NEWMONT AUSTRALIA

NEWMONT TANAMI PTY LTD

ANNUAL REPORT

1ST ANNUAL REPORT FOR SEL 23662 (CAVE HILLS)

for the period
03/04/2003 to **02/04/2004**

Central Tanami
NORTHERN TERRITORY

Volume **1** of **1**

1:250,000 SHEET:	The Granites	SF52-03
1:100,000 SHEET:	Frankenia	4857
	Ptilotus	4957

AUTHOR: M. Walter

TENEMENT HOLDERS: Newmont Tanami Pty Ltd

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SUMMARY

This is the first annual report for SEL 23662 (Cave Hills) covering the year to the 2nd April 2004.

Substitute Exploration Licence SEL 23662 is centred approximately 50km northwest of The Granites Gold Mine. It is readily accessible via roads and tracks leading from the Tanami Road, which bisects the licence (Figure 1). The licence was granted on the 3rd April 2003.

During the reporting period, exploration included soil surveys, an aircore drilling program over Titania North and a RAB drilling program over the Challenger 1 prospect.

Work Completed during the reporting period comprised:

TECHNIQUE	SAMPLE TYPE	DESCRIPTION
Geochemical Sampling	Soil (BCL)	605 Samples + 10 Quality control samples
Petrology	Drillcore and chips	16 sections
Drilling	Aircore	44 holes for 2591m, 896 samples
Drilling	RAB	63 holes for 2719m, 934 samples

The SEL was also included in a Tanami-wide regional structural mapping project. This project commenced in October 2003 and is still in progress. In conjunction with the structural project, ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) satellite imagery has been purchased, and is currently being interpreted to provide regional lithological, structural and mineral alteration signatures.

It is proposed that future work will involve the evaluation of prospect areas defined by target generation from the regional structural and ASTER studies. Conceptual targets outlined will be assessed using surface geochemical sampling and/or aircore / RAB drilling, depending on the particular geological and regolith settings.

Other work carried out at Titania has involved the further investigation of the prospect with a view to mining in 2005. This work was deemed necessary due to the significant technical problems associated with pit wall stability, pit dewatering and economic access identified in earlier work.

The work required multiple consultants and contractors over a period of eight months, to date, to carry out work in the fields of Environmental Flora & Fauna studies, Geotechnical analysis of possible final wall stability, Ore & Waste characterisation and possible access routes. Also being carried out is a dewatering study to determine the system required to ensure dry mining conditions and identify a suitable water disposal technique.

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1 INTRODUCTION

This report summarises the work carried out by Newmont Exploration Pty Ltd, on behalf of Newmont Tanami Pty Ltd on the Cave Hills substitution exploration licence during the period 03/04/2003 to 02/04/2004.

2 LICENCE DETAILS

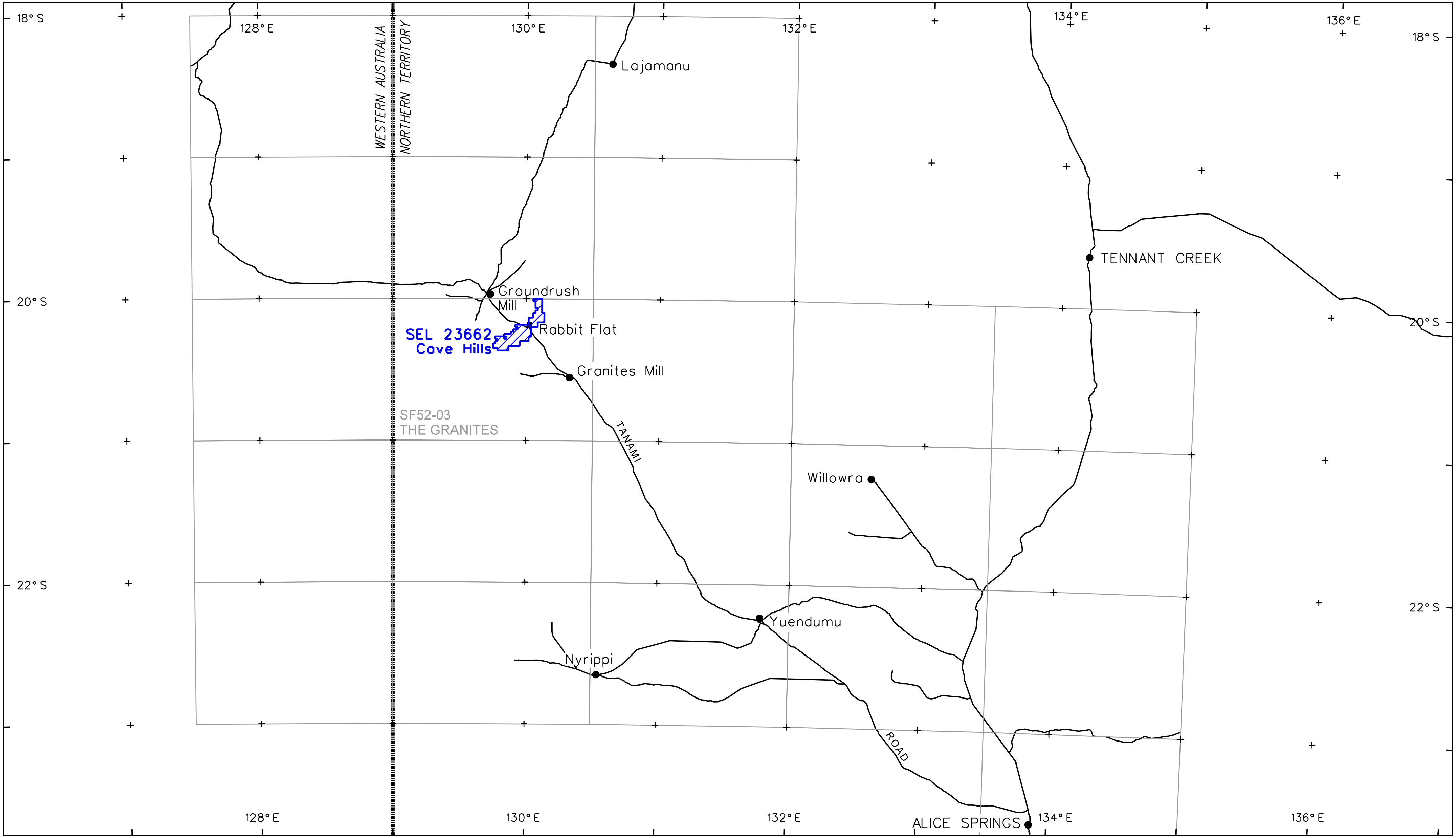
Newmont Tanami Pty Limited is the current holder of substitute licence 23662. It was granted on the 3rd April 2003, replacing EL 2370.

The licence is on Aboriginal Freehold and is therefore subject to agreements with the Central Land Council (CLC). The location of the licence is illustrated in Figure 1 and tenure details are summarised in Table 1.

TABLE 1: Lennards Exploration Licence Statistics.

TENEMENT		DATE OF		NUMBER OF BLOCKS	Area
Number	**Name**	**Grant**	**Expiry**	**Current**	**Km^2**
SEL 23662	**Cave Hills**	03/04/2003	02/04/2007	158	500.1

Under sections 26 and 28 of the NT Mining Act, the licence area was due to be reduced by 50% in March 2003. An application to waive this reduction is currently with DBIRD.



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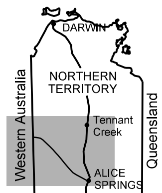
Transverse Mercator Projection - UTM Zone 52
Australian Geodetic Datum - AGD66

NEWMONT EXPLORATION

SEL 23662 (CAVE HILLS)
CENTRAL TANAMI PROJECT

TENEMENT LOCATION MAP

01/04/2004



NEWMONT AUSTRALIA

FIGURE 1

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3 LOCATION, ACCESS, INFRASTRUCTURE, SURVEY CONTROL & ENVIRONMENTAL PRACTICE

3.1 Location & Access

The Cave Hills SEL is centred approximately 50km northwest of The Granites Gold Mine. It is readily accessible via roads and tracks leading from the Tanami Road, which bisects the licence (Figure 1).

Geographically, the area lies in the western part of the Tanami Desert, a generally flat and featureless sand-covered landscape of spinifex and low scrub. The tenement lies within Aboriginal freehold land.

The annual average rainfall is of the order of 200mm, which is mostly derived from summer monsoonal and storm activity. Daily temperatures vary from minima of near freezing in winter to summer maxima of approximately 48°C. The area is devoid of surface water except in small soaks after heavy rain.

Access to the area is by air or via the Tanami Highway. A basic network of pre-existing and newly formed tracks link individual prospect areas to the major exploration camps at The Granites and Wilsons (Figure 2). A bitumen ore haulage road connects the Dead Bullock Soak mining operation with The Granites mill processing and camp facilities.

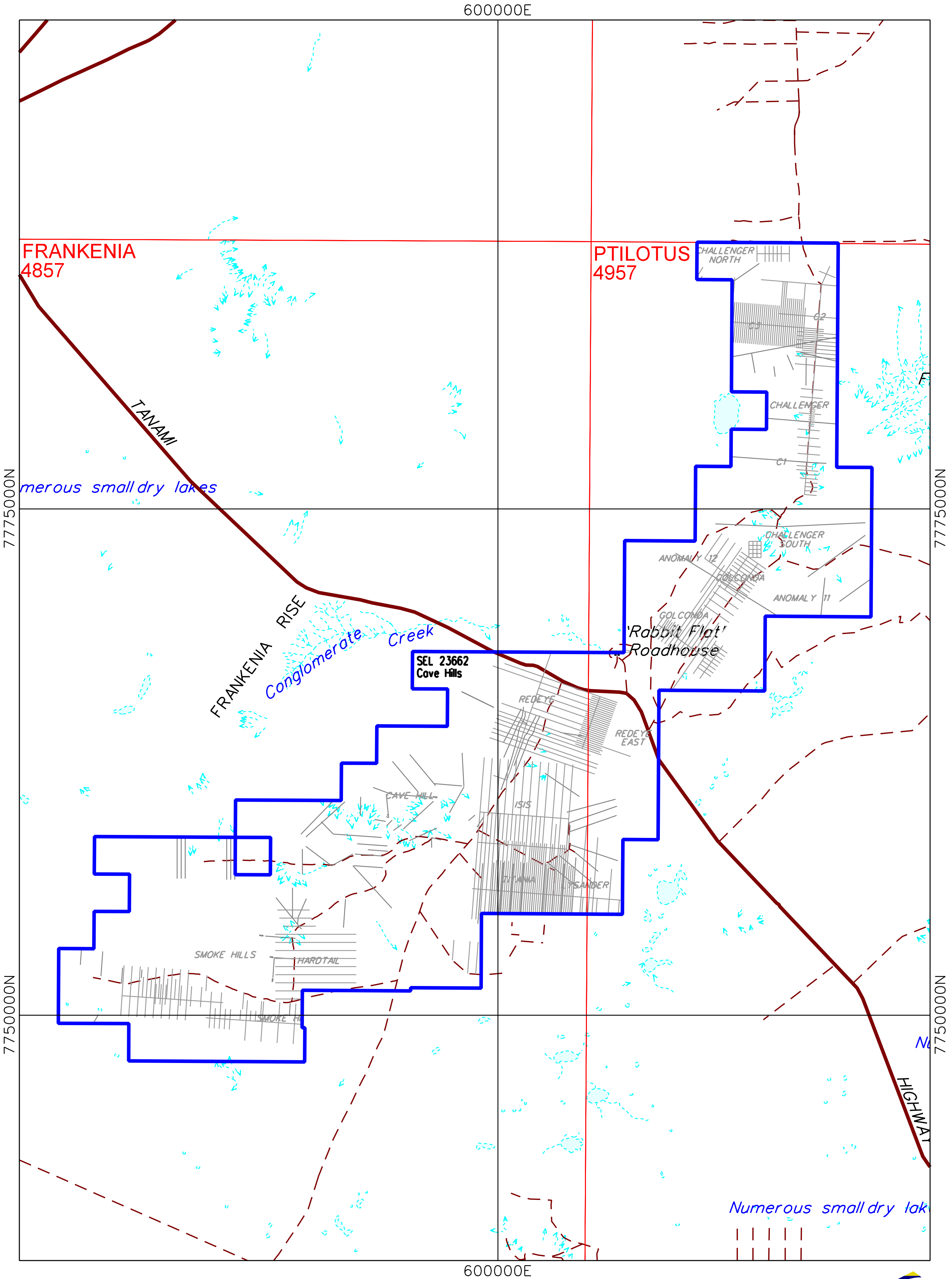
3.2 Infrastructure

Prior to the presence of Newmont Exploration and predecessor companies in this part of the Tanami region, infrastructure was almost completely lacking. Currently supplies are trucked or flown to the permanent camp at the Granites from Alice Springs. Telephone and fax using microwave links service this camp. Water is provided by two remote borefields. One borefield lies 35km east of The Granites (Billabong) and the other 10km northeast of Dead Bullock Soak (Jumbuck). Power is locally generated at exploration bases and mine sites. The nearest settlements are the Rabbit Flat roadhouse 50km to the northwest of The Granites on the Tanami Road and Tanami Downs pastoral homestead 60km to the west. The nearest town is Yuendumu Aboriginal community some 250km southeast of The Granites on the Tanami Road.

