NORTH FLINDERS MINES LTD/ROEBUCK RESOURCES NL

TENNANT CREEK JOINT VENTURE

# FIRST ANNUAL REPORT FOR

# EL 8237 (WEST KELLY WELL)

# FOR THE 12 MONTH PERIOD

# TO 30TH NOVEMBER 1994

Tennant Creek 1:250 000 Sheet SE 53-14

Tennant Creek 1:100 000 Sheet 5758



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NORTH FLINDERS EXPLORATION
FEBRUARY 1995

Report No. DACA252

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## 1. SUMMARY

This report describes the exploration activity and results obtained at EL 8237 (West Kelly Well) during the first year of tenure (year ending 30th November 1994). Work undertaken included:

- a search for relevant open file NTDME reports;
- interpretation of regional aeromagnetic data;
- geological mapping of the tenement; and
- a limited rockchip sampling programme.

Mapping confirmed that much of the prospect is covered by soil, gravel and laterite. The best gold assays were returned from thin quartz-hematite veins (7ppb Au) and from an outcrop of banded quartz-hematite jasper (5ppb Au). Further geochemical sampling, soil sampling and vacuum drilling is recommended, and ground magnetic surveys over discrete dipolar aeromagnetic anomalies are proposed.

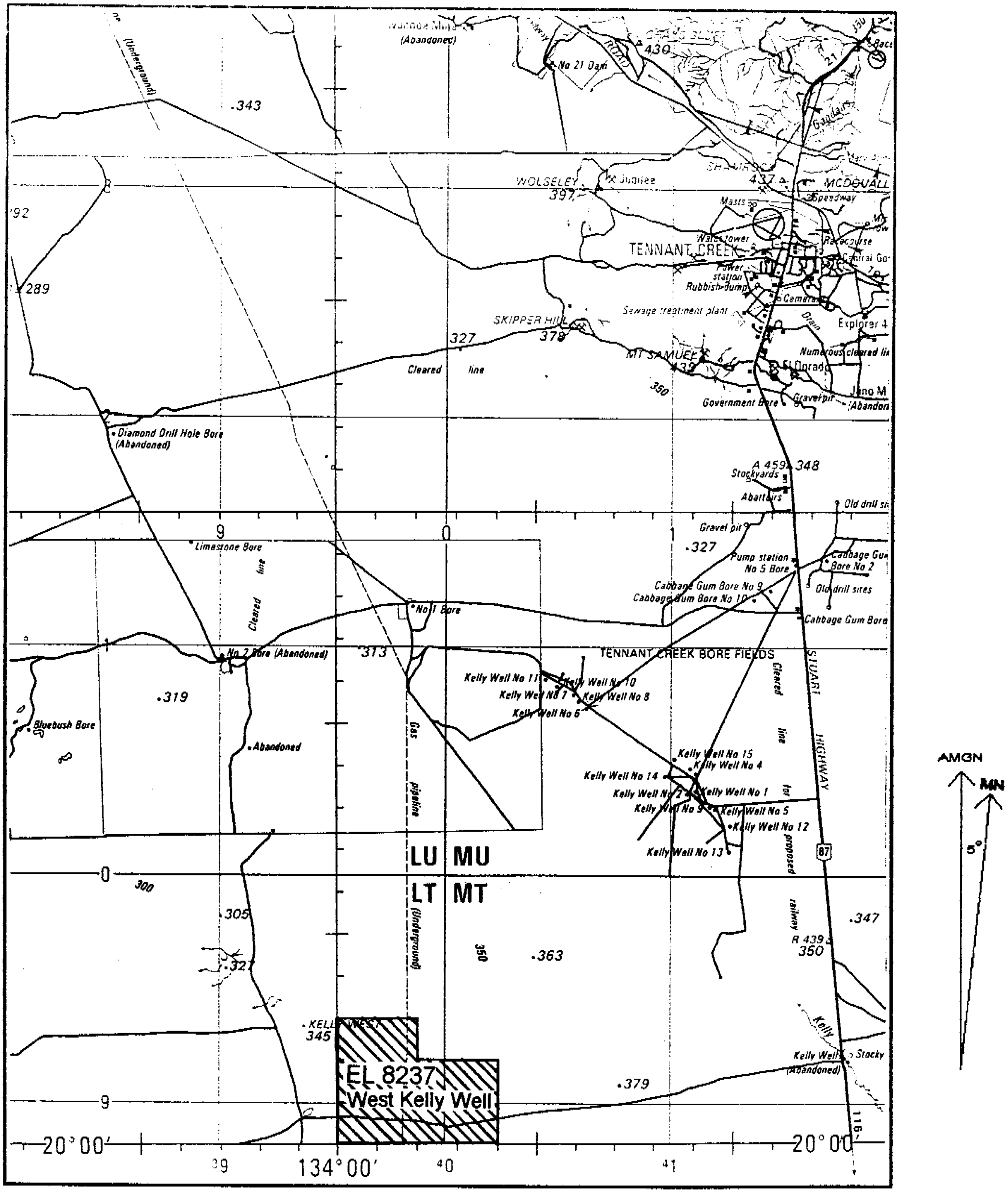
## 2. INTRODUCTION

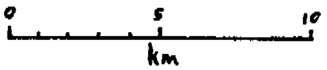
This report is a summary of work undertaken by North Flinders Exploration (NFE) on EL 8237 in the 12 month period to 30th November 1994, the first year of tenure. During this period exploration was managed by North Flinders Exploration (NFE) on behalf of the North Flinders Mines Limited / Roebuck Resources NL Tennant Creek Joint Venture (NFM/Roebuck JV).

Under the terms of the NFM/Roebuck JV, signed on 16th April 1991, North Flinders Mines solely contributed $1.2M to earn a 60% participating interest in the joint venture, with Roebuck Resources managing the exploration programme. The farm-in stage was reached in September 1992, and in January 1993 NFE exercised the right to manage ongoing exploration in the joint venture.

## 3. TENEMENT DETAILS

EL 8237 comprises 10 graticular blocks. The area is bounded to the south by latitude 20° 00'S and to the west by longitude 134° 00'E (Figs. 1-2). The tenement was granted on 1st December 1993 for a period of six (6) years and is due to expire on 30th November 1999. The annual exploration covenant is $10 000. EL 8237 has a total area of 32km$^2$.




