internal structure. They are variably feldspar phyric and locally weakly quartz-phyric. The de-textured appearance is most probably related to pervasive silicification and perhaps partial recrystallisation.

The volcanoclastic sandstones are commonly weakly quartz-phyric on both sides of the shale syncline centered at 2300E, but are more quartz-phyric in a poorly defined belt extending along the east side of the syncline, north of RH7 (5300mN). This unit apparently encloses the lower mineralised debris flow horizon. Spherulitic appearing (q-phc?) silica-chlorite altered felsic volcanics outcropping east of RH5 may correlate with these rocks. Jenkins (1991) mapped an altered q-f-porphyry immediately southeast of the RH5 area, (2480E, 5050N) which in thin section comprised 50% phenocrysts of which 40% were quartz.

Similar facies are evident on the western limb of the syncline, but here quartz is less obvious and the footwall sequence may be locally truncated by faulting. Elsewhere, in the northeast part of the Red Hills grid at 3100E, 5650N and 2950E, 6000N, McNeill (1987) has previously mapped spherulitic textured outcrop as q-f-porphyry. Considering the similarities to facies described in the eastern syncline area, a tentative correlation is implied. This hypothesis requires an anticlinal fold closure through 'The Red Hills' ridge and indicates the LMH may be repeated in this area. The occurrence of a block breccia adjacent to quartz-crystal volcanoclastic sandstone at 3000E, 5700N and the old workings (No. 1 East) within quartz-feldspar porphyry having nearby archival Zn soil anomalism (300ppm Zn; TCR 70-654) support this assumption.

The quartz-poor massive volcanoclastic sandstone unit is tentatively correlated with the Lynchform Member (Lower Tyndall Group) defined by White and McPhie (1996). These quartz-phyric volcanics could reflect a partial mixing of detritus from both CVC and TG (/Eastern Quartz Porphyritic Sequence?) source areas. A single occurrence of a quartz-feldspar crystal rich clast in a CVC hosted lithic volcanoclastic (2340E, 6100N), interpreted as footwall to the LMH, indicates erosion of a rhyolitic volcanic terrain at that time. These observations suggest the TG / CVC boundary may be transitional, with Tyndall Group volcanism commencing at or prior to formation of Lower Mineralised Horizon breccias. The change in Ti/Zr ratios from the more clearly CVC like (4 to 6) to Tyndall-like (10 to 15) above the LMH tentatively places the TG/CVC boundary at the LMH.

### **Black Shale Horizon**

This unit is dominated by black shale in the northern most exposures and drill holes between 5000N and 5400N, but a volcanoclastic component is increasingly evident to the south. The shale is typically dark grey to black and finely laminated, but more massive intervals with very fine-grained silty texture are locally apparent. Black shale outcrops well on track surfaces in the central and southern most parts of the grid area, but elsewhere outcrop is

scant with the shale occurring beneath Quaternary glacials and within forested gullies. The gullies perhaps reflect preferential erosion of this unit. The base of the shale represents the uppermost of two base metal mineralised horizons at Red Hills.

In the north, minor grey volcanoclastic siltstone and feldspar-crystal rich sandstones are interbedded with black shale. Grey volcanoclastic siltstone is evident at the base of shale at 2350mE, 5150mN and a similar lithology with black shale interbeds is apparent at 2375mE, 4100mN. Further south in RH11 (3400mN) Herrmann (1996) reports this lithology as a minor component associated with black shale.

Feldspar crystal-rich volcanoclastic sandstone uncommonly forms thin interbeds in drill core. In outcrop exposures of up to 5m or more in thickness occur (eg. 2350mE, 4680mN; 2440mE, 4080mN and 2375mE, 4100mN) and these locally display thin black shale interbeds. This lithology is not apparent further south.

The black shale horizon is interpreted to occupy the hinge zone of a steeply inclined and moderately south plunging syncline in the vicinity of 2300E, between 5000N and 5400N.

South of 4600N Herrmann (1996) reports various interbedded lithologies including fossiliferous? limestone breccias, limy sands, sericitic quartz-phyric sandstones and coherent quartz-porphyritic rhyolite from the upper 90m of RH11 with dacitic sills in the lower 70m before passing into CVC-like lithologies.

