EXPLORATION LICENCE

(MATHINNA-MANGANA)

ANNUAL REPORT YEAR 2

(24/11/1984 - 23/11/1985)

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INTRODUCTION

EL 55/83 covers an area of 180km² in the Mathinna - Mangana area. The E.L. was granted on the 23/11/1983.

This report covers all exploration undertaken in the E.L. during licence Year 2 and outlines the work program planned for Year 3. During Year 2 some interest in the hard rock gold occurrence within the Mathinna Group developed and it is intended to explore at least one target of this type in Year 3.

EXPLORATION

a) Alluvials

Seventeen backhoe holes were dug in Majors Gulley and the results of pan concentrates collected from these were submitted in the first Quarterly Report. Ten of the Seventeen pan concentrates contained visible gold and it was decided not to assay these concentrates.

Three, twenty litre drums of tailings sand were collected from the area of the Mangana Mine and submitted to the Department of Mines Laboratories in Launceston.

The following results were obtained -

- Mangana reef tailings	1.69 grms / tonne
- Fingal reef tailings	1.4 grms/tonne
- Union reef tailings	2.59 grms/tonne

b) Hard Rock

A study of the hard rock potential of the licence area was conducted by a consultant geologist. A copy of this report is appendixed.

It concludes that some potential for open cut mining of mineralized quartz veins exists.

Expenditure

Sampling of Majors Gully	$2350
Report on Hard Rock Potential	$1000
Titles Search, Literature Search and related costs	$2800
Field prospecting and assaying of bulk samples	$1400
Administration costs and geological consulting	$1800
TOTAL ---	$9350

WORK PROGRAM FOR YEAR 3

Three major projects will be undertaken in Year 3.

1/. A prospecting plant will be set up in the Mathinna area to treat bulk samples of alluvials. The aim is to define areas which can be worked with an operation similar to that at Lisle.

2/. A surface trench sampling and/or drilling program will be conducted on the Tower Hill quartz vein deposit to determine the open cut potential of this deposit.

3/. The majority of the E.L. will be either relinquished or converted to Mineral Lease.

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Appendix 1.

HARD ROCK GOLD POTENTIAL

OF

EL 55/83

NORTH EAST TASMANIA

T.G. Summons,
Summons Geoservices Pty. Ltd.,
March, 1984.

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INTRODUCTION

EL 55/83 lies between 240 and 1117m (Tower Hill) ASL in NE Tasmania, with an average elevation of approximately 400m ASL.

The major topographic feature is Tower Hill, emerging from a dissected plateau approximately 400m ASL, and all streams drain north, east and south in to the South Esk River, which flows through the northern end of the EL.

The licence area is approx. 75% crown land (State Forest), and 25% private land, represented mainly by river flats west and north of Mathinna (South Esk River), and west and south of Managana (Tower Rivulet).

The closest major centre is Fingal, situated 1km SE of the SE corner of the EL. The licence area is well serviced by roads, such as secondary routes B42, B 43, and a minor road (C429), and numerous tracks.

Gold was first discovered at Mangana in 1852, and by the 1880's most of the reefs in the Mathinna - Mangana district had been found. The Goldfield was abandoned in the late 1920's. The main producer was the Golden Gate Mine at Mathinna, which along with the Tasmanian Consols Mine (working the same reefs), during the period 1880 - 1932 produced 264,862 oz's of gold, out of total of 270,895 oz's for the Mathinna area.

The Mangana Goldfield produced 5449 oz's of gold from 1884 - 1905.

The gold mineralization exploited by the early mines was hosted by quartz veins, generally > 10cm wide, 10 - 50m in strike extent, and frenquently only mined to depths of 30m. The largest reefs occured at the Golden Gate deposit (West Reef 310m, East Reef 150m), and most of the ore bodies were in the range 100 - 1000 tonnes.

The ore was free milling because the sulphide content of the quartz veins was < 2%.

Gold grades were high, the Mathinna Goldfield averaged 20g/T (Golden Gate 26g/T), and the Mangana Goldfield averaged 27g/T.

GEOLOGY

A. STRATIGRAPHY

The oldest rocks in the area are the Mathinna Beds of early Ordovician to early Devonian age, and consisting of a sequence of slate, siltstone and greywacke variably metamorphosed to phyllites, slates, schists and quartzites.

Unconformably overlying the Mathinna Beds is the Parmeener Super Group Sequence of pebbly mudstone, sandstone and limestone of Carboniferous - Permian age.