**NORTH FLINDERS EXPLORATION**

NFM/ROEBUCK JV

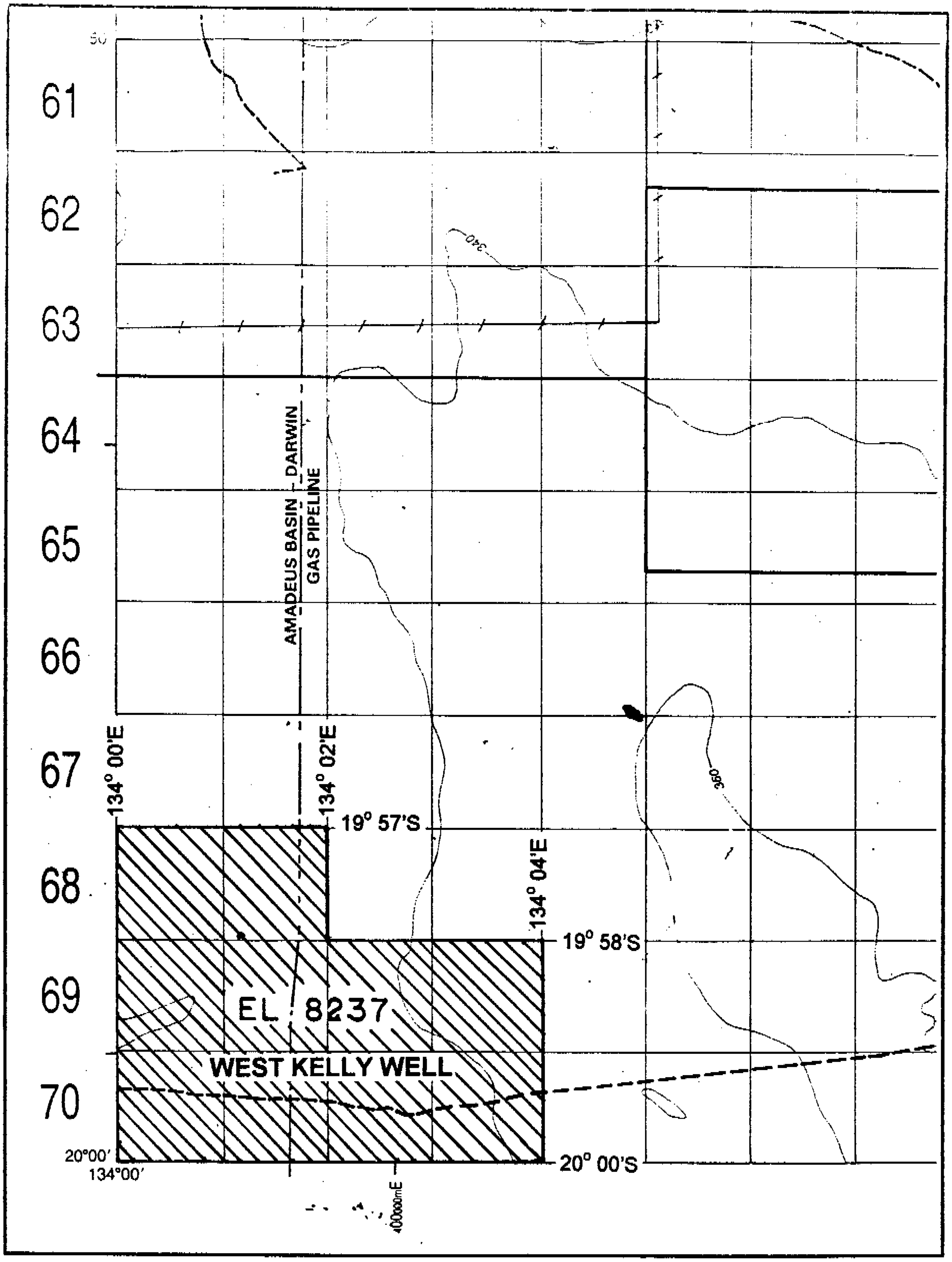
WEST KELLY WELL EL 8237

LOCATION PLAN

MODIFIED FROM PORTION OF
NATIONAL TOPOGRAPHIC SERIES
SE 53-14 TENNANT CREEK

FIG. 1

| SCALE: 1:250 000 | DRAWN. TEM | FEB 1995 |
|---|---|---|




**NORTH FLINDERS EXPLORATION**

NFM/ROEBUCK JV

WEST KELLY WELL EL 8237

TENURE PLAN

MODIFIED FROM PORTION OF TENNANT CREEK 52/5
1:100 000 MINING TENURE CENTRAL MINERAL FIELD
(PORTION OF NATIONAL 1:100 000 SERIES SHEET 5758

| SCALE: 1:100 000 | DRAWN: TEM | FEB 1995 |
|---|---|---|

FIG. 2

## 4. LOCATION AND ACCESS

The tenement is located 40km southwest of Tennant Creek Township (Fig. 1). Access is gained from the Stuart Highway via a track which heads west from Kelly Well. The Amadeus Basin to Darwin gas pipeline runs south to north through the centre of the EL, and the gas pipeline access track allows access to the northern part of the tenement The tenement is generally accessible except after heavy rain.

## 5. TOPOGRAPHY AND VEGETATION

Outcrop of bedrock within EL 8237 is poor. The area is mainly covered in aeolian and tertiary sands and soils. However, in the southern and western part of the lease, a well-developed lateritic profile is evident.

Vegetation consists of speargrass and spinifex with occasional stands of mulga and eucalypts.

## 6. REGIONAL GEOLOGY AND MINERALISATION

The highly productive Tennant Creek Goldfield is located in the Tennant Creek Block at the centre of the Tennant Creek inlier as defined by Le Messurier et al (1990). The Warramunga Group is the dominant geological unit of the Tennant Creek Block (up to 6000m thick) and consists predominantly of turbiditic greywackes and siltstones. An overview of the geology of the Tennant Creek Goldfield is presented in Fig. 3.