These observed lithologies in conjunction with feldspar-crystal rich volcanoclastic sandstones found to the north, support Herrmann's (1996) tentative correlation with the Lynchford Member of the basal Tyndall Group, as described by White and McPhie (1996). The recognition of interbedded CVC-like volcanics near the base and quartz-feldspar-phyric, clearly Tyndall Group volcanics near the top within the black shale unit highlights the transitional nature of this unit across a regionally significant volcanic boundary.

### **Quartz-Feldspar-Phyric Lavas and Volcaniclastics**

This section of the stratigraphy is readily identified as quartz-feldspar phyric rhyolitic lavas and volcaniclastics belonging to the Mt Julia Member of the Lower Tyndall Group. Their distribution is restricted to the eastern, western and southern margins of the lease, where they generally appear to be in disconformable? contact with the CVC sequences. To the south however, Herrmann (1996) describes a clearly continuous conformable sequence partly interbedded with and overlying the black shales of the Lynchford Member. This suggests the area to the north was partially emergent during deposition of the Tyndall Group.

## Basalt

Basalt is relatively uncommon, being observed as thin (<1m thick) dykes in drill core only. The basalts are variably ferromagnesian mineral (hornblende/pyroxene?)-phyric with fine grained to aphanitic groundmass and carbonate filled amygdales. Basalts commonly occur within or relatively proximal to felsic volcanic breccia horizons in northern drill holes, but also extend up into the black shales to the south and drillholes RH10, 11. This observation and evident proximity to faults in some instances suggests an origin as late dyke intrusions.

## Volcanic Facies Model

The following points simply summarize the likely Cambrian volcanic facies development.

1. Active CVC volcanism forming a rhyodacitic/dacitic lava centre with associated proximal breccias flanked by pumiceous volcanoclastic sandstone deposition from relatively distal sources via high density turbiditic and / or mass flow related processes.
2. Onset of VHMS mineralisation corresponding to the latter part of the CVC volcanism and initiation of TG volcanism, shown by partial mixing of TG and CVC provenance volcanism in high density turbiditic flows overlying the LMH breccias.
3. Black shale deposition representing the time of greatest quiescence prior to onset of and transgression of readily recognized feldspar-quartz-phyric Tyndall Group volcanism represented by the Mount Julia Member.

## STRUCTURE

The Red Hills area is interpreted to be more structurally complex than previously considered, with the volcanic sequences deformed by a series of approximately north south aligned steeply west inclined tight to open folds. Locally, faulting further complicates the picture, however field mapping and drill core observations have somewhat clarified the geological distribution, but many gaps are still apparent. The following outlines the current understanding of structure within the Red Hills lease.

Cleavage development is variable but typically moderately developed and close spaced in the finer lithologies.

## Folding

The nature of folding within Cambrian stratigraphy at Red Hills is not well documented, although previous workers (Purvis et al, 1983) have indicated the likelihood of such structures controlling black shale distribution. Folds within the Owen Conglomerate stratigraphy mapped by McNeill (1987) are a

guide to confirming the presence and approximate locations of folds within the Cambrian volcanic stratigraphy beneath. The current interpretation within the lease area is a central synform flanked by two antiforms localized along the Western and Red Hills ridges at 2000E and 2200E respectively (Figure 3).

Few reliable structural features are preserved at outcrop scale to support the fold model. That is, few bedding-cleavage relationships are visible to determine fold vergence, which is not surprising considering that these fabrics are near parallel in most cases. Similarly, clear examples of bedding or primary banding are scarce, but a 'poles to bedding' plot for reliable data (Figure 4) supports the fold model. A fold axis trend of  $179^\circ$  with shallow southerly plunge of  $33^\circ$  is calculated from this data. A key outcrop within shale at 2300E, 5200N exhibits a perpendicular bedding/cleavage intersection, confirming the presence of a fold axis in this vicinity.

Further north, at 2250E, 6140N ptigmatic folding within a grey volcanoclastic siltstone indicates proximity to a fold closure or fault zone is likely.