3.3 Environmental Practice

Rehabilitation of exploration sites is carried out pursuant to Section 24(e) of the NT Mining Act and in accordance with the Departments “Guidelines for Rehabilitation of Exploration Sites”;

- all drillholes are capped on completion
- all grid lines and tracks are rehabilitated when no longer needed.



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UTM Zone 52 (AGD66)

SEL 23662 - CAVE HILLS

PROSPECT, ACCESS & LOCALITY PLAN

14/04/2004

FIGURE 2

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4 PREVIOUS EXPLORATION

SEL 23662 has replaced the 158 sub blocks of EL2370 previously held by Newmont Exploration.

All details of the work completed during the tenure of this licence can be found in the reports listed in the bibliographic section of this report.

5 EXPLORATION OBJECTIVES

Exploration and mine-based reasearch studies indicate that gold mineralisation in the region has an association with a broad range of geological environments, all displaying common characteristics. Models of gold occurrence for which the Tanami is believed to be most prospective include:

- Disseminated, stratabound deposits hosted by ‘banded iron formations’, and chemically reactive iron-rich lithologies (The Granites, Dead Bullock Soak, Windy Hill);
- Relatively late stage discordant stockwork and sheeted quartz veins, controlled by anticlinal folding, shear zones and chemically reactive carbonaceous lithologies (Callie, Titania, Coyote);
- Shear zone-controlled quartz veining with strong alteration characteristics, hosted in both sediments and mafic intrusives (Groundrush, East Ptilotus);
- Brittle fault-controlled quartz veins in mafic extrusives (Hurricane, Repulse, Jim’s);
- Deposits in regolith containing gold concentrated by alluvial, eluvial or lateritic processes (Titania, Tanami, Coyote).

With these models in mind, the Company’s geologists have selected prospective target exploration areas based on regional geological, structural, geophysical and geochemical data.

Detailed assessment of the targets is undertaken using a range of exploration techniques. These are designed to reveal the geology of the target area and the presence of indicator elements, particularly gold itself, in anomalous quantities.

Effective exploration is made difficult in places by the extensive cover of windblown sand and other transported material, which conceals the rock and associated soil, typically to a thickness of several metres. This blanket covers a large proportion of the region. Consequently the exploration process relies heavily on point samples obtained by drilling to expose bedrock.

6 GEOLOGY

The Granites-Tanami Goldfields lie in the eastern part of the Early Proterozoic Granites-Tanami Inlier, which is part of the Northern Australian Orogenic Province (Plumb, 1990). The Inlier abuts the Arunta Complex to the south and east and is probably a continuation of the Halls Creek Orogen in Western Australia (Hendrickx, et al, 2000). The Inlier underlies younger cover sequences including the extensive Paleozoic Wiso Basin on its northeastern margin, and Victoria River Basin to the north. To the west, clastic sediments of the Middle Proterozoic Birrindudu Basin overlie and separate the Inlier from the similar age rocks in the Halls Creek Province.

The oldest rocks of the Tanami region belong to the Billabong Complex, a suite of Archaean age gneiss and schist. This is unconformably overlain by the Proterozoic MacFarlanes Peak Group (mafic volcanic and volcanoclastic rocks), followed by a thick succession of clastic sediments of the Tanami Group. (Hendrickx et al, 2000). A suite of syn-to post-deformation dolerites and gabbros are found intruding both the MacFarlane Peak and Tanami Groups.

Complex, polyphase deformation during the Barramundi Orogeny (1845 – 1840Ma) has affected the entire Granites-Tanami Inlier. It appears to have been largely controlled by two sets of regional scale fundamental crustal fractures that trend NNE and WNW. This is evidenced by the orientation of successive phases of macroscopic folding in the region and the consistent sympathetic trends of late tectonic faults.

Peak metamorphism during the Barramundi Orogeny reached amphibolite facies (The Granites Gold Mine), but is more generally greenschist facies through the Inlier (Callie Gold Mine). Contact metamorphic aureoles, commonly identified in pelitic schist units by randomly orientated andalusite porphyroblasts, are well developed at the margins of the syn- and post-orogenic granite plutons.

Localised extension followed, forming small basins which filled with shallow marine sediments to the west (Pargee Sandstone) and pillow basalts and turbiditic sediments to the east (Mt. Charles Formation).

Following the period if extension, widespread granite intrusion and volcanism followed in the period 1830 – 1810 Ma. At least three suites of granitic intrusives and two volcanic complexes are present. The last intrusion of (undeformed) granite occurred at around 1800 – 1795Ma, with intrusion of The Granites Suite (Hendrickx et al, 2000).

Residual hills of gently folded Carpentarian Gardiner Sandstone unconformably overlie Early Proterozoic lithologies. Younger flatlying Cambrian Antrim Plateau Basalts are also preserved as platform cover in areas protected from erosional stripping.

Tertiary drainage channels, now completely filled with alluvial and lacustrine clays and calcrete are a major feature of the region. Some drainage profiles are 10 km wide and greater than 100m deep.

A desert terrain comprising transported and residual colluvial cover sediments and aeolian sand blanket a large portion of the Inlier, with an estimated outcrop exposure of less than 10% of the early Proterozoic lithological units.

Gold mineralisation within the Newmont Tanami tenement holdings is dominantly hosted by the Tanami Group, a sequence of fine to medium-grained turbiditic metagreywackes with lesser amounts of metapelite, carbonaceous siltstone and schist, banded iron-formation, chert and calcsilicates. (Hendrickx et al, 2000). Owing to their more resistant nature, only the cherts and iron-formations and associated interbedded graphitic schists tend to outcrop above the sand plain. The interlayered pillow basalts and sediments of the Mt.Charles Formation at the Tanami Mine deposits also host significant gold mineralisation.

7 WORK COMPLETED

7.1 DATA COMPILATION AND REGOLITH REVIEW

A review of all previous exploration completed on EL 2370 was undertaken in 2003. The review focussed on re-interpretation of past drilling and surface sampling with respect to the CRCLEME regional regolith and landform mapping completed on the licence area in 2000, as part of a Tanami-wide project.

Recent internal and external geological research has enabled Newmont's geological staff to achieve a better understanding of metal depletion and enrichment processes occurring in the regolith. This knowledge has increased markedly since 2000, and as a result it is considered that past drilling on some project areas has not been entirely effective, due to these depletion processes. Similarly, a Tanami-wide review of historical geochemical sampling has also indicated there are large sections of prospective terrain within current licences which have not been sampled effectively due to a lack of understanding of the regolith depth and characteristics.

Consequently, this review has outlined areas which are considered worthy of further work under the SEL, either through deeper regional-spaced drilling, or application of Newmont's in-house geochemical techniques specifically suited to the desert Tanami terrain. This review is ongoing and will generate targets for field investigation in 2004.

7.2 SOIL SAMPLE SURVEYS

Four soil sample programs were completed during the reporting period. These are;

1. The southern Challenger belt after encouraging results from a survey in 2002.

2. Samples will be collected in areas where no sampling was conducted last year, as well as increasing the sampling density over the Golconda Prospect area.

3. The Cave Hills prospect area

4. The Titania prospect area

All assay results are included in Appendix 1 and locations are displayed on Figures 3a & 3b.

7.2.1 Challenger Belt & Golconda Surveys

These two survey areas when combined cover an area approximately 53km^2 north of the Rabbit Flat Roadhouse. Sampling density varies from 500mX500m to 250mX250m. It was noted that a large area (approximately 20km^2) in which samples with gold concentrations of between 3 and 15ppb could be collected, occurred to the north east of the Golconda Prospect Area. When comparing the location of this gold anomaly with DTM and radiometrics data, it was noted that these gold results all came from samples that were collected from two drainage channels. The northern drainage channel is reasonably steep and flows to the south east, whereas the southern drainage channel is wider, less steep and flow to the south-south west. Although Golconda is located at the southern end of the larger gold anomaly, it is not thought to be solely, if at all responsible for the addition of gold within the soil profile within these drainage channels

7.2.2 Cave Hills Survey Area

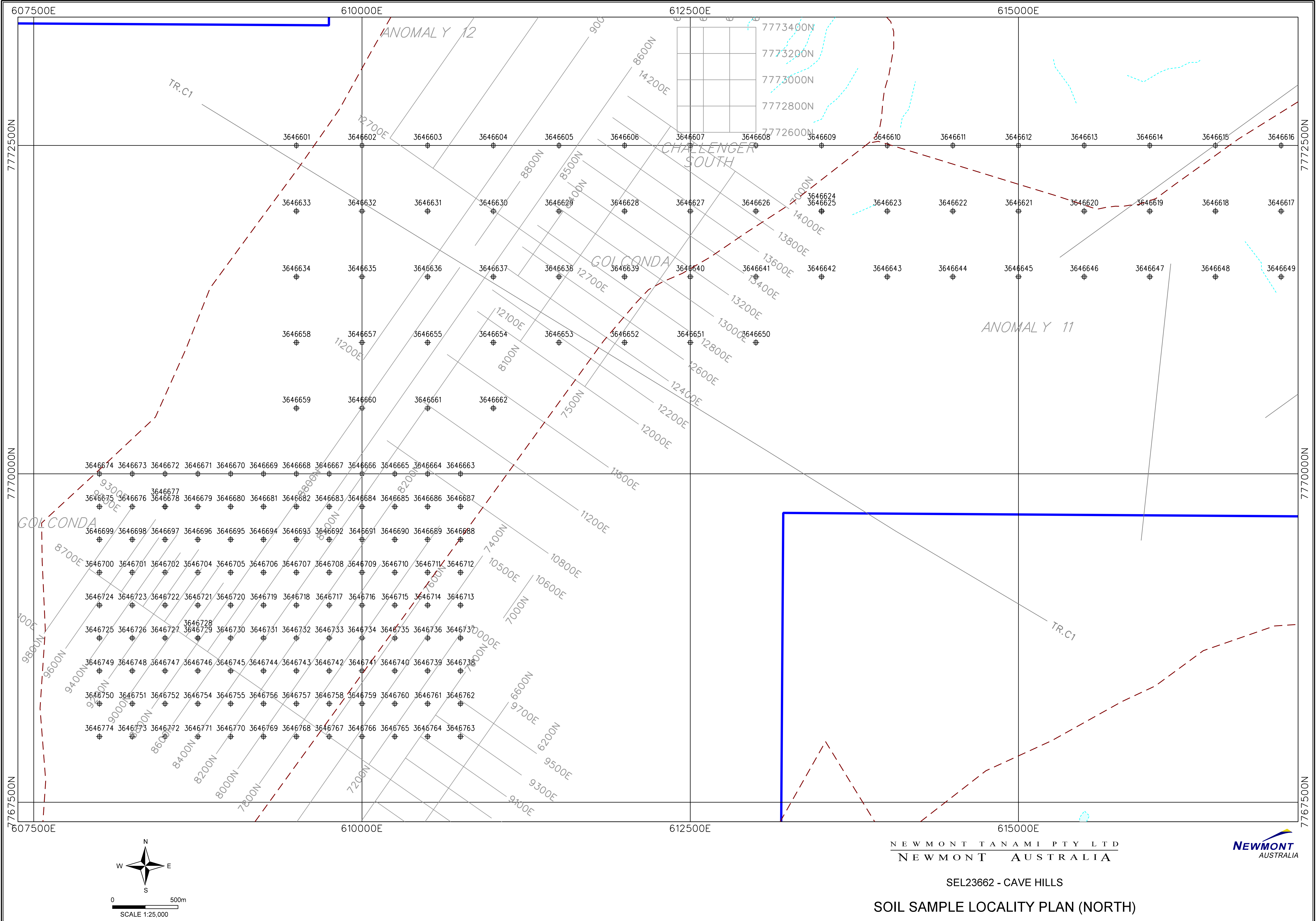
An area covering approximately 60km^2 west of Titania and covering the Cave Hills was soil sampled using a 500m X 500m soil sampling pattern. A couple of soil samples were found to contain gold concentrations greater than 2ppb in locations in the north east of the survey area, however these results in themselves were considered to be of low significance. These survey results will eventually be verified by field inspection.