The Early Proterozoic Warramunga Group sediments and volcanics constitute the major part of the Tennant Creek Block and are unconformably overlain in the north by sediments of the Tompkinson Creek beds and in the south by the Hatches Creek Group. Cambrian sediments of the Georgina Basin in the east and south and Devonian sediments of the Wiso Basin in the west unconformably overlie the Proterozoic rocks.

The largest intrusion in the region is the Tennant Creek Granite Complex located in the central and eastern parts of the goldfield, mainly north of the Quartz Hill Fault (QHF). The granite is divided into two separate masses: a circular poorly exposed northern mass with a diameter of 20km and a southern well exposed east-west elongated body.

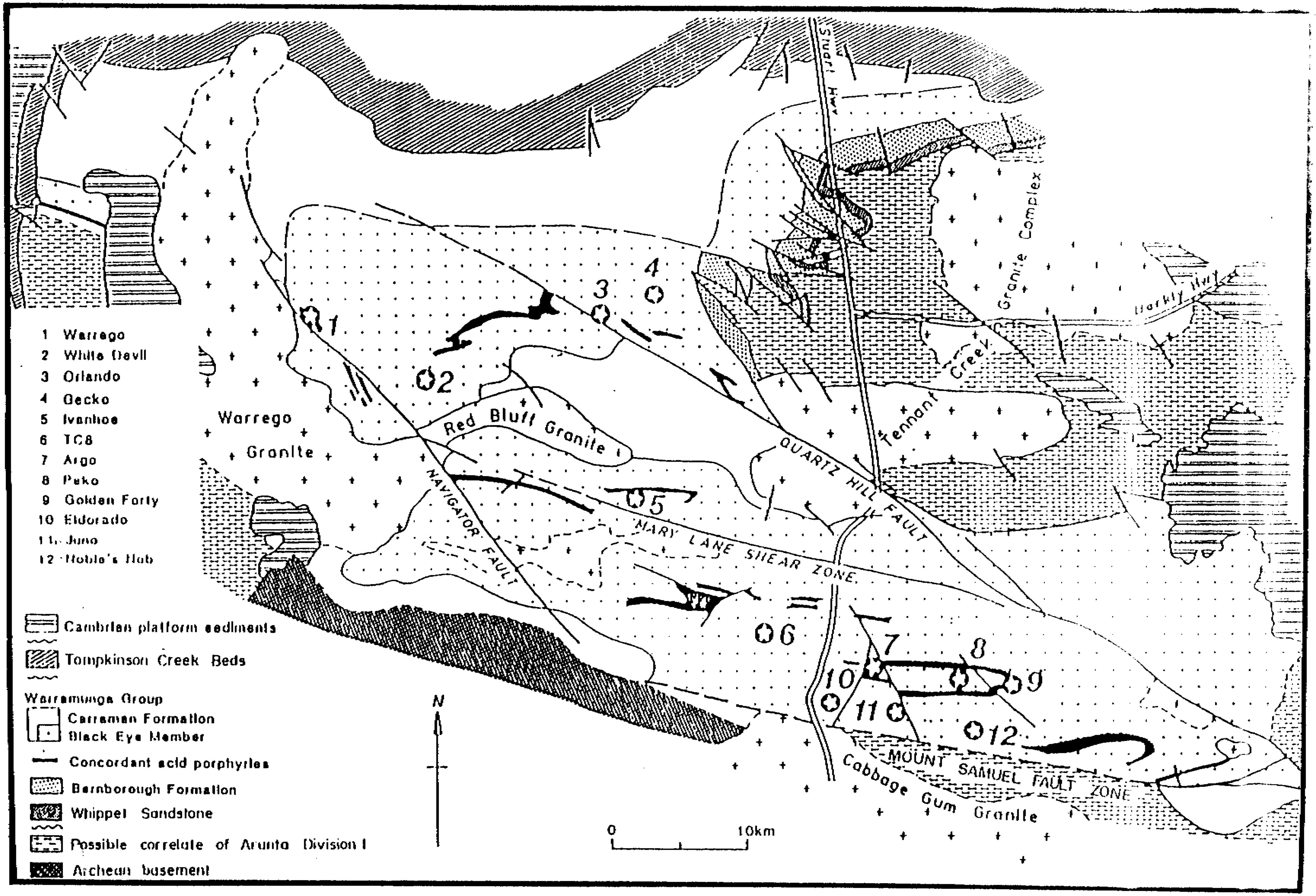



Fig. 3 Geology of the Tennant Creek Goldfield (after Fox, 1990)

The Cabbage Gum Granite is located south of the Mount Samuel Fault Zone (MSFZ), the Warrego Granite occurs along the western margin of the goldfield west of the Navigator Fault and the Red Bluff Granite forms a small elongate mass south of the White Devil Gold Mine. The granites are typically medium to coarse grained, biotite rich and sparsely porphyritic with large phenocrysts of K-feldspar. The margins of the granite may be sheared and a 100-200m wide contact aureole may be developed in the adjacent sediments.

U-Pb zircon and whole-rock analyses indicate two periods of granite intrusion. The Tennant Creek Granite Complex and Cabbage Gum Granite have U-Pb isotopic ages of 1870±20 and 1846±8 Ma, respectively. The Warrego and Red Bluff Granites are significantly younger with Rb-Sr whole rock isochrons of 1650-1660 Ma (Wedekind et al. 1990).

Several deformations have been recognised with the major folding event characterised by upright, symmetric, open to tight, east-west trending macroscopic folds with an axial plane slaty cleavage. In the Tennant Creek district NFE geologists have recognised at least five deformation phases. The second deformation ($D_2$) is the main folding and cleavage forming event. North-south directed compression produced east-west trending macroscopic folds which are upright, symmetric and generally tight with major steeply dipping limbs, very narrow hinge zones and small intersection angles between bedding and the $S_2$ axial plane cleavage. Fold wavelengths vary from several metres to several kilometres> An intense pervasive $S_2$ axial plane slaty cleavage has developed.