Features indicative of folding within drill core include:-

1. Extreme variation in unfaulted black shale thickness, possibly indicative of thin fold limbs and thickened hinge zones.
2. Symmetry of mineralised volcanic breccias (LMH) both east and west of the black shale.
3. Symmetry of pyritic semi massive sulphide or stinger pyrite enclosing black shale in RH7 and RH8.
4. Facing reversals downhole, as in RH16.

Tight limbed inclined folds ( $\sim 70^\circ$ ) with western limbs locally overturned are postulated with evidence largely gathered from interpretation of drill sections. The main fold closure identified lies within the black shale unit west of the silica-K-Feldspar altered "Red Hills lavas". A southerly plunge to this structure pinches out most of the LMH in the north, but to the south of 4500N the fold closure is interpreted to open up, becoming a broad limbed fold in the vicinity of drillholes RH18 and 19, northwest of Lake Westwood (Herrmann, 1996).

Fold patterns for the rest of the tenement area are difficult to identify largely because of the sheared and altered nature of the outcrops and paucity of discrete marker units. Fold tightness appears to be variable and may be partly dependent upon the large differences in strain modulus between altered and less altered volcanics as well as between volcanoclastics and lavas.

Coherent lava outcrop and strongly altered and indurated volcanics along the high ridge of 'The Red Hills' probably acted somewhat coherently during Devonian deformation resulting in an open anticlinal fold relative to the adjacent tighter shale syncline to the west. Similarly, the hinge of an inferred anticline closure hosted in dacite lava along the western ridge at  $\sim 2000E$ ,