Dolerite of Jurassic age has intruded the older sequences, and typically forms topographic highs (Tower Hill).

Quaternary (and possibly Tertiary) age alluvium (sand/gravel) covers the low lying areas of the river flats.

B. REGIONAL SETTING AND GENERAL STRUCTURAL HISTORY

The area covered by EL 35/83 forms the southern portion of a large linear zone of gold mineralization in NE Tasmania, extending ≈ 90km from Mangana north to Lyndhurst.

This linear belt strikes NNW to NW, and is approximately 1km wide.

West of the Tamar River, rocks of similar age to the Mathinna Beds (east of the Tamar River), show contrasting structural styles and lithologies. The boundary between these regions is a NW trending fracture zone termed the Tamar Fracture System (TFS), along which lateral movements brought the contrasting regions into juxtaposition.

The Mathinna Beds were deformed during early-mid Devonian time in two phases;

Early - NW trending folds, flat to SE plunging, with slaty cleavage.

Late - cleavage fanning, tightening of early folds, and crenulation cleavage.

Large granitoid batholiths emplaced in late Devonian time in NE Tasmania, are generally post-tectonic to the above deformation. (Williams, 1979).

The licence area is 10km from granitoid bodies to the north (Blue Tier), north west (Scottsdale), and west (Ben Lomond).

Williams (1979) described a post-granite deformation of both granites and

Mathinna Beds, and related this deformation to sinistral motion across the Tamar Fracture System.

The linear zone encompassing the Goldfields in NE Tasmania includes the Mangana, Mathinna, Alberton, Warrentina and Waterhouse Goldfields.

The broad parallelism of this linear tract to the TFs (with its plate tectonic implications) is noteworthy.

This "Goldfields Linear" has been variously described as a zone of close folding coincident with a thick sequence of slates which are strongly cleaved (Finucane 1935), a zone of pronounced cleavage to slight schistosity (Blake 1936), and a zone of numerous strike faults collectively defining a large sheared zone (Threader 1967).

C. STRUCTURAL MODEL FOR THE GOLDFIELDS LINEAR

Quartz veins strike NW, N, NNE, NE and W - E, and in general do not show any consistent relations to either bedding or cleavage in the host Mathinna Beds.

The orientations of the quartz veins have been influenced by other factors, mainly sheared (fault) zones and joint patterns.

Detailed underground level plans and descriptions of the (New) Golden Gate Mine at Mathinna (e.g. Montgomery 1892, Daly 1981), indicate the NNE orientated lode channels contained the thickest (< 3m) quartz veins, which were also the most richly mineralized; NW trending lode channels were impoverished in quartz, and apparently in gold content.

However, this observation relates only to the Main and Loanes reefs, and other reefs with NNW trends had comparable gold tenor.

The Tower Hill deposit consisted of a NW trending quartzite unit cut by veins and irregular masses of quartz the larger of which trended NE. These veins were confined to the quartzite and are described more fully later in the report.

Incomplete descriptions of the structures controlling the gold mineralization preclude a definitive interpretation of the origin of the Mathinna - Mangana portion of the Goldfields Linear, but if it is assumed that the Golden Gate and Tower Hill deposits are generally representative of quartz vein attitudes, the other recorded vein orientations can be satisfactorily interpreted in terms of a mega shear.

This mega shear is postulated to have formed in response to dextral divergent (clockwise) rotation of continental crust.

Such rotation of continental plates was first recognized by Carey(1958), and if the incipient shear couple was orientated NW - SE, the following features would develop:

1. Initial, N - S orientated extensional (tensile) fractures; further rotation would cause these fractures to dilate in the middle, and taper off toward the margins of the shear zone, to produce a sigmoidal form.

2. Continual rotation would then induce opposing sinistral shearing along the tensile fractures.

3. Prolonged dextral rotation may ultimately result in NW - SE orientated extension fractures.

A further feature which may be predicted in this model is the formation of W - E orientated folds, possibly accompanying the early formed extension fractures.

The observed range of quartz vein/shear zone strikes may then be assigned as follows:

(i) N, NNE Trends: fissure fillings in the sigmoidal shaped (early) extension fractures (1. above);

(ii) NE Trends: slight clockwise rotation of the shear couple would produce NE trending extension fractures; however, other evidence indicates the presence of major NE linears which appear to have formed syntectonically with the shearing;

(iii) NW Trends: fissure fillings in the NW - SE aligned (later) extension fractures, (3 above);

(iv) W - E Trends: these may be due to the intrusion of quartz veins along the axial surfaces of incipient W - E folds, or simply W - E tension joints.