7.2.3 Titania Survey Area.

These samples were collected from 6 traverse lines across the Titania prospect area. These samples are part of an orientation survey which has been designed to assess the impact of variations in the regolith on the distribution of metals in the surface soil material. At the time of writing, the samples have yet to be assayed. Any subsequent results will hopefully be reported in 2005.

TABLE 2. Soil Sample Details.

Region	Sample ID	No. Samples	Elements Analysed	Lab Method
South Challenger	3646601-3646662	62	Au	Newmont In House BLEG
Golconda	3646663-3646774	112	Au & As	Newmont In House BLEG
Cave Hills	3646971-7000 5501001-5501082 55011201-5501359	271	Au	Newmont In House BLEG
Titania	3121905-1946, 3121732-1762 3121785-1892	215	No Results	
Total: 660 samples (includes 23 QC samples)				



UTM Zone 52 (AGD66)

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SEL23662 - CAVE HILLS

SOIL SAMPLE LOCALITY PLAN (NORTH)

29/04/2004

FIGURE 3a

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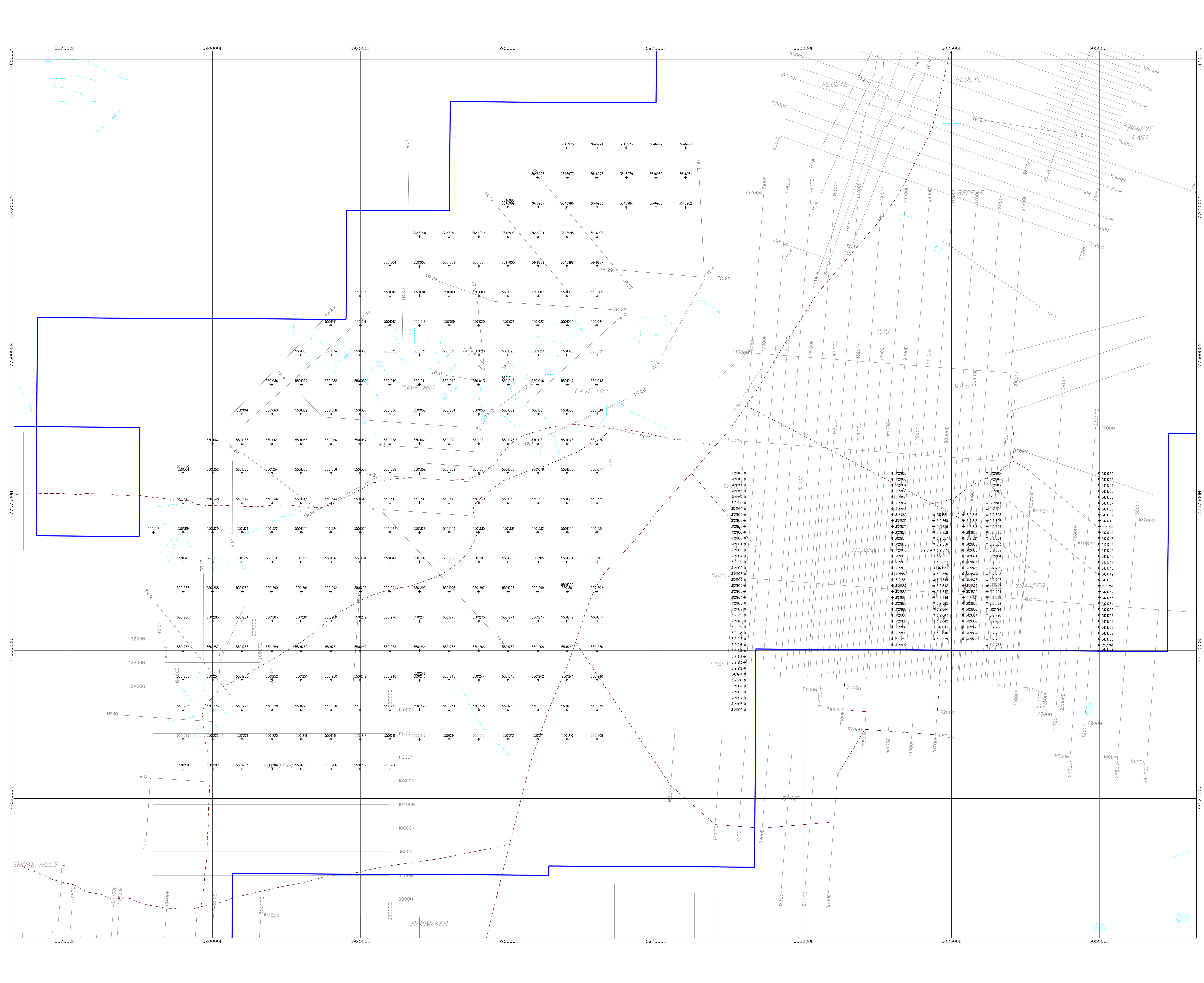

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Tanami Reconnaissance : Northern Territory

SEL 23662 - CAVE HILLS

SOIL SAMPLE

LOCALITY PLAN

(SOUTH)

Universal Transverse Mercator Projection - AMG Zone 52
Australian Geodetic Datum - AGD66

SCALE 1:25,000

DATA BY :	Newmont Tanami			PLAN No. :
DATE :	14/04/2004	AMEND :	29/04/2004	Figure 3b

7.3 TITANIA NORTH - AIRCORE DRILLING

An aircore-drilling program was completed at the Titania North Prospect area. 2591 metres were drilled, for a total of 896 samples. These samples were submitted to ALS for analysis for gold, arsenic, bismuth, copper, iron and manganese. All results are submitted in Appendix 1.

Drilling was been designed to target a low magnitude air borne magnetics anomaly, which is located approximately 500m from the mineralisation found at Oberon. From the drilling it has been found that cover varies from 15 to 40 metres in depth. Bedrock has largely been either coarse-grained quartz sericite meta-greywacke to arenite, or cherty, haematite stained, banded meta-siltstone and massive meta-mudstone to psammite. These latter units are also inter-bedded with chert units, and are reminiscent of the "Madigan Bed" equivalent units found in other parts around the general Titania region. These latter units, especially in the central portions of the traverses to date, have contained phenocrysts of leucoxene and iron oxide after magnetite and/or pyrite. Quartz veining has also been found in parts, some of which contain vugs which may have contained sulfides at one point in time. Micro-granite and porphyritic dykes, similar to that found at the northern end of the Isis Prospect area, have also been found in parts of the area drilled. Refer Figure 4.

TABLE 3. Titania North: Aircore Drillhole/Sample Details.

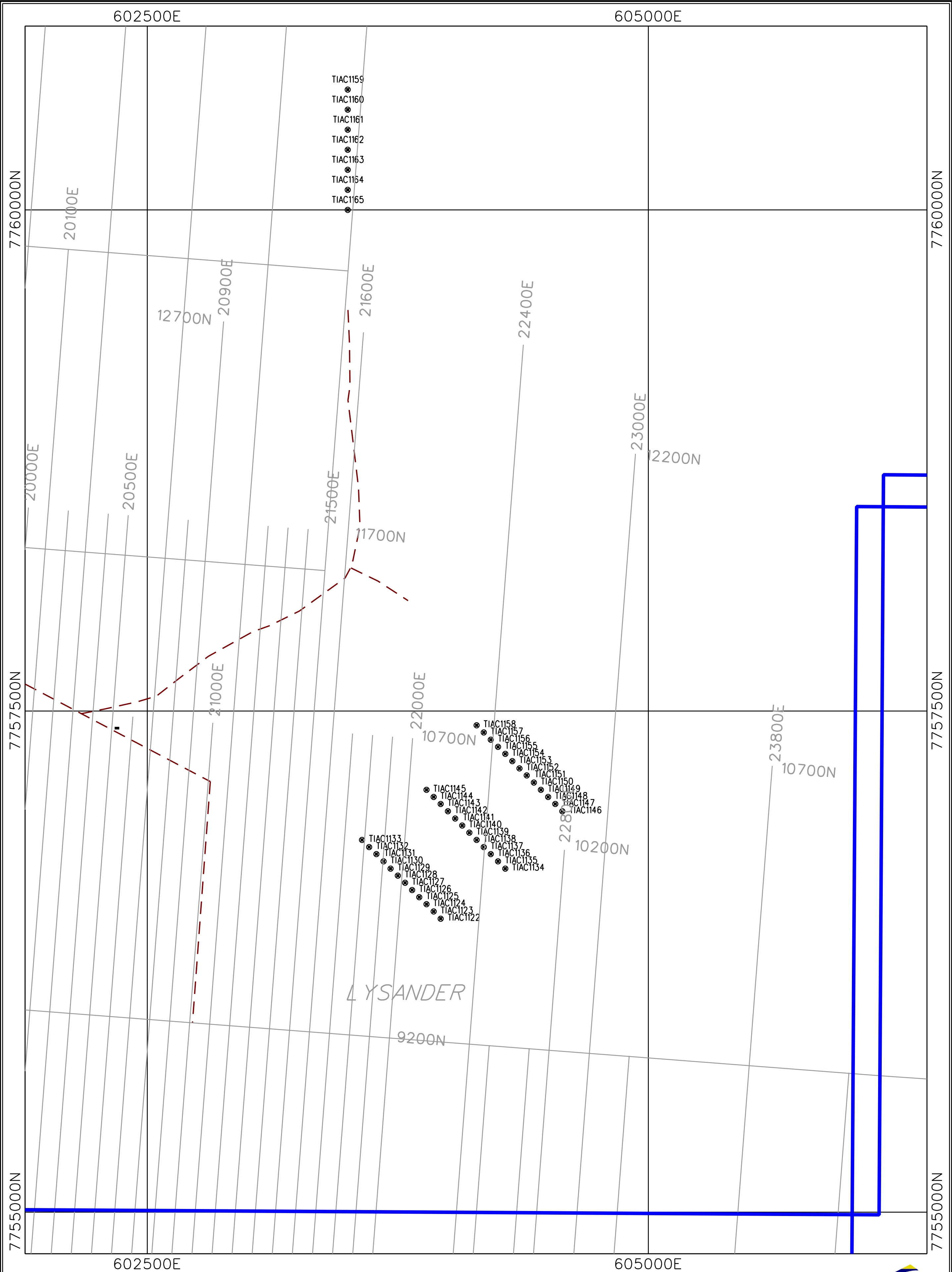
<table>
<tr><th>Hole ID</th><th>Drillhole Type</th><th>No.</th><th>Metres</th><th>No. Samples</th><th>Elements Analysed</th><th>ALS Lab Method</th></tr>
<tr><td rowspan="2">TITAC1122-TITAC1165</td><td rowspan="2">Aircore</td><td rowspan="2">44</td><td rowspan="2">2591</td><td rowspan="2">896</td><td>Au</td><td>AU-GF42</td></tr>
<tr><td>As, Bi, Cu, Fe, Mn</td><td>ME-ICP43</td></tr>
<tr><td colspan="2">Total:</td><td>44</td><td>2591</td><td>896</td><td colspan="2"></td></tr>
</table>

So far, the best result is 1m @ 1.58g/t Au from 39m depth (EOH) from TIAC1137. What makes this result more significant is that it was the last sample collected from the hole in question. Cover was interpreted to be between 33 and 36 metres thick. The hole was abandoned early due to very difficult drilling conditions, which involved high water pressure and broken ground. The bedrock was logged as a grey, cherty mudstone. Most of the meta-sediment samples collected have contained concentrations of Arsenic greater than 100ppm. The largest concentrations of arsenic are found in the southern half of the drilled area.