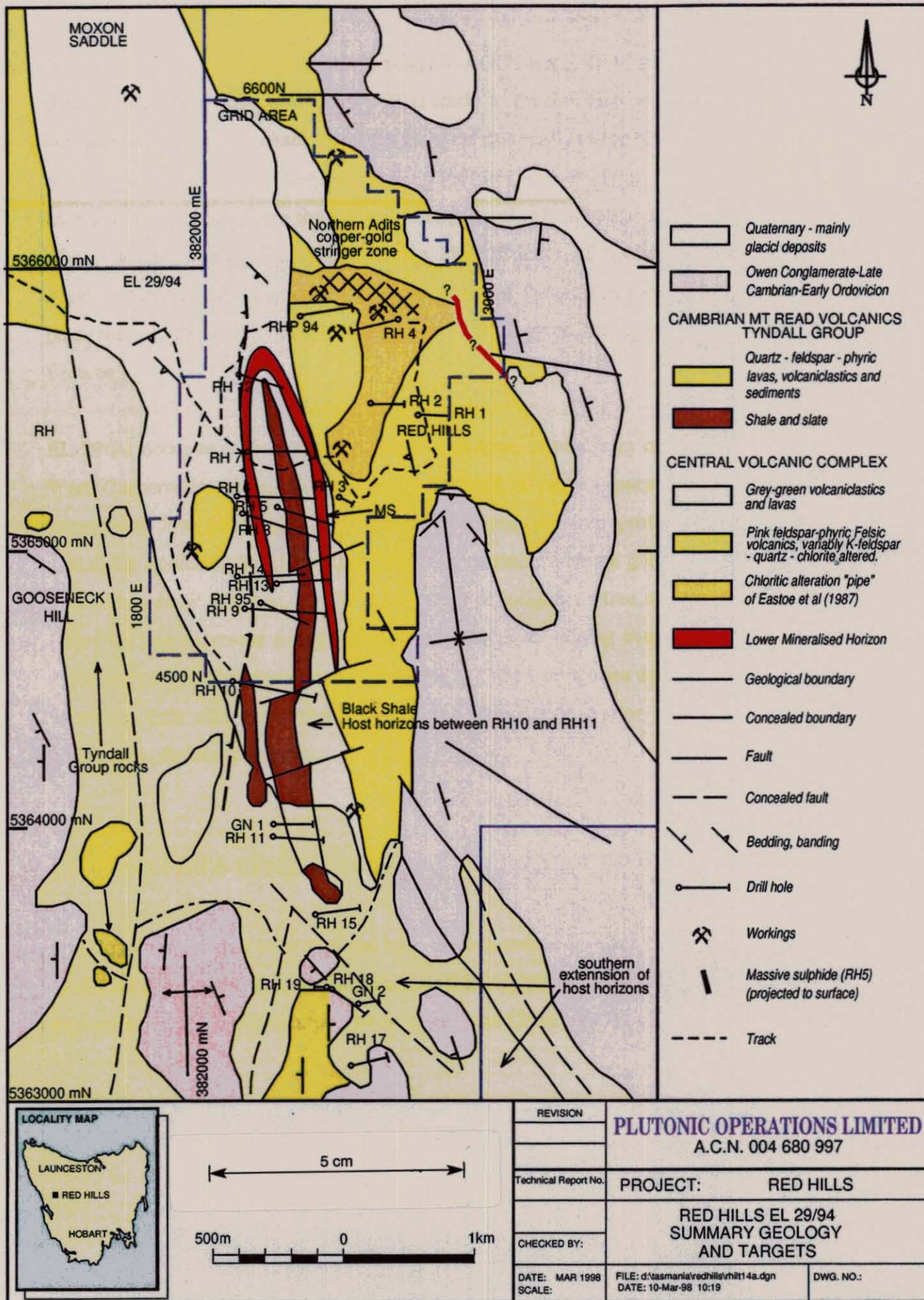
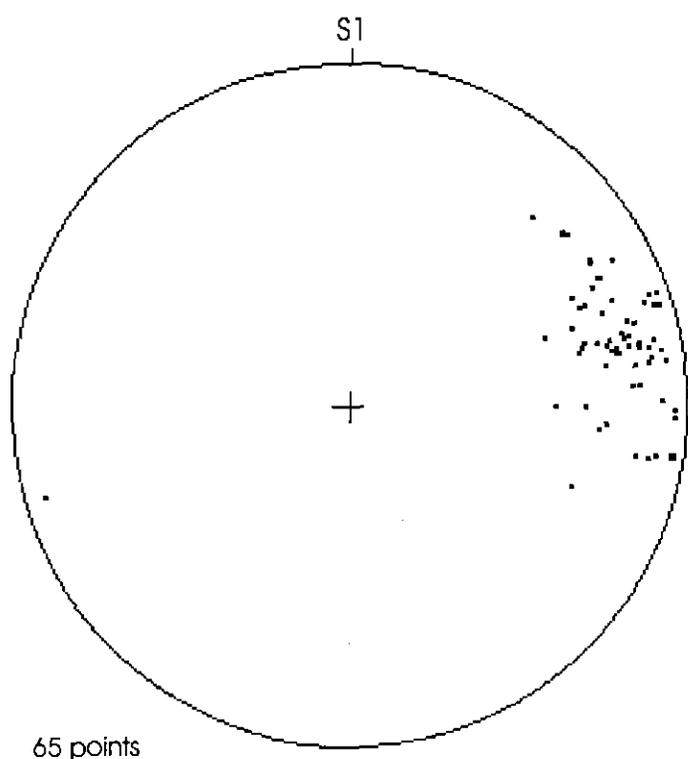
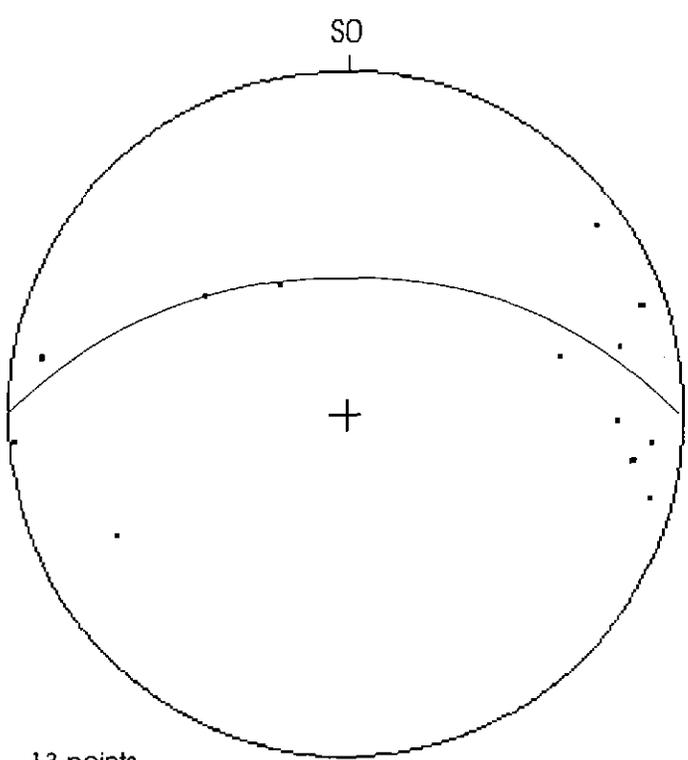