The regional geology of the Tennant Creek district has been extensively studied and documented, but there are some matters unresolved. In particular, there is debate about the intrusive or extrusive nature of the volcanics (e.g. Bernborough Volcanics) and the origin of magnetite in the sediments (syngenetic or hydrothermal). Economic mineralisation within the Tennant Creek Goldfield is spatially associated with iron oxides (Le Messurier et al. 1990). These iron oxides are in the form of either magnetite or hematite. All of the major mines in the Tennant Creek area, with the notable exception of Nobles Nob, are associated with magnetite, and have high magnetic signatures. The early recognition of this fact resulted in magnetic surveying and interpretation being used as the major exploration tool to define drill targets in the goldfield over many years.

The alteration and mineralisation of the various deposits in the Tennant Creek district have many similarities. One obvious alteration feature is the development of ironstone. More than 650 ironstone bodies have been identified in outcrop or by drilling in the Tennant Creek area. The ironstones vary in size from small bodies to large bodies over 15 million tonnes, and are composed of varying proportions (in decreasing order of abundance) of magnetite, quartz , chlorite, hematite, pyrite, talc, dolomite, muscovite and calcite.

The ironstone lodes generally form ellipsoidal to flattened bodies within the plane of the regional $S_2$ cleavage. The plunge of the lodes is usually steep but may have been reoriented by later granitic intrusion (e.g. Warrego), folding or faulting. Ironstone may also form flat bodies parallel to bedding, especially in the hinges of $F_2$ anticlines ("saddle reef" ironstones). Thin jasperoidal ironstone bodies also occur along the margins of porphyry lenses (e.g. northern margin of the Airport Porphyry), possibly representing contact metamorphism and iron metasomatism. Ironstones contained within the $S_2$ slaty cleavage commonly occur in the hinges of anticlines, whilst others occur in shear zones. It is not uncommon for several lodes to form an *en echelon* stack in close vicinity (e.g. Warrego).