Some of the best intersections so far from the drilled area are detailed in the table below

TABLE 4. Titania North: Aircore Results – Best Intersections

Hole	Intersection	Depth
TIAC1137	1m @ 1.58g/t Au	39m
TIAC1136	6m @ 0.238g/t Au	54m
TIAC1122	6m @ 0.153g/t Au	33m
TIAC1125	3m @ 0.141 g/t Au	30m



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SEL23662 - CAVE HILLS

TITANIA NORTH
DRILLHOLE LOCALITY PLAN

April 2004

FIGURE 4

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7.4 CHALLENGER 1: RAB DRILLING

A drilling program in the Southern Challenger Belt was completed. In total, 63 drill holes were completed for 2719m drilled and 934 samples submitted for analysis. Assay results are included in Appendix 1. Refer Figure 5.

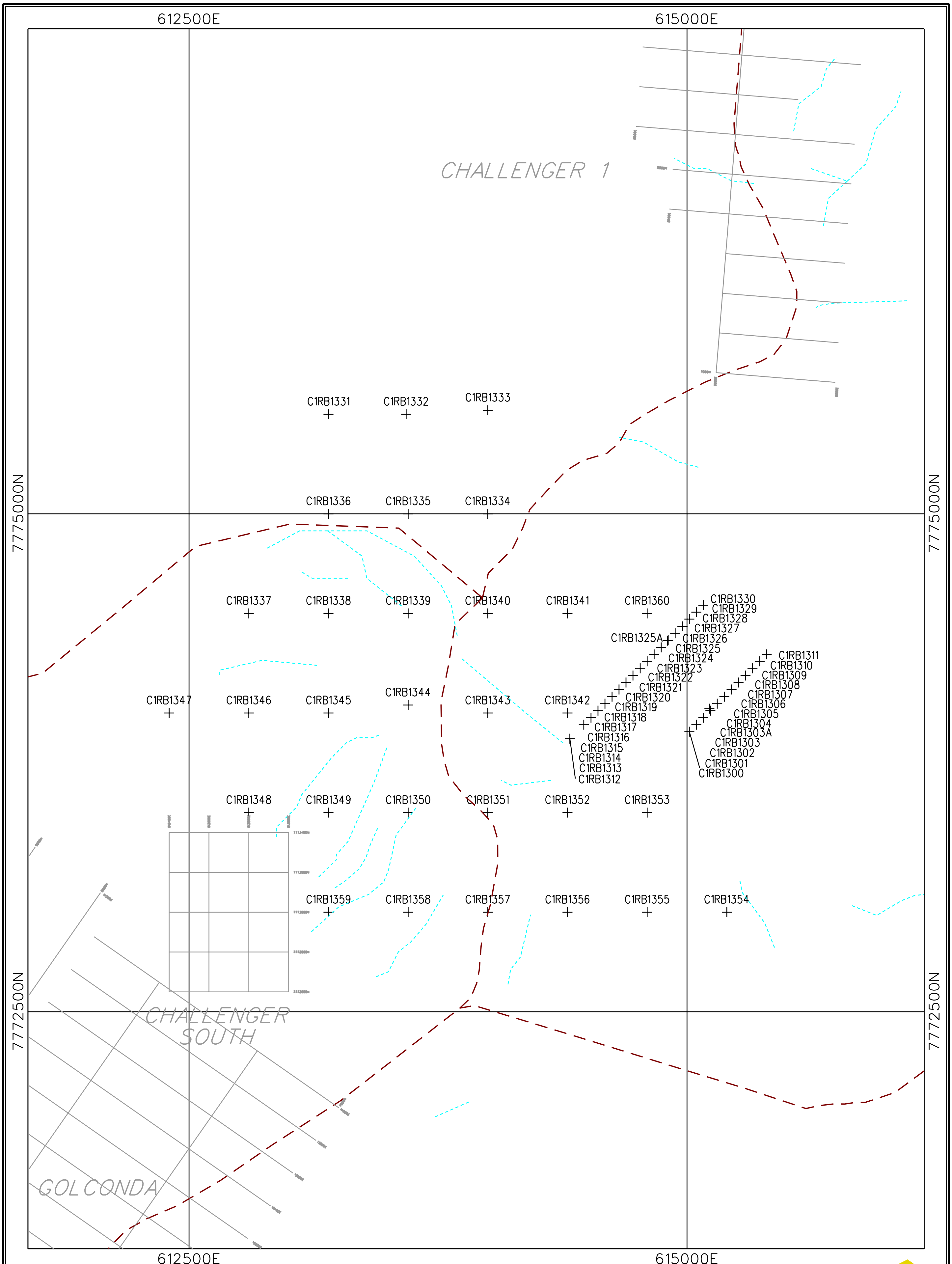
There were two parts to this drilling program. The first was a close spaced drilling program over an area from which a gold anomaly was mapped using the Newmont In house BLEG methodology on soil samples. No gold results of any significance were found from samples collected as part of this drilling program. A thin veneer (0.1-0.5m) of cover was present, underneath which were primarily meta-basalts with minor interbedded metasedimentary units. Weathering of bedrock at this particular location was minimal, with near-fresh basalt normally found at a depth of approximately 15m.

The second part or this drill program was designed to broadly assess the geology and potential for hosting gold mineralisation within a large antiformal structure located underneath an undefined depth of Antrim Plateau Basalt. From what information there is, depth of this basalt cover varies between 12 and 30m, but the paucity of the information available make any further extrapolation tenuous. Geology is currently interpreted to be the volcanogenic units within the Macfarlanes Peak stratigraphy based on the limited data that is currently available. Collars were drilled 50m apart and will be drilled on 3 traverse lines 500m apart.

Two samples with gold concentrations greater than 0.1g/t Au was returned from the reconnaissance 400m X 500m drilling program. One result (3m @ 0.129g/t Au) came from a sample from hole C1RB1350, from 51-54m depth. This hole was located very near the axis of the interpreted anticline with rocks logged largely as a chloritic siltstone. Another result (3m @ 0.113g/t Au) came from a sample from hole C1RB1355, from 21-24m depth. This hole was drilled on the eastern limb of the interpreted anticline and largely intersected fresh basalt. However, there was a unit of siltstone intersected higher up in the hole and it contained a little quartz veining. Other rock units found included graphitic and amphibole schist. Antrim Plateau Basalt cover varied in thickness from 1m to 39m. The Antrim cover also does not appear as extensive as originally interpreted, mainly occurring in the northern and western areas drilled.

TABLE 5. Challenger 1: RAB Drillhole/Sample Details.

Hole ID	Drillhole Type	No.	Metres	No. Samples	Elements Analysed	ALS Lab Method
C1RB1300-C1RB1360 (+C1RB1303A & C1RB1325A)	Blade RAB	6	300	103	Au	AU-GF42
	Hammer RAB	57	2419	831	As, Bi, Cu, Fe, Mn	ME-ICP43
	Total:	**63**	**2719**	**934**		



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SEL 23662 -CAVE HILLS

CHALLENGER 1 PROSPECT

RAB DRILLHOLE LOCALITY PLAN

APRIL 2004

FIGURE 5

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7.5 TITANIA FEASIBILITY STUDY

Recent work carried out at Titania has involved the further investigation of the prospect with a view to mining in 2005. This work was deemed necessary due to the significant technical problems associated with pit wall stability, pit dewatering and economic access identified in earlier work.

The work required multiple consultants and contractors over a period of eight months, to date, to carry out work in the fields of Environmental Flora & Fauna studies, Geotechnical analysis of possible final wall stability, Ore & Waste characterisation and possible access routes. Also being carried out is a dewatering study to determine the system required to ensure dry mining conditions and identify a suitable water disposal technique.

Five diamond holes have been drilled to a depth of 100m, predominantly inclined at 60^{o}. The resultant core has been used for multiple purposes. The whole core has been logged and representative samples dispatched for geotechnical analysis. Other composite samples of core were dispatched for geochemical analysis. Seven 200mm vertical RC holes were drilled, three being equipped as pumping bores for the purpose of determining the hydrological characteristics of the area. In addition two holes were drilled in ore (one in each ore zone) and the core dispatched to Newmont's in house laboratory in Denver for ore characterisation and metallurgical work.

Results from pump testing the pumping bores have been used to create a model of the area so that indicative pumping rates and water quality can be identified. Data collected from the geotechnical investigation has been used to model the proposed pit wall and recommend safe wall angles. This data has also been used to determine the traffic characteristics of a potentially problematic 15m thick clay layer and to determine the drill & blast requirements (diggability of the rock).

Wet & Dry season flora & fauna surveys have been carried out as a base environmental survey. This data will allow us to evaluate the impact on the environment of the mine, road and proposed water disposal systems. The Government has been approached with a proposal to bituminise the Tanami Road. This option allows Newmont to live up to its commitment towards its 'social licence to operate' ideals and allows us to minimise our impact to the environment. Should this option prove unattainable work is progressing on a haul road south to existing operations at DBS.

The planned cost of the feasibility is approximately $1.2m. To date, a total of $628K has been expended with a further $255k commitment. The work is entering evaluation and optimisation stage and is expected to finish in July.

As the surveys are still in progress no data is yet available and thus will be included in the next annual report for this SEL.

7.6 REGIONAL STRUCTURAL STUDY AND ASTER INTEPRETATION

A major in-house regional structural mapping project commenced in October 2003, encompassing SEL 23662. The project is being undertaken by specialist consultants from RSG-Global Pty Ltd in conjunction with Newmont Exploration geological staff.

The regional mapping and interpretation is still in progress, and it is anticipated this will be finalised by July 2004. At this point in time it would be meaningless to report any outcomes from interpretation of the area within SEL 23662, as the project synthesis needs to be completed to put this in context with the whole Tanami region. Results and targets arising from this project will be reported in the next annual report for the SEL.

In conjunction with the structural project, ASTER (Advanced Spaceborne Thermal Emission and Reflection Radiometer) satellite imagery has been purchased, and is currently being interpreted to provide regional lithological, structural and mineral alteration signatures. Results from this project will also be reported in the forthcoming annual SEL report.

7.7 PETROLOGICAL REPORT

A re-evaluation of a suite of thin and polished thin sections prepared from subsurface rock taken from the Titania and Lysander prospects was undertaken by APS.

The 16 sections were primarily taken from diamond core and drillchips. Brief descriptions are included Appendix 2.

8 EXPENDITURE

TABLE 6: SEL 23662 Cave Hills Expenditure for the period 03/04/2003 to 02/04/2004.

	Costs
Employee Costs	151,427
Exploration Overheads and Allocations	49,677
Exploration Operating Costs	51,441
Laboratory Costs	41,127
Drilling Costs	73,392
Mining Feasibility Survey	628,000
Specialist Services	53,296
TOTAL:	**1,048,360**
Covenant:	**180,000**

9 PROPOSED WORK

Proposed exploration for SEL 23662 for the second year of tenure commencing April 2004 will include the following –

- Ongoing historical data review, regolith landform mapping and geological evaluation of the SEL, leading to surface sampling using in-house proprietary geochemical techniques; targets will be tested with reconnaissance-scale RAB drilling, followed by RC and diamond drilling if appropriate;
- Evaluation of regional targets defined by the current regional structural / Aster interpretation to be completed by mid-2004. This will be undertaken using the appropriate geochemical or drilling techniques as determined by the target type and regolith characteristics.
- Follow-up exploration of semi-regional targets defined during 2003, including Smoke Hills West, Challenger and Titania; exploration will comprise detailed surface geochemistry, regolith mapping and prospect-scale RAB and RC drilling;
- RC drilling of a number of targets defined on the Titania project area in 2003. These targets represent advanced projects within this licence, and will be investigated in detail. Encouraging results from drilling of the Lamaque or Oberon Extended prospect areas will lead to infill RC and diamond drilling to undertake resource estimation assessments.

TABLE 7: Cave Hills Proposed Expenditure for the period 03/04/2004 to 02/04/2005.

	Costs
Employee Costs	50,000
Exploration Overheads and Allocations	25,000
Exploration Operating Costs	25,000
Laboratory Costs	20,000
Drilling Costs	60,000
Mining Feasibility Survey	255,000
Specialist Services	20,000
TOTAL:	**455,000**
Covenant:	**200,000**

10 REFERENCES

References

Blake, D., Hodgson, I.M., and Muhling, P.C., 1979. Geology of The Granites-Tanami Region, Northern Territory and Western Australia, *Bur. Miner. Resour. Geol. Geophys. Aust. Bull. 197.*

Davidson, A.A. 1905. Journal of Explorations in Central Australia, by the Central Australian Exploration Syndicate, Limited, *South Australia Parliamentary Paper 27.*

Gee, L.C.E. 1911. General Report on Tanami Goldfield and District (Northwestern Central Australia). *South Australia Parliamentary Paper 31.*

Hossfeld, P.S. 1940b. The Gold Deposits of The Granites-Tanami District, Central Australia. *Aer. Geol. Geophys. Surv. N.Aust., Northern Territory Report 4*3.