FIGURE 3



65 points



13 points

**FIGURE 4** : Stereographic projections for poles to cleavage (top; strike  $\sim 350^\circ$ /  $\sim 70^\circ$  dip) and poles to beds (bottom; trend  $179^\circ$ , plunge  $30^\circ$ ).

5100N contains strong development of Devonian bucky quartz veins and reefs which possibly reflect the brittle nature of the lava's during deformation. The less coherent volcanoclastics and shale have been subject to more plastic deformation and are interpreted to host fold wavelengths of approximately 400m.

### **Faulting**

In the Red Hills grid area, northerly and east-northeast trending faults have been recognized. Principal evidence for faulting comes from drill core. Here, zones of strong shearing sometimes accompanied by dextral offset kink bands indicate faulting. Zones of broken core are further pointers and these locally contain thin (<20cm) puggy cataclastic zones. Bed offsets are also apparent with interpreted fault movement of greater than 50m indicated by the possible faulted transposition of the LMH to a position up hole and proximal to the black shale in both RH9 and 13. Devonian quartz-carbonate veins are commonly evident in the vicinity of interpreted faults.

At surface, faults and / or shear zones are indicated by zones of strong foliation and sometimes by lineation of quartz veins.

A steep westerly-dipping fault centered on approximately 2200mE has been interpreted to transgress most of the grid from north to south. In the south (2000E, 3900N) CVC lithologies from the west side hangingwall, abutting MJM units in the fault footwall. Further north along this "Western" fault in the RH5 area, CVC lavas abut LM and upper most CVC volcanoclastic lithologies. These observations imply reverse movement, west side up. The "Western" fault extends north to at least RH12, where intense foliation defines the structure at surface beside the drill collar. North of this position a topographic lineament separating lavas from inferred footwall volcanoclastics may represent continuation of the fault.

A second inferred fault extends south on 2300E from approximately 4900N to 4400N. A faulted sliver of black shale and nearby strong quartz veining in the vicinity of 2450E, 4150N may represent southward continuation of this structure. North of 4900N, evidence for the fault is scant which possibly indicates termination or offset of the fault where it intersects an approximately east-northeast oriented inferred fault. The latter fault was identified from mapping where three consecutive samples bearing black shale were obtained from the vicinity of 2425E, 5000N, whereas shale was not mapped along strike to the south. Shale outcrops to the west at 2325D, 4900N indicate dextral fault offset of up to 80m on the east-northeast trending fault.

### **Mineralisation and Alteration**

The Red Hills area is host to three principal mineralisation styles:-

1. Stratabound polymetallic – gold VHMS
2. Stringer vein Cu-(Au)-Mt (Granite related)

### 3. Gold in "Devonian" quartz vein stockworks

The VHMS mineralisation is best expressed as a 2.8m lens of banded sphalerite and galena, grading 0.32% Cu, 34.5% Zn, 11.35% Pb, 250g/t Ag and 6.55g/t Au in RH5. Whereas the stringer veins are represented by py-cpy-mt mineralisation in the northern adits area. Jenkins (1991) provides supplementary descriptions of this mineralisation and accompanying alteration styles. He recognizes a pipe-like zone of pervasive chloritic alteration with lesser K-feldspar extending along 'The Red Hills'. Recent mapping supports this broad zonation pattern, however, in addition widespread silicification is also recognized. The third mineralisation style is recognized along the Western ridge where a well-developed quartz (siderite) vein stockwork in a dacitic lava unit carries significant gold and minor Pb-Zn values.