The alteration phases surrounding the ironstone lode typically exhibit a common vertical zonation, although these alteration phases are not necessarily associated with every ironstone. Chlorite is the most common alteration phase and forms an envelope around the ironstone. Down plunge of the lode an elongate chlorite-magnetite stringer zone is typically developed. Below this zone chlorite is dominant. The width of the chlorite halo adjacent to the lode varies from tens of centimetres to tens of metres. The chlorite alteration - ironstone lode contact is very sharp. This contrasts with a generally diffuse chlorite-altered to unaltered sediment contact. In the oxide zone chlorite weathers to characteristic red-brown to purple brown iron oxides. Towards the top of the ironstone, talc alteration, dolomite and jasper may also occur.

Economic concentrations of gold, copper and bismuth are found in crosscutting cracks and fractures within the ironstone lodes and/or at their margins in breccia stringer zones (Wedekind et al. 1990). It is generally accepted that the mineralisation post-dates formation of the ironstone lode. The principal gangue minerals in the primary lodes are magnetite, quartz, chlorite, talc, hematite, dolomite sericite, jasper, pyrite and pyrrhotite. Common ore minerals are chalcopyrite, native gold, bismuthinite and a variety of seleniferous bismuth sulphosalts. Less common are bornite, galena, sphalerite, cobaltite, uraninite and scheelite (Le Messurier et al. 1990). The mineralisation typically exhibits a vertical zonation, albeit sometimes crude, with a gold-bismuth core enveloped by a broader copper halo. Gold is generally concentrated in the base or in the footwall of the ironstone lode. Gold may also occur in the chlorite-magnetite stringer zone, but decreases in grade away from the lode (Wedekind et al. 1990). Chlorite, muscovite and sericite are often intergrown with gold, and may develop as an envelope around the gold pod.

## 7. PREVIOUS MINING AND EXPLORATION

A search of all Northern Territory Department of Mines and Energy (NTDME) reports on open file pertaining to the West Kelly Well area was completed by NFE to ascertain the extent of previous mining and exploration. No relevant exploration reports were located. There is no record of any previous mining activity within the EL and no old workings were located during field work.

## 8. AEROMAGNETIC SURVEY

The West Kelly Well EL lies to the south of the area covered by the Austirex multiclient aeromagnetic and radiometric survey (acquired by NFE in 1992). A search of NTDME open file records indicated that EL 8237 had been covered by survey 88/100. Aeromagnetic contours from a portion of this survey are shown in Fig. 4.

A ridge of higher magnetics, approximately 150nT to 200nT above background trends northwest through the tenement and corresponds with the trend of a topographic ridge of Warramunga Group sediments. Occasional quartz-hematite±jasper veins lie within the sediments. The magnetic source is likely to be magnetite within the turbidites, and this may include ironstone bodies, particularly where discrete dipolar anomalies can be observed.