Mayer, T.E. 1990. The Granites Gold Field, in *Geology of the Mineral Deposits of Australia and Papua New Guinea* (Ed F.E. Hughes) pp 719-724 (The Australasian Institute of Mining and Metallurgy: Melbourne).

O'Driscoll, E.S.T. 1990. Lineament Tectonics of Australian Ore Deposits, in *Geology of the Mineral Deposits of Australia and Papua New Guinea* (Ed F.E. Hughes) pp 33-41 (The Australasian Institute of Mining and Metallurgy: Melbourne).

Plumb, K.A. 1990. Halls Creek Province and The Granites-Tanami Inlier - regional geology and mineralisation, in *Geology of the Mineral Deposits of Australia and Papua New Guinea* (Ed F.E. Hughes) pp 681-695 (The Australasian Institute of Mining and Metallurgy: Melbourne).

Reports to NT DME

Chadwick, R.C., 1989. EL's 2366, 2367, 2369 and 2370, Annual Exploration Report 1988. NFM Report.

Fermio, S.J., 1990. EL's 2366, 2367, 2369 and 2370, Annual Exploration Report 1989. NFM Report ER89004.

Archibald, D.A.C., 1990. EL's 2366, 2367, 2369, 2370, 4529, 6835, 6859, 6938 and 7122, Annual Exploration Report for Period March 1990 to February 1991 (2 Volumes). NFM Report.

Archibald, D.A.C., 1991. Relinquishment Report for Portion of Exploration License No's 2366, 2367, 2369, 2370 and 6859 – Period to 21/11/90. NFM Report. NFM Report.

Archibald, D.A.C., 1992. EL's 2366, 2367, 2369, 2370, 4529, 6835, 6859, 6938 and 7122, Annual Exploration Report for Period March 1991 to February 1992. NFM Report.

Archibald, D.A.C., 1993. EL's 2369, 2370, 4529, 6859, 6938 and 7122, Annual Exploration Report for Period March 1992 to February 1993. NFM Report RN ANN1992.

Archibald, D.A.C., 1994. Annual Report for the Tanami Project Area for the Period March 1993 to February 1994, Exploration licenses Covered by this Report:- 1060, 2290, 2366, 2367, 2369, 2370, 2371, 2372, 4529, 6759, 6859, 6938, 7121 and 7122 (6 Volumes). NFM Report RN ANN1994.

Archibald, D.A.C., 1994. Relinquishment Report for the Tanami Project Area for the Period March 1988 to March 1994, Exploration Licences Covered by this Report - EL2366 (Hordern Hills), EL2367 (Schist Hills), EL2369 (Mt Ptilotus) and EL2370 (Rabbit Flat). NFM Report.

Adrichem, S.M., 1995. Annual Report for the Tanami Project Area for the Period March 1994 to February 1995, Exploration Licences Covered by this Report:- 1060, 2290, 2366, 2367, 2369, 2370, 2371, 2372, 4529, 6759, 6859, 6938, 7121 and 7122 (4 Volumes). NFM Report RN SMA9501.

Adrichem, S.M., 1996. Annual Report for the Tanami Project, March 1995 To February 1996. Exploration Licences Covered by this Report:- 1060, 2290, 2366, 2367, 2369, 2370, 2371, 2372, 4529, 6759, 6859, 7121 and 7122. NFM Report RN SMA9601.

Adrichem, S.M. & Archibald, D.A.C., 1996. Relinquishment Report for the Tanami Project for the Period 25 March 1988 to 11 September 1996. NFM Report RN SMA9605.

Adrichem, S.M. & Archibald, D.A.C., 1997. Annual Report for the Tanami Project, March 1996 to February 1997. EL's Covered by This Report:- 1060, 2290, 2366, 2367, 2369, 2370, 2371, 2372, 4529, 6759, 6859, 7121, 7122. NFM Report SMA9702.

Adrichem, S.M. & Longmire, R.A., 1998. Annual Report for the Tanami Project, March 1997 to February 1998. EL's Covered by This Report:- 1060, 2290, 2366, 2367, 2369, 2370, 2371, 2372, 4529, 6759, 6859, 7121, 7122. Normandy NFM Report SMA9801.

Adrichem, S.M. and Longmire, R.A., 1999. Annual Report for the Tanami Project for the 1998 Field Season. Normandy NFM Report DME9910.

Walter, M. 1999. Relinquishment Report for the Tanami Project for the Period 11 March 1998 to 31 March 1999 (2 Volumes). Normandy NFM Report DME9922.

Thomas, D.J., Zdziarski, A., Dale, P., Power, D. and Pring, P. Annual Report for the Tanami Project for the 1999 Field Season. Normandy CR26116.

Twinning, M., Pring, P. & Russell, J. (2001). Annual Report for the Tanami Project for the 2000 Field Season. Normandy RN:28010.

Keppel, M., et al, (2002). Annual Report for the Tanami Project for the 2001 Field Season. Normandy CR: 29528.

Keppel, M., Hill, R. & Walter, M., (2003). Annual Report for the Tanami Project covering the 2002 Field Season. Normandy NFM Ltd. Newmont CR: 31076

Walter, M., 2003. Final Report for EL2370 (Rabbit Flat) for the period 25/03/1988 to 02/04/2003. Newmont Tanami Ltd. Newmont CR:31112

Appendix 1:

DIGITAL SAMPLE & DRILLHOLE DATA

(See attached ASCII files)

SEL23662_200404_06_SURFACESAMPLES.DAT
SEL23662_200404_07_SURFACEGEOLOGY.DAT

CHALLENGER_200404_02_COLLAR.DAT
CHALLENGER_200404_03_SURVEY.DAT
CHALLENGER_200404_04_GEOLOGY.DAT
CHALLENGER_200404_05_ASSAY.DAT
CHALLENGER_200404_08_STRUCTURE.DAT

TITANIA_200404_02_COLLAR.DAT
TITANIA_200404_03_SURVEY.DAT
TITANIA_200404_04_GEOLOGY.DAT
TITANIA_200404_05_ASSAY.DAT
TITANIA_200404_08_STRUCTURE.DAT

Appendix 2:

Petrology Report

Applied Petrological Services

PETROLOGICAL STUDIES
OF
AIRCORE DRILL CHIP
FROM
THE LYSANDER PROJECT, EASTERN TANAMI

FOR
NEWMONT AUSTRALIA LTD

December 2003

APS Report 262
Project No. 26010

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New Zealand

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SUMMARY

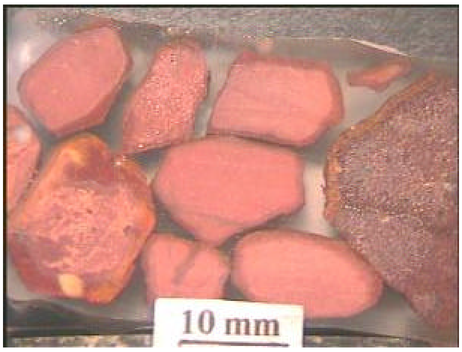
1. A petrological study of drill chip material taken from relatively shallow depths in drill holes in the Lysander prospect defines a sequence of metamorphosed sedimentary rocks and minor volumes of metamorphosed lamprophyre-like rock that have been intruded by a biotite granitoid porphyry. The biotite granitoid porphyry and intruded metamorphic rock types are both hosts to Type A and Type B quartz veining and related wallrock metasomatism.

2. The metamorphosed lamprophyre-like rock and minor volumes of metamorphosed Fe-rich mudstone are likely to have higher magnetic responses than the majority of meta-sedimentary rocks present in the Lysander prospect area. However, it is considered that the volume and geometry of the biotite granitoid porphyry are more likely to be responsible for the positive magnetic anomaly defined by interpretations of aeromagnetic data for the Lysander project area. Localised metamorphic/metasomatic effects on the Fe-rich sedimentary laminae and lamprophyre-like rock provided by the granitoid porphyry may enhance the positive magnetic signature formed about the biotite granitoid.

3. Gold mineralisation is genetically related to Type A quartz veining, and related metasomatism developed within meta-sedimentary rocks, the metamorphosed lamprophyre-like rock and (unmetamorphosed) biotite granitoid porphyry, although in this study gold is only identified in Type A quartz veining hosted by meta-sedimentary rock. The gold mineralised Type A quartz veining is enveloped by an arsenic geochemical anomaly that is centred upon and genetically related to both Type A and Type B quartz veining but apparently more specifically to the Type B quartz veining.

4. The distribution of the arsenic anomaly and therefore genetically related Type A and Type B quartz veining appears in part to be strongly controlled by the location and geometry of the biotite granitoid porphyry as interpreted from the aeromagnetic data. As much as the contrasting competencies of the granitoid porphyry and host meta-sedimentary rocks may have provided a structural influence on the distribution of the quartz veining, it is also considered that there may be a genetic relationship between the granitoid porphyry and the (variably) mineralised quartz veins. Whilst the granitoid porphyry defined near surface by drilling and aeromagnetic data appears to have exsolved some amounts of hydrothermal fluids, an ultimate and more voluminous hydrothermal fluid source may exist at depth or periphery in the form of a more voluminous parent or related granitoid.

SAMPLE NUMBER: 26010.01
LOCATION: TIAC1122/54-63m
ROCK NAME: Metamorphosed mudstone, silty sandstone and intermediate porphyritic rock
FIELD DESCRIPTION: Metasedimentary rock chips



OFFCUT DESCRIPTION:

The sample comprises a selection of angular, pebble-sized drill chips. The chips are of red-brown to brown, weathered/oxidised, meta mudstones and meta-sandstones/siltstones and some fine grained acid/felsic igneous lithologies.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The coarser grained meta-sedimentary drill chip fragments have primary fragmental textures defined by moderately to poorly sorted, matrix to framework clast supported populations of angular silt to sand-sized detrital framework clasts. Framework clasts are interposed with minor amounts of matrix (10-15%). The framework clast assemblage comprises equally abundant quartz, feldspar and rock fragments. The rock fragments comprise polycrystalline quartz, quartz + feldspar, meta-quartzite + muscovite, felsic/acid volcanics and silty mudstones. The composition of the detrital feldspar is not resolvable. Minor amounts of detrital muscovite and zircon are present.

Other sedimentary lithic drill chip fragments present have sparse silt-sized detrital clasts contained within voluminous primary and/or secondary mica assemblages.

Also present amongst the drill chip assemblage are porphyritic lithologies. Preserved quartz and ghosted feldspar, pyroxene/amphibole and biotite phenocrysts contained within finer grained, equigranular groundmasses define the porphyritic textures. The groundmasses have minor to trace amounts of relict quartz interposed with secondary mica mineral, ghosted mica minerals after primary silicate minerals (feldspars). Relict grains of apatite are present in the groundmass.

ALTERATION

REPLACEMENT

Replacement of the coarser grained sedimentary lithologies is strong. Matrix, rock fragments and feldspar fragments are altered to pervasive muscovite intergrown with variable amounts of biotite. The biotite is altered to sericite and chlorite, and ultimately overprinted by hydrated Fe-oxides and hematite. There is some recrystallisation of detrital quartz.

Replacement of the finer grained sedimentary lithologies is complete. Primary clay mineralogy is replaced by pervasive very fine-grained muscovite. The muscovite exhibits a strong preferred orientation. The very fine-grained muscovite is dispersed with abundant ghosted porphyroblasts/micro-porphyroblasts, which have random orientations relative to the muscovite. The porphyroblasts comprise ghosted biotite and possible Al-silicates. The biotite is altered to aggregates of ultra fine-grained hematite. Sericite/illite and quartz replace the Al-silicates. Grains of tourmaline are present. Granoblastic quartz and muscovite replace pre-existing porphyroblasts.

Replacement of the porphyritic lithologies is strong. Pyroxene/amphibole phenocrysts are replaced by pervasive platy biotite. Secondary feldspars and mica minerals (muscovite) replace feldspar phenocrysts and groundmass components. Muscovite/sericite and Ti-oxides replace primary and secondary biotite phenocrysts. The secondary silicate assemblage is altered to smectite/kaolin clays dispersed with ultra fine grained hematite and hydrated Fe-oxides.