This model also allows explanation of the following features of the veins;

(i) The lensoidal form of the veins;

(ii) The short strike (50 - 100m) of Main and Loanes reefs;

(iii) The relatively greater strike extent of the West and East reefs (which strike NW/NNW);

(iv) The evidence for multiple episodes of shearing of the veins and the enclosing sheared zones ("lode channels").

On a regional scale, the overall shape of the areas affected by the shear couples may be wedge-like, suggesting locally discontinuous zones of intense shearing within the mega shear or linear.

A dextral sense of movement across the Goldfields Linear would be conjugate to sinistral movement across the TFS, and suggests that gold mineralization may be largely post - granite in age.

Available evidence indicates that much of the strain resulting from the shearing was taken up by the slate horizons in the Mathinna Beds. This is to be expected, since in a given stress regime shales/slates would yield initially by ductile flowage, whereas the sandstone/quartzite beds would respond by brittle fracture.

However, the proposed model suggests that the slates were stressed sufficiently to exceed their elastic limits.

GOLD MINERALIZATION

A. MODES OF OCCURRENCE

Gold mineralization has the following known modes of occurrence in the Mathinna-Mangana Goldfields;

1. Quartz Veins

(a) **Major** - generally > 10cm wide

- (i) Fault bound - within sheared zones
- (ii) Stratiform - within (and concordant with) slate or quartzite e.g. Horseshoe, Eldorado and Jubilee mines

(b) **Stringers** - generally ≪ 10cm wide

- (i) Fault bound - as for 1.(a)(i)
- (ii) Strata bound - within (and discordant to) quartzites, e.g. Old Boys, Buckland and Tower Hill mines.

2. Disseminated in Mathinna Beds country rock

- (a) Slate host - Mangana Gold Reefs and Golden Entrance mines
- (b) Quartzite host - Pincher mine

The distinction between major and minor veins is arbitrary, based on the historical cut off widths used in the old mining operations.

Most of the gold produced was from the major quartz veins, especially those which were fault bound.

B. GRADES

1. Primary

Definition of the in situ gold grades of the Goldfields is difficult, since it varies widely, both within a given reef system and between reefs. A further complication involves the two episodes of gold mineralization;

- an early high temperature phase (associated with sulphides)
- a late low temperature phase (discrete grains of gold).

The most common sulphides are pyrite and arsenopyrite, with minor galena,

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sphalerite and chalcopyrite.

Threader (1967) considered the gold and arsenopyrite to have formed at the same time in the overall paragenesis of the non-quartz minerals.

Available information indicates that both gold-quartz and gold-sulphide veins occur in the area.

Finucane (1935) quoted gold grades in "pyrite" from the Golden Gate mine as ranging 150 - 300 g/T, and that the sulphide content ranged up to 2 vol%; combining these figures suggests that for the maximum volume of sulphides (e.g. pyrite arsenopyrite), their contribution to the overall ore grade was 3 - 6 g/T.

This would imply that the gold content of the quartz (sulphide free) in the Golden Gate was in the range 20 - 23 g/T. Elsewhere, at the Pincher mine, the in situ ore grade was 7.2 g/T, of which 0.2 g/T was the contribution of the pyrite etc.

2. Enrichment

(a) Primary - gold grades were observed to increase where two or more reefs intersected, or where a quartz reef intersected a pre existing fracture.

(b) Secondary - secondary enrichment is a common feature of many goldfields in Australia, and relates to the effects of oxidation and leaching of sulphides, resulting in an in situ (residual) increase in grade, and/or the leaching and re-precipitation of gold resulting in a net increase in grade.

Because the quartz veins in the licence area contain 1 - 2 vol% sulphides, the major factor in any secondary enrichment would appear to be the remobilization of gold in the zone above the water table.

However, not all gold was re-deposited in a given reef system, and several examples of gold depletion in the oxidised zone are recorded.

A typical example of a secondary enrichment may occur in the Pincher deposit

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near Mathinna, as follows:

surface - 4m:	42 - 81 g/T
4 - 12m:	23 g/T
12m:	19 g/T
15m:	7 g/T

The base of oxidation here was ≃ 12m, and from 12 - 15m pyritic tailings assayed 10 g/T, which if represented 2% of the ore, would contribute ≃ 0.2 g/T to the total ore grade.