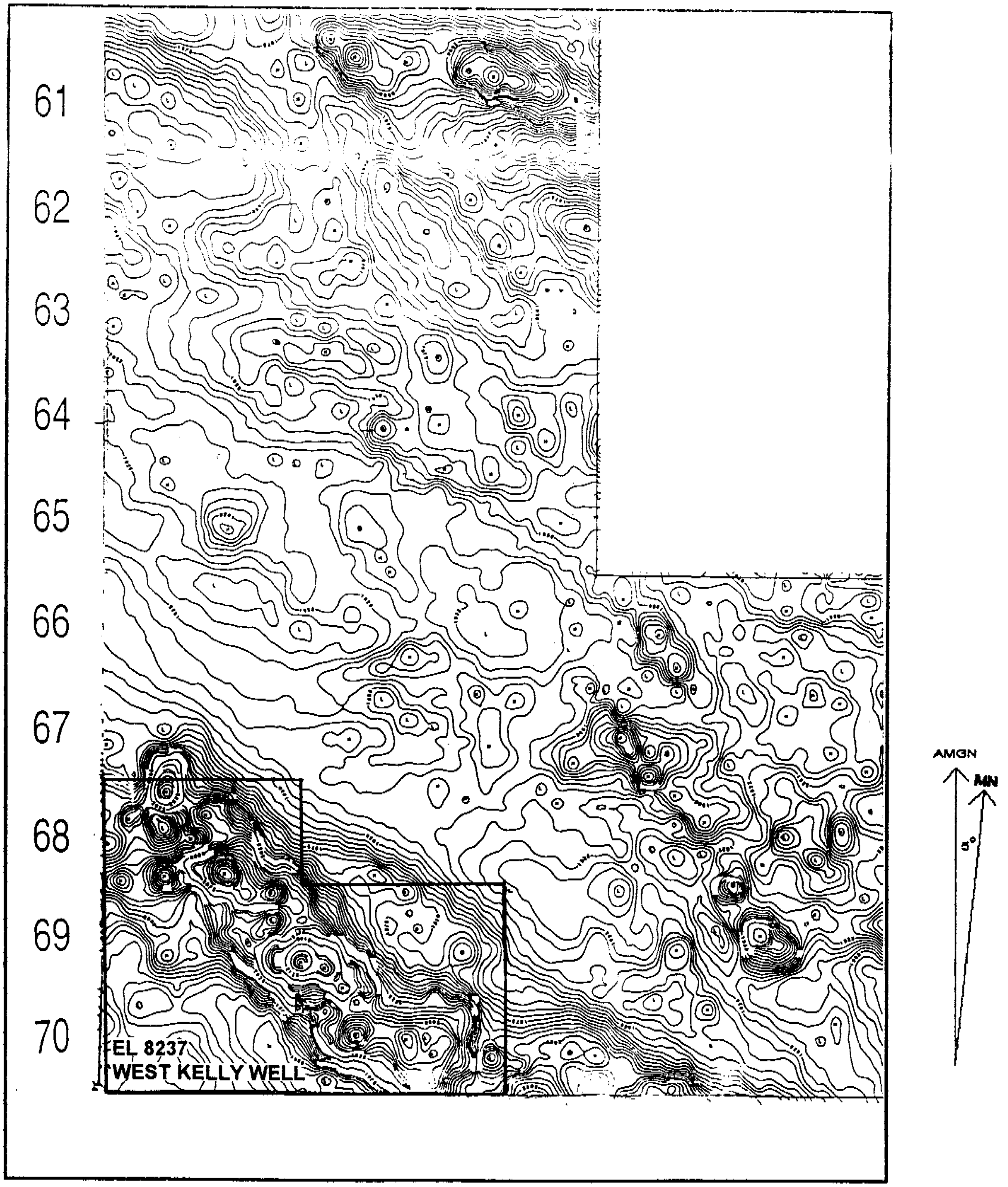
## 9. GEOLOGICAL MAPPING AND ROCK CHIP SAMPLING

NFE geologist, Andrew Cooper, carried out a geological mapping exercise over the West Kelly Well tenement. A Magellan Nav1000 GPS unit was used to locate positions in the field and no gridding was undertaken during the course of the exploration programme. The resultant geological map is shown in Fig. 5.

West Kelly Well was mapped at a scale of 1:25,000. The mapping programme confirmed that approximately 95% of the tenement is covered by soil, gravel and a well developed lateritic cap. Bedrock outcrop, when visible, was located under the lateritic profile. Cleavage was found to dip consistently to the south at a steep angle. Outcropping lithologies include greywacke and siltstone and occasional quartz-hematite±jasper veins. The lithologies appear to be typical Warramunga Group sediments (as mapped by the NTGS in 1991).

Quartz-porphyry was found to outcrop 1.3km to the east of the tenement. However, a sample of the porphyry returned low values (1ppb Au, 30ppm Cu, <1ppm Bi and 3ppm As).

Sixteen rockchip samples were taken. Results are listed in Table 1 and sample locations are shown in Fig. 5. Where possible, outcrop or sub-outcrop was sampled. Elsewhere, laterite samples were taken. Samples were assayed for gold, copper, bismuth and arsenic. Maximum assays were: 7ppb Au; 30ppm Cu; 17ppm Bi; and 70ppm As. The best gold and bismuth assays were associated with quartz-hematite±jasper veins.