DEPOSITION

Early discrete microfractures traversing the fine-grained sedimentary and igneous lithologies are filled with very fine-grained "mesothermal" style quartz. Microfractures are filled with hydrated Fe-oxides and hematite.

COMMENTS

The drill chip assemblage comprises metamorphosed mudstones, silty sandstones and an acid/intermediate porphyritic rock. Peak metamorphic grade is indicated by the presence of ghosted biotite. Retrograde sericite/illite has overprinted the peak metamorphic biotite present in the sedimentary and igneous rock types.

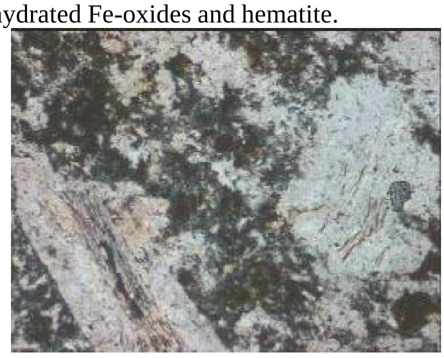
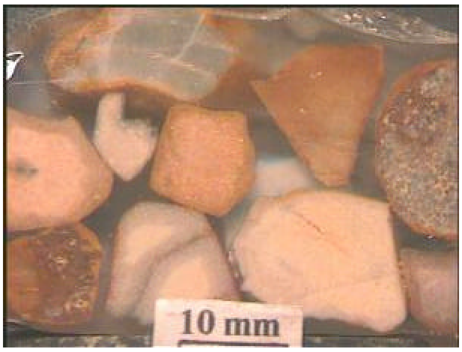


Plate right. Ghosted silicate phenocrysts contained within secondary hematite rich groundmass. 1200 µm, ppl.

SAMPLE NUMBER: 26010.02
LOCATION: TIAC1125/50-60m
ROCK NAME: Quartz veined and silicic altered, metamorphosed mudstone and silty sandstone



FIELD DESCRIPTION: Meta-sedimentary drill chip fragments

OFFCUT DESCRIPTION:

The sample comprises a selection of angular, granule to pebble-sized drill chip fragments. The drill chips are of mottled pale white, grey to grey-brown, weathered/oxidised, metamorphosed, fine to medium grained sedimentary rock types.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The examples of coarser grained sedimentary rock, moderately well to poorly sorted, framework clast to matrix supported populations of silt to sand-sized detrital fragments define fragmental textures. The detrital framework clast assemblage is dominated by mono and polycrystalline quartz. Less abundant framework clasts of feldspar and rock fragments are present. Minor to trace amounts of relict detrital muscovite, zircon and rutile are present.

The majority of drill chip fragments have primary fragmental textures defined by sparse silt-sized detrital fragments contained within finer grained secondary/detrital mica and quartz assemblages. Associated with these domains/chips is modified/recrystallised sedimentary chert.

ALTERATION

REPLACEMENT

Replacement of the coarser grained primary fragmental textured drill chips is strong. Detrital quartz is recrystallised, mainly at detrital grain margins. The secondary/recrystallised quartz is intergrown with fine-grained muscovite after matrix, rock fragments and detrital feldspars. Interstitial to the recrystallised quartz and intergrown with the relict secondary muscovite are plates and aggregates of ghosted biotite. The biotite is altered to sericite/illite and chlorite and ultimately pervasive ultra fine grained hematite and hydrated Fe-oxides.

The finer grained sedimentary lithologies in drill chip fragments are replaced by pervasive very fine to ultra fine grained anhedral quartz intergrown with very fine to fine grained muscovite. The muscovite has moderate to poor initial preferred orientation. Ghosted, platy mica porphyroblasts present are interpreted to be biotite. The biotite is ultimately replaced by ultra fine grained hematite and hydrated Fe-oxides (or have been leached). Grains of rutile are dispersed about the secondary silicate assemblage.

The peak metamorphic replacement mineralogy has been subjected to strain. Quartz has undulatory extinction, and ghosted/leached biotite porphyroblasts have been rotated into a plane of strain.

In some domains of quartz veining and strong shearing, the peak metamorphic replacement is overprinted by pervasive very fine to ultra fine-grained anhedral quartz intergrown with sericite/illite.

DEPOSITION

Networks of discrete microfractures and cavities contained along shears are filled with very fine to ultra fine-grained anhedral quartz. Late-stage microfractures are filled with hematite and hydrated Fe-oxides.

COMMENTS

Biotite was part of the peak metamorphic replacement assemblages. The peak metamorphic mineralogy has been tectonically deformed. Silicic alteration is centred upon quartz veining of a transitional "epithermal-mesothermal" nature.

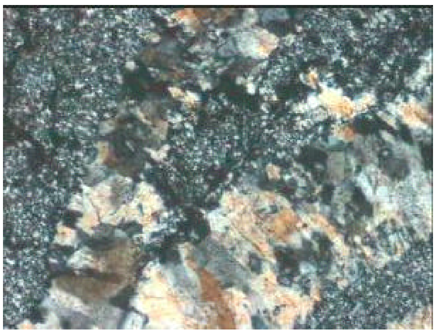
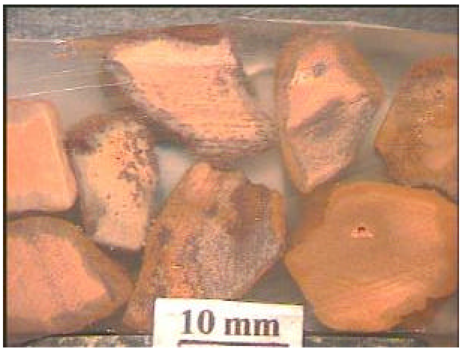


Plate right. Transitional "epithermal to mesothermal" style quartz veining hosted b silicic altered fine-grained sedimentary rock. 1200 µm. cpl.



SAMPLE NUMBER: 26010.03
LOCATION: TIAC1126/57-60m
ROCK NAME: Strongly oxidised/weathered, quartz veined, sericite/illite altered, Fe-rich laminated mudstone
FIELD DESCRIPTION: Meta-sediment drill chip fragments
OFFCUT DESCRIPTION:

The sample comprises a selection of angular granule to pebble-sized drill chips. The chips are of mottled pale to medium brown, oxidised/weathered, locally hematite-rich, fine grained meta-sedimentary rock.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The drill chip fragments have poorly preserved primary fragmental textures. Sparse, silt-sized detrital fragments contained within voluminous secondary mica assemblages define the primary fragmental textures. The silt-sized fragments comprise exclusive quartz. Some amounts of less-than silt-sized detrital quartz material are interpreted to also have been present.

ALTERATION

REPLACEMENT

With the exception of some amounts of detrital silt-sized quartz, replacement is complete. Replacement is dominated by very fine-grained muscovite intergrown with ultra fine to very fine-grained anhedral quartz. In some domains, relatively coarser grained muscovite is intergrown with quartz and minor amounts of ghosted biotite. The biotite is altered to sericite/illite and ultimately by ultra fine-grained hematite.
In some parts of the rock, ultra fine to very fine-grained ghosted opaque minerals are concentrated along primary lamination structures. The ghosted opaques, interposed with sericite/illite are replaced by ultra fine-grained hematite.

DEPOSITION

Irregular, moderately penetrative microfractures are filled with very fine to ultra fine-grained, "epithermal" style quartz veining. Ultra fine grained, ghosted opaques (Fe-sulphides) are concentrated along discrete lamination-parallel microfractures.

COMMENTS

Concentrations of ghosted opaques along primary lamination structures may be interpreted in terms of former iron-rich laminae within a well-laminated mudstone. Some sericite/illite alteration is associated with "epithermal" style quartz veinlets.

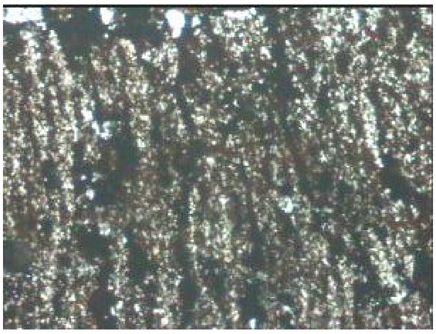
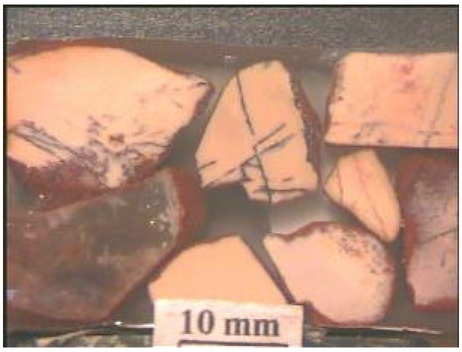


Plate right. Concentration of ghosted opaque minerals, probably formerly Fe-sulphides, along primary laminations within a metamorphosed mudstone. 1200 µm. ppl

SAMPLE NUMBER: 26010.04
LOCATION: TIAC1128/39-54m
ROCK NAME: Quartz veined, locally sheared and sericite/illite altered, metamorphosed interbedded chert and mudstone
FIELD DESCRIPTION: Meta-sedimentary drill chip fragments



OFFCUT DESCRIPTION:

The sample comprises a selection of angular, pebble-sized aircore drill chips. The chips are of pale brown-grey to dark red-brown, weathered/oxidised, and metamorphosed mudstone. Hematite is contained along microfractures.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The drill chips have very poorly defined primary fragmental textures. Sparse, silt-sized detrital quartz fragments contained within voluminous secondary mica assemblages define the primary fragmental textures.
Present amongst the drill chip fragments are chert lithologies.

ALTERATION

REPLACEMENT

With the exception of trace amounts of silt-sized detrital quartz, replacement of the primary rock is complete. Replacement is dominated by pervasive very fine-grained muscovite. In some places (some drill chip fragments) the muscovite has a moderate preferred orientation, defining a penetrative strain fabric within the rock. Some amounts of very fine-grained anhedral quartz are intergrown with the muscovite. Ghosted/leached? Biotite micro-porphyroblasts are present in some places. Trace amounts of tabular to prismatic, euhedral tourmaline are present within the secondary mica assemblage.
In some places, intense sericite/illite has formed along discrete shears. In association with the sericite/illite, grains of ghosted, tabular Fe-sulphides are present. The Fe-sulphides are replaced by hematite.
The possible biotite micro-porphyroblasts are altered to ultra fine-grained hematite. Ultra fine-grained hematite masks the secondary silicate replacement in many places.
The primary silica in the chert lithologies is replaced by very fine-grained anhedral/mosaic quartz.

DEPOSITION

Early microfractures are filled with very fine-grained "epithermal" style quartz. Quartz has formed along shears that traverse the meta-chert lithologies. Late-stage microfractures are filled with ultra fine-grained hematite.

COMMENTS

A peak metamorphic replacement assemblage comprises quartz, muscovite and biotite. Ghosted Fe-sulphides present are interpreted to be associated with sericite/illite alteration that is centred upon "epithermal" style quartz veinlets and shears. Tourmaline is part of the peak metamorphic replacement assemblage.

Plate right. Secondary prismatic tourmaline crystal present amongst pervasive metamorphic muscovite. 300 µm. ppl.

SAMPLE NUMBER: 26010.05
LOCATION: TIAC1131/50-60m
ROCK NAME: Strongly weathered, locally sericite altered, weakly potassic altered biotite granodiorite porphyry
FIELD DESCRIPTION: Weathered/oxidised intermediate to acid porphyry

OFFCUT DESCRIPTION:

The sample comprises a selection of angular, granule to pebble-sized drill chips. The drill chips are of brown to brown-red, oxidised/weathered, fine grained, equigranular to porphyritic textured intermediate to acid igneous rock.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The drill chips have moderately well preserved primary porphyritic textures. Preserved to partly preserved, fine to medium grained, tabular to prismatic phenocrysts are contained within fine grained, equigranular to hypidiomorphic textured groundmass. The phenocrysts comprise ghosted biotite and more abundant, prismatic plagioclase (andesine to oligoclase). The groundmass is composed of interlocking tabular, anhedral quartz, and tabular, subhedral to anhedral plagioclase (andesine to albite) and less abundant K-feldspar. Quartz, alkali feldspar and plagioclase are present in the proportions: 25/60/15. Some amounts of biotite are interstitial to groundmass quartz and feldspars. In some examples (drill chips) the percentage of groundmass quartz is significantly reduced (to 15%). Relict grains of sphene, zircon and Fe/Ti-oxides are present interstitial to silicate minerals in the groundmass.