The maximum enrichment in this case ranges from a factor of 6 to 11.5 (based on primary grade of 7.2 g/T).

3. Comments

The old mine records indicate two, apparently contradictory features of the primary gold mineralization;

(a). Gold grades were directly related to quartz vein width, e.g. Main and Loanes reefs, Golden Gate (Montgomery 1892);
(b). Gold grades were inversely related to vein width, e.g. the Miners Dream (Reid 1925), and City of Melbourne (Nye 1941) mines in the Mathinna area. Further examples occur in the Pincher deposit where a 7.6cm vein with 21 g/T decreased to 12.6 g/T where it was 30.5cm wide. Similarly in the Old Boys deposit, the 1. 22m wide reef carried 10.9 g/T but decreased to < 6g/T over a width of 3.66m.

Both these latter examples hint at a constant gold level in a given vein, diluted by the volume of quartz.

A similar phenomenon is seen in the exogranitic quartz veins carrying Sn -W mineralization at Aberfoyle.

The corollary to the above observation is that stringer veins should have comparable to higher gold grades than the major veins; a graph of gold versus vein width suggested a poor correlation between these variables with a hint that the stringers are generally probably higher in gold content than the major veins.

The apparent anomaly in the data relating to gold grades and vein widths cannot be resolved on the available data, except that the Main and Loanes reefs occur in NNE trending tensile fractures, and the other examples occur in NW trending fractures, in which the shear stresses probably exceeded the tensile stresses.

GOLD POTENTIAL OF EL 55/83

Although there are probably major quartz veins yet to be found (e.g. blind stratiform veins or saddlereefs) in the area, the potential for locating such bodies in conjunction with the likely tonneages involved, combine to render such targets only moderately attractive.

It is considered that the quartz stringers, either alone or in conjunction with the disseminated modes of gold mineralization, represent a more attractive exploration target.

A. QUARTZ VEIN STRINGERS

Stringer veins were recorded from most of the old mines in the fault bound mode, and to a lesser extent stratabound.

1. Fault Bound

Montgomery (1892) summarised the Mathinna area as "the country rock is highly auriferous, gold being found ..... not only in definite reefs, but also very commonly in innumerable small veins". However, there is very little data on the gold content of the stringer veins. Blake (1936) described the [redacted] as having a lode channel 1. 22m wide, with 30.5cm of quartz, and 91.5cm of slate and stringers, the entire 1.22m width bulking at 5.3 g/T.

As stated previously, stringer veins appear to have gold grades at least comparable to the major veins, but this observation requires proper evaluation.

In the [redacted] an adit driven across the reefs exposed an eastern lode channel 19.8m wide, and a western lode channel 32.9m wide. Both lode channels contained "many stringer veins and bunches of quartz" (Montgomery 1892). At this level, the Main and Loanes reefs (in the eastern channel), and the Central and Western reefs (in the western channel), consisted of stringer veins, and were not recognised as the said reefs until No.1 level (26.2m below adit) and No.2 level (44.5m below adit level), respectively.

Preliminary interpretation of the geology in the vicinity of the Golden Gate suggests both the western and eastern lode channels (shear/tensile zones) continue north to the North Golden Gate workings.

The <u>original</u> in situ mass of rock carrying stringers may then be estimated;

(a). <u>Western zone</u>; strike ≃ 100m, width ≃ 33m, depth (to No.1 level) ≃ 26m

∴ mass of rock ≃ 100 x 33 x 26 x 2.5 ≃ 215 000 tonnes

(b). <u>Eastern zone</u>; strike ≃ 100m, width ≃ 20m, depth ≃ 26m

∴ mass of rock ≃ 100 x 20 x 26 x 2.5 ≃ 130 000 tonnes.

It is emphasised that these tonneages are pre-mining figures only, and no attempt has been made to estimate the residual mass of rock.

2. Stratabound

[redacted] of numerous short and narrow quartz veins (2mm to > 30cm wide) contained in a band of quartzites 30m wide, and a minimum strike extent of 250m. The quartzite strikes NW and dips NE, and was found by Nye (1930) to be devoid of gold.

The thicker veins strike NE, but the stringers are irregular and appear to form a stockwork.

The grade of this deposit has not been thoroughly tested; during 1929 - 30, of 63 samples of quartz and quartzite, 54 yielded traces of gold, and the remainder ranged from 1.5 to 15 g/T of Au. However, the breakdown of the samples was not stated, and the 9 gold bearing* samples may not necessarily be quartz. (* > Trace Au)

The in situ (original and present) mass of rock is:

∴ 250 x 30 x 30 x 2.5 ≃ 560 000 tonnes.