**NORTH FLINDERS EXPLORATION**

NFM/ROEBUCK JV

WEST KELLY WELL EL 8237

AIRBORNE GEOPHYSICAL SURVEY

MAGNETIC CONTOUR MAP

PORTION OF TENNANT CREEK 52/5
OPEN FILE AEROMAGNETIC SURVEY 88/100
(PORTION OF NATIONAL 1:100 000 SERIES SHEET 5758

| SCALE: 1:100 000 | DRAWN: TEM | FEB 1995 |
| --- | --- | --- |

**FIG. 4**

TABLE 1. **Results of Rockchip Sampling**

| Sample No. | AMG East | AMG North | Au (ppb) | Cu (ppm) | Bi (ppm) | As (ppm) |
|---|---|---|---|---|---|---|
| 332271 | 404230 | 7789460 | 1 | 30 | <1 | 3 |
| 332272 | 398230 | 7789060 | <1 | 21 | <1 | 20 |
| 332273 | 398900 | 7789150 | <1 | 18 | <1 | 26 |
| 332274 | 398300 | 7789660 | 1 | 4 | <1 | 20 |
| 332275 | 398320 | 7789570 | <1 | 24 | 1 | 36 |
| 332276 | 398340 | 7789940 | <1 | 20 | <1 | 28 |
| 332277 | 398440 | 7790100 | 1 | 7 | 1 | 70 |
| 332278 | 398800 | 7790750 | 7 | 17 | 6 | 4 |
| 332279 | 398800 | 7790670 | 1 | 11 | 4 | 5 |
| 332280 | 399150 | 7790210 | 5 | 14 | <1 | 3 |
| 332281 | 398090 | 7790275 | 4 | 29 | <1 | 11 |
| 332282 | 398085 | 7790275 | 3 | 8 | 2 | 13 |
| 332283 | 399110 | 7790280 | 3 | 19 | 17 | 8 |
| 332284 | 398040 | 7791460 | 2 | 5 | 1 | 17 |
| 332285 | 397550 | 7792000 | 1 | 19 | <1 | 26 |
| 332286 | 396600 | 7792300 | 5 | 11 | <1 | 3 |

## 10. EXPENDITURE FOR TWELVE MONTHS TO NOVEMBER 1994

**TABLE 2. Expenditure for Twelve Months to November 1994**

| | |
|---|---|
| Geologist (10 days @ $400/day) | 4,000.00 |
| Field Assistant (5 days @ $250/day) | 1,250.00 |
| Assays | 240.00 |
| Drafting | 400.00 |
| Accommodation | 750.00 |
| Vehicle | 400.00 |
| Airfares | 1,095.00 |
| Base Support Costs | 813.00 |
| Administration | 1,342.00 |
| **TOTAL** | **$10,290.00** |

Covenanted expenditure was set at $10,000 for the year to November 1994.

## 11. FUTURE PROGRAMME

11.1. It is proposed to undertake a 200m x 200m soil sampling reconnaissance programme over areas of outcrop, suboutcrop and thin lateritic cover.

11.2. A series of lines of reconnaissance vacuum drilling are proposed to obtain more information on the bedrock geology and possible mineralisation.

11.3. Ground magnetic surveys over discrete dipolar aeromagnetic anomalies are proposed in order to help to define drilling targets.

## 12. REFERENCES

**Le Messurier, P., Williams, B.T. and Blake, D.H., 1990.** Tennant Creek Inlier - regional geology and mineralisation. in *Geology of the Mineral Deposits of Australia and Papua New Guinea* (Ed. F.E. Hughes), pp 829-838 (The Australasian Institute of Mining and Metallurgy: Melbourne).

**Wedekind, M.R., Large, R.R. and Williams, B.T., 1990.** Controls on high grade gold mineralisation at Tennant Creek, N.T., Australia in *The Geology of Gold Deposits: The Perspective in 1988. Economic Geology Monograph 6.* (Eds. R.R. Keays, W.H.R. Ramsay and D.I. Groves), pp 168-179 (The Economic Geology Publishing Company: El Passo, TX).