ALTERATION

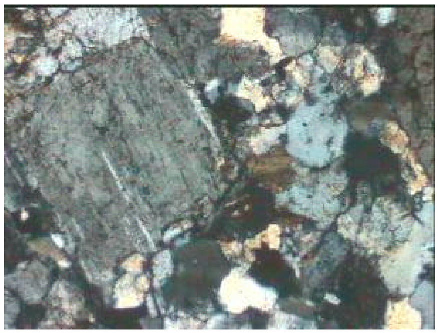
REPLACEMENT

Replacement is weak to moderate. Early replacement is limited to minor to trace amounts of biotite formed interstitial to groundmass feldspar minerals. In some places pervasive sericite/illite has formed after plagioclase. Strong weathering in some drill chip fragments is represented by smectite and kaolin clays and hydrated Fe-oxides after primary and secondary biotite, and kaolin clays after plagioclase.

DEPOSITION

Microfractures are filled with kaolin and smectite clays and hydrated Fe-oxides.

COMMENTS



A biotite granodiorite porphyry. There is some variation in modal quartz percentages such that some domains are more quartz diorite porphyry in composition. Early, weak potassic alteration is represented by biotite after feldspars. Locally more pervasive alteration is represented by sericite after plagioclase. Strong weathering is represented by smectite/kaolin clays and hydrated Fe-oxides after biotite and plagioclase.

Plate right. Well preserved granodiorite porphyry lithology, with plagioclase phenocrysts contained within equigranular quartz + plagioclase + alkali feldspar groundmass.

SAMPLE NUMBER: 26010.06
LOCATION: TIAC1135/48-54m
ROCK NAME: Metamorphosed silty mudstone and biotite/pyroxene phyric "lamprophyre"
FIELD DESCRIPTION: Meta-sedimentary and igneous drill chip fragments

OFFCUT DESCRIPTION:

The sample comprises a selection of angular pebble-sized aircore drill chips. The chips are of brown to red-brown, weathered/oxidised, meta-sedimentary rock and fine grained, porphyritic, intermediate igneous rock.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The fine-grained igneous lithologies in drill chip fragments have relict porphyritic textures. Ghosted, tabular to prismatic, euhedral phenocrysts are contained within finer grained, equigranular, possibly hypidiomorphic textured groundmasses. The phenocryst morphologies are of biotite and pyroxene. Present are sparse, relict quartz phenocrysts. The groundmasses comprise euhedral, ghosted biotite and pyroxene crystals contained within a more voluminous assemblage of anhedral, ghosted ?K-feldspar. Relict grains of zircon are present in the groundmass. Ghosted Fe/Ti-oxides are also present in the groundmasses. Possible relict magnetite is present in the groundmass.
Primary fragmental texture lithologies are present in some drill chips. Sparse to moderate amounts of relict, silt-sized detrital fragments contained within detrital and secondary clay/mica assemblages defines the fragmental textures. Relict detrital fragments are recognised as quartz, muscovite and zircon.

ALTERATION

REPLACEMENT

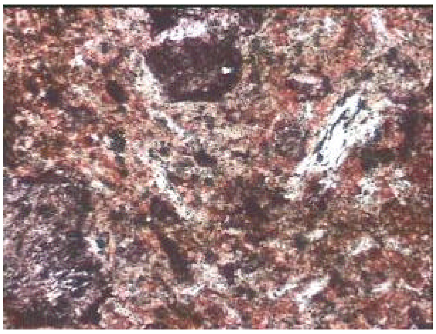
Replacement of the porphyritic lithology is complete. Biotite is replaced by secondary biotite. Chlorite and sericite/illite replace the primary and secondary biotite, and later kaolin/smectite clays dispersed with ultra fine-grained hydrated Fe-oxides and hematite. Early biotite and later pervasive kaolin/smectite clays and ultra fine-grained hematite replace pyroxene. Feldspar is replaced by early sericite/illite and later, more pervasive smectite/kaolin clays impregnated with ultra fine-grained hematite and hydrated Fe-oxides.
With the exception of relict muscovite, quartz and zircon, replacement of the sedimentary lithologies is complete. Replacement of a former detrital clay component is dominated by fine to very fine-grained muscovite that is interlocking with minor amounts of anhedral quartz and ghosted biotite. The secondary quartz and mica minerals define mostly decussate textures. Biotite is altered to early chlorite and sericite and later more pervasive smectite clays and hydrated Fe-oxides. Hydrated Fe-oxides mask much of the secondary silicate assemblage in places. The early muscovite + quartz + biotite replacement has in some drill chip fragments been deformed, resulting in sub-rotation of mica minerals (mainly muscovite) into a common plane of strain.
Grains of rutile are dispersed about the early replacement assemblages in both rock types.

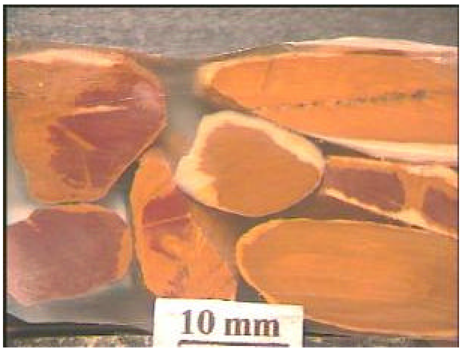
DEPOSITION

Earliest microfracturing within the replaced sedimentary lithologies is filled with very fine grained, anhedral tabular "mesothermal" style quartz.
Hydrated Fe-oxides and hematite are contained along late shears and microfractures.

COMMENTS

The igneous lithology present appears to be a lamprophyre, having phenocrysts/microphenocrysts of biotite and pyroxene within an alkali feldspar rich groundmass. The igneous rock does not appear to have been subjected to metamorphism. A decussate texture is defined by a ghosted peak metamorphic replacement assemblage in the accompanying meta-sedimentary drill chips. Minor amounts of "mesothermal" style quartz veining are present.
Plate right. Ghosted biotite and possible pyroxene phenocrysts contained within a mainly K-feldspar bearing groundmass. 1200 μm. ppl.





SAMPLE NUMBER: 21010.07
LOCATION: TIAC1137/39-40m
ROCK NAME: Gold bearing, plastically deformed, quartz veined, metamorphosed silty mudstone and mudstone
FIELD DESCRIPTION: Meta-sedimentary drill chip fragments
Assay: 1.58 g/t Au

OFFCUT DESCRIPTION:

The sample comprises a selection of angular, pebble-sized drill chip fragments. The chips are of mottled brown to brown-red, oxidised/weathered; quartz veined metamorphosed mudstone and silty mudstone.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The drill chips have relict primary fragmental textures. Sparse silt-sized detrital framework clasts contained within voluminous secondary mica assemblages define the primary fragmental textures. The distribution of the silt-sized detrital fragments and variation in secondary mica crystallinity reflects a former lamination. Relict detrital zircon is present. Some laminae are host to discrete ghosted chert nodules (attenuated and rotated within a superimposed plane of strain). The distribution of the chert nodules also preserves and former sedimentary lamination.

ALTERATION

REPLACEMENT

With the exception of some detrital quartz, replacement of the sedimentary lithology is complete. Replacement is dominated by fine to very fine-grained muscovite, locally intergrown with anhedral quartz and dispersed with randomly orientated, ghosted biotite. Detrital quartz is locally recrystallised. The silica phases within the chert nodules are replaced by very fine to ultra fine-grained anhedral quartz.

The silicate replacement assemblage has been plastically deformed, with muscovite being rotated into a common place of strain, defining a penetrative strain fabric in some drill chips.

Abundant ultra fine-grained rutile is dispersed about the early silicate replacement assemblages. Grains of rutile and preserved pyrite are present within the domains of recrystallised chert.

Trace amounts of native gold occur interstitially to ghosted metasomatic/metamorphic replacement minerals (proximal to "mesothermal" style quartz veinlets) in one drill chip fragment.

Biotite is altered to kaolin/smectite minerals and hydrated Fe-oxides. Hydrated Fe-oxides and ultra fine-grained hematite mask the silicate replacement assemblage in many places.

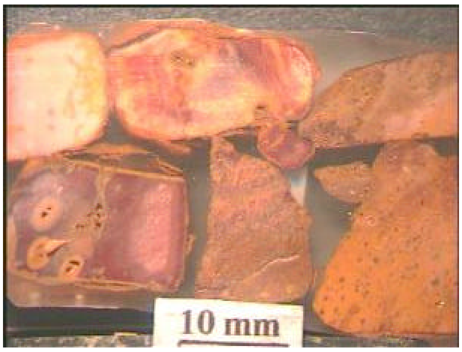
DEPOSITION

Early microfractures are filled with very fine-grained anhedral, tabular ("mesothermal" style) quartz. The quartz is granoblastic in texture (suggestive of total recrystallisation from time of precipitation). The quartz veinlets are plastically deformed and locally monoclinally or ptygmatically folded. Ghosted, platy biotite (→ chlorite → smectite and hydrated Fe-oxides) is interstitial to and intergrown with the quartz. In some places, ghosted alkali feldspar (→ illitic clay → kaolin clays) and ghosted opaques (→ hematite) are also interlocking with the quartz. A single grain of native gold occurs interstitial to the quartz and ghosted biotite at one location. The quartz is host to relict gas-rich/filled fluid inclusions.

COMMENTS

Relict chert nodules are contained within a metamorphosed silty mudstone and mudstone. There appears to be a close spatial association between native gold identified in wallrock and "mesothermal" style quartz veinlets. With weathering and oxidation the gold in the wallrock may have been mobilised from a primary quartz vein association.

Plate right. Plastically deformed, early "mesothermal" style quartz veinlet hosted by weathered/oxidised metamorphosed mudstone. 1200 µm. ppl.



SAMPLE NUMBER: 26010.08
LOCATION: TIAC1138/54-60m
ROCK NAME: Oxidised/weathered, metamorphosed interbedded, porphyroblastic mudstone and chert
FIELD DESCRIPTION: Meta-sedimentary drill chip fragments
OFFCUT DESCRIPTION:

The sample comprises a selection of angular, granule to pebble-sized drill chip fragments. The chips are of brown to red-brown, oxidised/ weathered, metamorphosed sedimentary rock including chert. Ghosted porphyroblastic textures are evident.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The drill chip fragments have poorly preserved primary fragmental textures. The presence of sparse, relict silt-sized detrital fragments amongst voluminous secondary mica mediums defines the former fragmental textures. Relict lamination or sedimentary structures are defined by the distribution of (recrystallised) chert nodules and/or laminae. Some drill chip fragments are composed entirely of (modified) sedimentary chert material.

ALTERATION

REPLACEMENT

Replacement of the primary sedimentary lithologies is complete. Replacement of the clay-rich primary sediments is dominated by very fine-grained muscovite intergrown with minor amounts of anhedral quartz. Early formed, deformed/attenuated (rhombohedral shaped) porphyroblasts are replaced by ultra fine-grained anhedral quartz intergrown with flakes of sericite/muscovite. Minor to trace amounts of ultra fine-grained tourmaline are intergrown with secondary quartz and mica minerals (particularly at the sites of early porphyroblasts).

The primary silica phases within the chert nodules and more extensive chert laminae/beds are replaced by ultra fine to very fine-grained anhedral (mosaic) quartz. Grains of tourmaline and ultra fine-grained muscovite occur within the secondary quartz. Ghosted grains and aggregates opaques (Fe-sulphides) are dispersed about and within the domains of crystallised chert.

The opaque minerals (sulphides) are replaced by aggregates of ultra fine-grained hematite and hydrated Fe-oxides. The secondary quartz and mica minerals are locally overprinted by or masked by ultra fine-grained hematite and hydrated Fe-oxides.

DEPOSITION

Cavities resulting from leaching of early porphyroblasts are filled with very fine grained, anhedral, tabular ("mesothermal"style) quartz. Microfractures within the recrystallised chert laminae/beds (represented by some drill chips) are filled with ultra fine grained anhedral (mosaic) quartz.

COMMENTS

The sample is representative of a metamorphosed interbedded mudstone and chert. The early-ghosted porphyroblasts with deformed rhombohedral morphologies are possibly former dolomite associated with and formed during early diagenesis within the pre-metamorphosed mudstone lithologies.