## 5.0 PREVIOUS WORK

Numerous companies have explored the Red Hills area over a long period dating back to the turn of the century, but principally within the last 40 years. A summary of previous exploration in the Red Hills area is given in Reid and Close (1995).

Plutonic's primary interest in the Mt Read Volcanics was the discovery of economic VHMS mineralisation. The highly VHMS prospective Central Volcanic Complex / Tyndall Group boundary is believed to occur within the Red Hills tenement. This stratigraphy combined with the close proximity and similarity of mineralisation to that at the Henty Gold Mine are considered to be highly favorable factors. Thus in the Red Hills area, Plutonic's exploration targets were both polymetallic VHMS and the related Cambrian gold mineralisation.

Apart from one high-grade polymetallic intersection over 2.8 metres in drill hole RH5, a protracted history of exploration has not produced further base metal intersections with economic potential. However, upon review of previous data the combination of favorable mineralisation factors identified at Red Hills suggests there is potential for a significant polymetallic resource.

The relevant factors are:-

1. The recognition of the VHMS prospective Central Volcanic Complex / Tyndall Group boundary within the tenement.
2. Banded exhalative Pb-Zn-Ag-Au mineralisation in RH5 within a proximal volcanoclastic sequence directly above an extensive pervasive chlorite-K-feldspar-silica altered zone, represented by the Red Hills.
3. A large vein stockwork stringer-zone of pyrite-magnetite-chalcopyrite-gold mineralisation at the northern end of the Red Hills, hosted by the pervasive chlorite-K-feldspar alteration assemblage.

4. Syngenetic massive pyrite and anomalous base metals (up to 5.8% Zn, 1.6% Pb in RH11) with associated footwall VHMS alteration in a more distal upper exhalative position at the base of a black shale unit.

The principle objective of the Red Hills work program was to assess the base metal and gold potential of the tenement area. Initial exploration involved the compilation and review of previous work. Due to the multiplicity of previous exploration grids, Plutonic fieldwork commenced with the establishment of an AMG oriented grid encompassing the central portion of the tenement. Subsequently, the grid area was remapped with focus on volcanic facies and structural interpretation and reconnaissance regional mapping was conducted to the edge of the Owen Conglomerate cover. Surface mapping was complimented by re-logging and interpretations of existing drill holes.

The entire Plutonic grid was C-horizon soil sampled at 25m intervals along the 100m spaced east – west grid lines. All samples were analyzed for Cu, Pb, Zn, Mn, As, and Au to aid targeting of mineralisation and for geological interpretation. Limited rock chip sampling for a similar suite of elements was also completed.

Geophysical surveys involved a ground magnetic coverage of the entire grid area together with a moving loop EM survey, principally targeted at locating sulphide mineralized conductors in the northern portion of the grided area.

## **6.0 WORK UNDERTAKEN FOR THE PERIOD**

Reviews of all data collected and historical data were undertaken. No exploration activities have occurred during the reporting period.

## **7.0 CONCLUSIONS AND RECOMMENDATIONS**

Mapping and drill hole relogging has shown that strata bound VHMS mineralisation is localized in felsic volcanic-debris flow volcanoclastic sequences at the top of the Central Volcanic Complex and within Lynchford Member lower Tyndall Group sediments.

Prime VHMS prospectivity occurs in the Lower-Mineralised Horizon on the eastern limb of the Shale Synform where previous drilling has outlined a zinc-gold rich target zone surrounding drill hole RH5.

Distal shale sequences of the Lynchford Member south of Red Hills may correlate with the Henty host horizon and are therefore prospective for polymetallic massive sulphides and remobilised Henty-style gold mineralisation.

No exploration activities were undertaken during the reporting period.

## 8.0 REFERENCES

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