B. DISSEMINATED

1. Slate Hosted

Blake (1936) described the Golden Entrance mine at Mangana as containing some of the gold "in oxidised planes in the slates". No other details are available, and several interpretations on the origin of such gold are possible, including tectonic remobilization during late shearing.

2. Quartzite Hosted

In the Pinchem mine, a quartzite (adjacent to the auriferous quartz vein), gave a channel assay of 5.3 g/T over a width of 48.3cm. It is likely that this type of mineralization is transitional to the stratabound quartz stringer type, and should be evaluated at the Tower Hill deposit.

C. COMMENTS AND CONCLUSIONS

Gold mineralization in either country rock (disseminated) or quartz stringer hosts would only be economic propositions if mined by open pit methods.

Current gold mining operations in Australia suggest a range of viable tonnage - grade combinations from $\approx$ 100 000 tonnes @ $\geq$ 4g/T, to 500 000 tonnes @ $\geq$ 2g/T.

Thus if the Golden Gate deposit contained say 300 000 T (in the two lode channels), then a target grade of $\approx$ 3 g/T is required.

Since ore grade (OG) is the product of quartz grade (QG) and quartz volume (QV),
then if QV = 10%, QG required = 30 g/T
and if QV = 20%, " " = 15 g/T

Alternatively, if the stringers are assumed to be similar to the major veins in grade, and the grade of the latter is reflected in the mine statistics (i.e. 26 g/T average), then the QV required is 11.5%.

In the Tower Hill deposit an in situ tonneage of 500 000 tonnes with some of the quartz stringers ranging - $\leq$ 15 g/T, appears an attractive exploration target. If an average grade of 2 g/T is required,
then if QV = 10%, QG required = 20 g/T
or if QV = 20%, " " = 10 g/T.

Thus in conclusion, EL 55/83 appears to contain at least two hard rock gold prospects, with physical dimensions suitable for open cut extraction. However, gold grades are not known at this stage, and can only be assumed.

It is concluded that likely targets for exploration in the area should be $\geqslant$ 500 000 tonnes @ $\geqslant$ 2 g/T Au.

Previous exploration by Geophoto, Tasminex and Anglo American has generated both geophysical and geochemical anomolies that require follow up work.

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MAJORS GULLY. MANGANA

TRENCH NO. 1: Sandy grey creek gravel for 2 metres then 2 metres of clay red wash to hard slate floor. (4) colours to dish.

TRENCH NO. 2: Sandy creek gravel for top 2 metres clay red wash for 1.8 metres to hard slate floor. (1) colour to dish.

TRENCH NO. 3: Sandy creek gravel for 2 metres to hard slate floor. No visable colours in pan con.

TRENCH NO. 4: Sandy creek gravel for 2 metres .15 metre of red wash fine colour in pan con.

TRENCH NO. 5: Sandy creek gravel for 2 metres hard slate floor. No visable colours in pan con.

TRENCH NO. 6: Sandy creek gravel for 2.2 metres hard slate floor No visable colour in pan con.

TRENCH NO. 7: Sandy creek gravel for 1.8 metres hard slate floor No visable colour in pan con.

TRENCH NO. 8: 1.8 metres raw gravel (fine colours) from surface. Brown wash for 2.2 metres. (1) colour in pan con. (Down stream of old workings) Hard slate floor.

TRENCH NO. 9: 2 metres raw gravel (fine colours) from surface. Brown wash 2.3 metres, fine colours in pan con. Hard slate floor.

TRENCH NO. 10: 2 metres raw gravel, fine colour in pan con. Hard slate floor.

TRENCH NO. 11: 2.2 metres raw gravel, no visable colour in pan con Hard slate floor.

TRENCH NO. 12: 2 metres raw gravel (fine colour) in pan con. .3 metre hard packed clay wash, colour in pan con. Hard slate floor.

TRENCH NO. 13: 1.9 metre raw gravel, no visable colours in pan con. Hard slate floor.

TRENCH NO. 14: 1.8 metres raw gravel, 1 colour in pan con. Hard slate floor.

TRENCH NO. 15: 3 metre raw gravel, no visable colour in pan con. 1 metre clay wash, no visable colours. Hard slate floor.

TRENCH NO. 16: 2 metres raw gravel (fine colour) 1 metre clay wash, 2 colours in pan con. Hard slate floor.

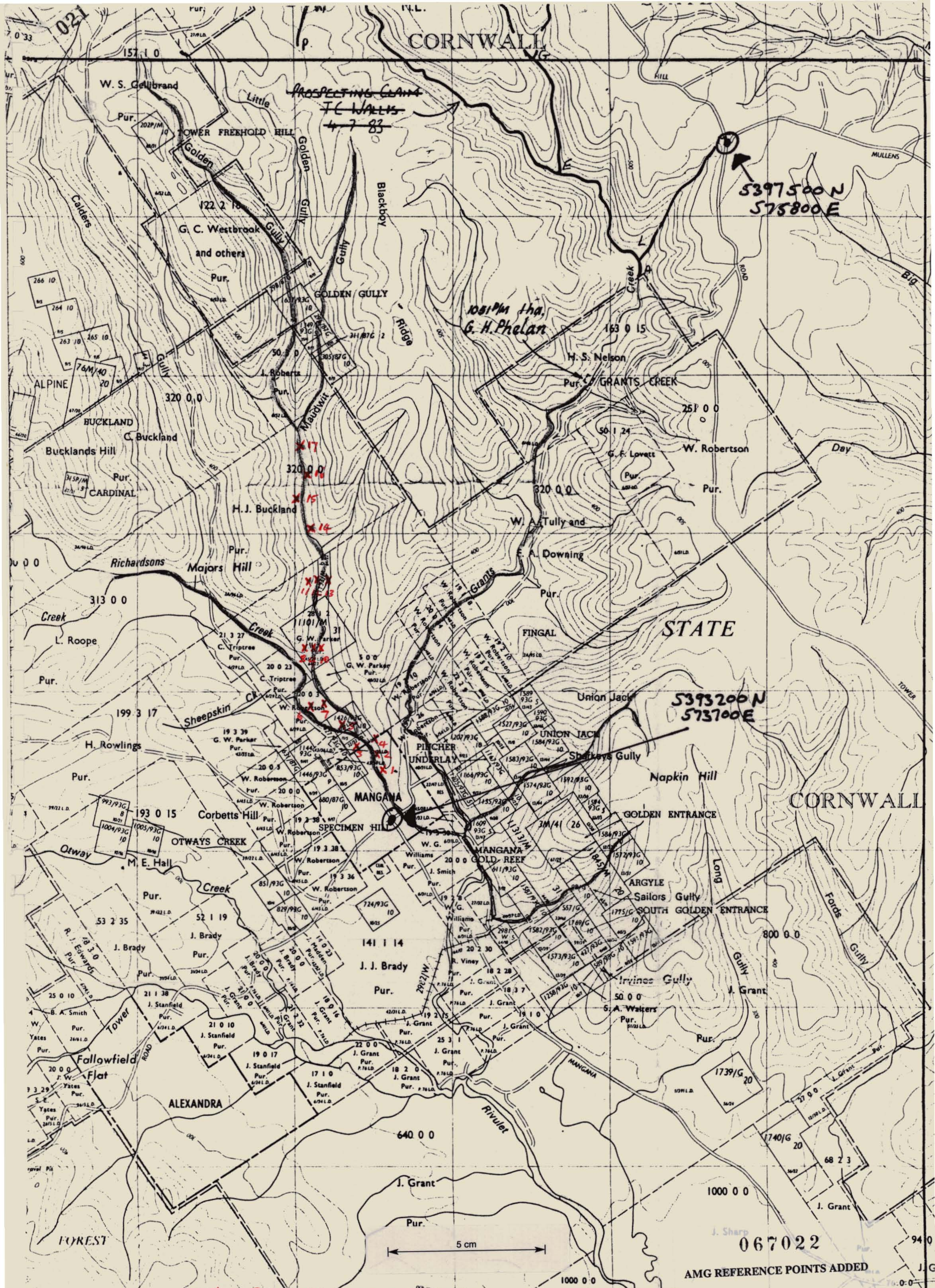
<u>TRENCH NO. 17</u>: 2 metres raw gravel (no colour), 2 metres clay wash, 2 colours in pan con.
Hard slate floor

ALL PAN CON SENT TO MINES DEPARTMENT TO BE ASSAYED

BATTERY SANDS

SAMPLE MARKED: F = FINGAL MINE
U = UNION JACK
M = MANGANA GOLD REEF

A 20 litre drum of sands from each of the above dumps has been sent to Mines Department, Launceston for analysis.



X = BACKHOE TRENCH SITES.