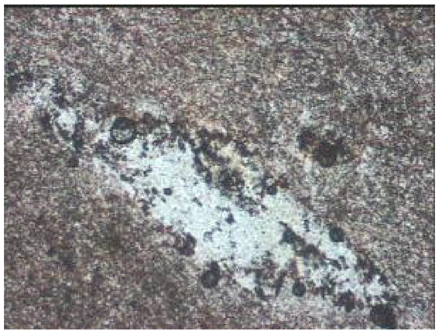
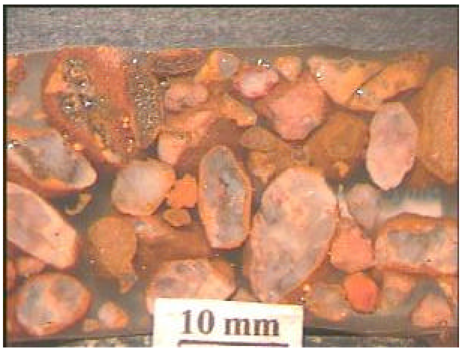


Plate right. Ghosted, attenuated, early porphyroblast replaced by quartz, muscovite and less abundant tourmaline. 1200 µm. ppl.

SAMPLE NUMBER: 26010.09
LOCATION: TIAC1146/40-54m
ROCK NAME: Quartz veined, phyllic altered, sheared/ deformed quartz veined granitoid porphyry
FIELD DESCRIPTION: Altered fine grained igneous rock and quartz vein drill chip fragments



OFFCUT DESCRIPTION:

The sample comprises a selection of angular, granule to pebble-sized drill chip fragments. The chips comprise various milky white to vitreous grey quartz vein material, and oxidised/weathered, brown-red fine grained, intermediate to acid igneous lithologies.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

Some drill chips have moderately well to poorly preserved primary porphyritic textures. Well-preserved quartz and ghosted/pseudomorphed, tabular to prismatic feldspar (plagioclase and alkali feldspar) and biotite phenocrysts are contained within fine grained equigranular textured groundmasses. The groundmass comprises tabular (partly recrystallised) quartz interlocking with equally tabular, ghosted and preserved alkali feldspar. Sparse grains of ghosted biotite are also present in the groundmass. Ghosted Fe/Ti-oxides are present in the groundmass.

ALTERATION

REPLACEMENT

Replacement in some parts (some chips) of the porphyritic lithology is strong. Feldspar (phenocrysts and groundmass components) is replaced by pervasive, well-formed sericite. The sericite is intergrown with locally recrystallised primary quartz. Sericite and Ti-oxides replace biotite.

Any residual feldspar (not replaced by sericite) is altered to kaolin clays and impregnated with ultra fine-grained hematite. Parts of the sericite alteration are overprinted by ultra fine grained hematite and hydrated Fe-oxides.

DEPOSITION

Earliest and voluminous fracturing is filled with fine grained, tabular, anhedral ("mesothermal" style) quartz. The quartz has undulatory extinction, sub-grain boundary development and crenulate grain boundaries. Porphyroclastic and granoblastic textures are developed in some places.

Later microfracturing and fracturing cutting both wallrock and early quartz veining is filled with fine to medium grained, tabular to prismatic anhedral to euhedral ("epithermal" style) quartz. Within this quartz, fluid inclusions and illitic clay inclusions define faceted growth zones. The quartz is intergrown with sericite, in places the sericite being continuous with that formed after adjacent porphyritic wallrock. The quartz is locally sheared and fragmented along discrete and penetrative shears.

COMMENTS

A quartz phyric, granitoid porphyry. There is strong phyllic alteration of the igneous rock in association with "epithermal" style quartz veining. The strong phyllic alteration is represented by pervasive well-formed sericite intergrown with secondary quartz in some domains. Present are minor amounts of early "mesothermal" style quartz veining. Two styles of quartz veining are represented in the sample.

Plate right. Quartz phenocryst (margin of) enclosed by quartz-rich groundmass. 1200 μm. ppl.

SAMPLE NUMBER: 26010.10
LOCATION: TIAC/1142/47-50m
ROCK NAME: Tectonically strained/deformed, metamorphosed sedimentary chert and mudstone
FIELD DESCRIPTION: Metasedimentary rock chip fragments

OFFCUT DESCRIPTION:

The sample comprises a selection of angular, mainly pebble-sized drill chips. The chips are of mottled grey, white to brown, oxidised/ weathered, metamorphosed sedimentary lithologies. Some of the sediments comprise chert.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The drill chips have poorly preserved primary fragmental textures. Sparse to minor amounts (5% to 15%) of silt-sized, detrital fragments contained within mainly secondary mica assemblages defines the fragmental textures. The resolvable detrital fragments comprise quartz and muscovite. Also present are equally abundant domains (drill chips) of modified sedimentary chert.

ALTERATION

REPLACEMENT

Replacement is complete. Replacement is dominated by fine to very fine-grained muscovite intergrown with minor amounts of anhedral quartz. Grains of tabular to prismatic tourmaline are dispersed throughout the mica + quartz replacement. The former chert domains are replaced by very fine to ultra fine-grained anhedral quartz.

The replacement assemblage is dispersed with ultra fine-grained rutile.

Strain fabrics are superimposed upon the replacement assemblages such that muscovite and quartz have very strong preferred orientations.

Grains of hematite (after former Fe-sulphides?) are dispersed about the replacement assemblages.

DEPOSITION

Early microfractures are filled with very fine to ultra fine-grained anhedral, tabular ("mesothermal" style) quartz.

COMMENTS

The sample comprises mainly sedimentary chert lithologies in which secondary (recrystallised) quartz and less abundant muscovite have a strong preferred orientation defining a penetrative strain fabric within the rock. The strain fabric is superimposed upon an initially equigranular secondary quartz.

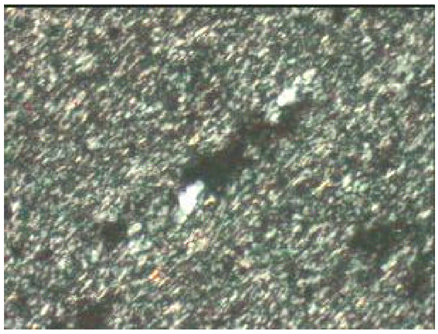


Plate right. Discrete strain-parallel quartz veinlet contained within metamorphosed sedimentary chert. 600 µm.

Applied Petrological Services

PETROLOGICAL STUDIES
OF
DRILL CORE
FROM
THE TITANIA PROJECT

FOR
NEWMONT AUSTRALIA LTD

August 2003

APS Report 251

Project No. 26003

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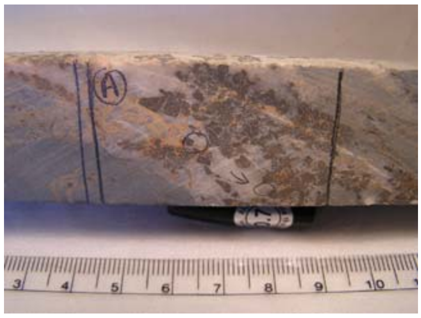
SUMMARY

1. Gold, arsenic, silver and bismuth of a primary quartz vein association have as a result of a tectonically facilitated hydrothermal overprint, been locally remobilised into a predominantly secondary carbonate cement/vein association.

2. Gold, silver and bismuth minerals are primarily contained within early quartz + arsenopyrite ± apatite ± feldspar ± biotite ± muscovite veins. With ongoing tectonic deformation the fractured, sheared and fragmented quartz veining is cemented with and crosscutting fractures filled with a locally voluminous iron and magnesium bearing carbonate.

3. The carbonate, also present as a late stage overprint in adjacent wallrock, is representative of a late hydrothermal fluid distinct from that which the early quartz dominated veining was formed. It would appear that the late hydrothermal fluid was sufficiently reactive such that gold, arsenic, bismuth and silver were locally remobilised together into the carbonate association. There is no evidence in the current study that any of these elements were mobilised beyond the geometry of the primary quartz veins, however it is possible that there was some differential remobilisation of these elements within the late fluid.

4. Textural evidence is that the primary gold mineralising fluid was syn to post peak metamorphism represented by incipient biotite, very fine grained muscovite and chlorite. A penetrative strain fabric represented by a preferred orientation of metamorphic mica minerals is at high angles to primary lamination preserved to some extent by the distribution and grain-size variation of secondary minerals and ghosting of detrital quartz. The penetrative strain fabric to a large extent has controlled brittle deformation of the mineralised quartz veining and the distribution of late hydrothermal overprinting.



SAMPLE NUMBER: 26003.01a
LOCATION: TID0012/250.6
ROCK NAME: Plastically deformed, quartz + arsenopyrite veined meta-sediment
FIELD DESCRIPTION: Quartz, carbonate and arsenopyrite veined meta-sediment

OFFCUT DESCRIPTION:

Quarter drill core. Medium grey, brown to milky white in colour. An arsenopyrite rich quartz vein is contained in a medium grey meta-sedimentary wallrock. Brown carbonate is present.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

Wallrock has a very poorly preserved primary fragmental texture. Ghosted, poorly to moderately well sorted populations of silt-sized detrital framework clasts define the fragmental texture. The predominant detrital framework clast is interpreted to have been quartz. Minor to trace amounts of detrital muscovite are present. Trace amounts of detrital zircon are present. In some places less abundant ghosted/recrystallised detrital silt-sized fragments (quartz) are contained within a secondary mica assemblage (after detrital mud-sized component). Primary sedimentary layering is defined by systematic variation in the proportions of secondary minerals (quartz and muscovite).

ALTERATION

REPLACEMENT

Replacement of the wallrock is complete. Detrital quartz is recrystallised and intergrown with pervasive very fine-grained muscovite. The muscovite has a strong preferred (dimensional and crystallographic) orientation, and anastomoses about the recrystallised detrital quartz. Trace amounts of euhedral tourmaline are enclosed by the muscovite rich replacement assemblage. Grains or aggregates of very fine-grained rutile ($\rightarrow$ leucoxene) and pyrite are dispersed about the secondary assemblage. Less abundant euhedral grains of arsenopyrite or arsentiferous pyrite present have strain shadows filled with very fine-grained ribbon-like quartz.

Present amongst the secondary muscovite and quartz-rich replaced are ghosted platy (possibly mica) minerals, originally orientated randomly but rotated into the plane of strain defined by muscovite.

Parts of the quartz and mica replacement are overprinted by aggregates of very fine grained, brown carbonate.

DEPOSITION

Fracturing of the wallrock is filled with voluminous fine to medium grained, anhedral, tabular quartz. The quartz is interlocking with and enclosing grains and aggregates of fine to medium grained, tabular, euhedral to subhedral arsenopyrite. The quartz has undulatory extinction and sub-grain boundary development.

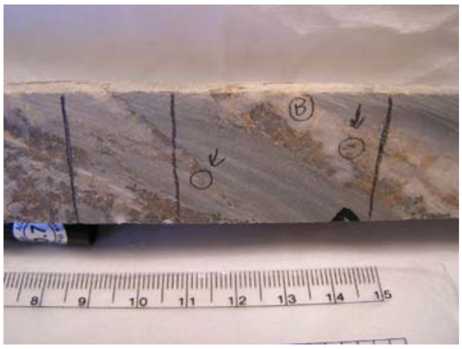
With further deformation there is recrystallisation of quartz along grain boundaries and attenuation of quartz in strain-shadows formed about arsenopyrite. There is also recrystallisation of quartz along penetrative but discrete shears. With further deformation, arsenopyrite is fragmented and fractured. The fractures are filled with early, very fine to ultra fine grained anhedral quartz and later more voluminous brown carbonate. Ultimate fracturing and fragmentation of arsenopyrite and quartz is filled/cemented with exclusive fine to medium grained brown carbonate. As well as filled fractures and cavities, the brown carbonate occurs as a discrete overprint to early quartz, forming along grain boundaries. Secondary, finer grained arsentiferous pyrite is intergrown with the carbonate and secondary quartz.

Native gold occurs as inclusions within and interstitial to early (stage-1) quartz. The quartz enclosing gold has sub-grain boundary development and in places is recrystallised. Some carbonate forms an overprint to the gold primarily enclosed by quartz. Gold primarily contained along stage-1 quartz grain boundaries is intergrown with recrystallised quartz and overgrown by carbonate. Some gold is intergrown with secondary As-pyrite and quartz.

Abundant early fluid inclusions enclosed by stage-1 quartz are mostly decrepitated. Late-stage inclusions are aqueous liquid-rich types.

COMMENTS

The early quartz + arsenopyrite veining is strongly deformed. Recrystallisation of quartz has taken place with little of no hydrothermal fluids present. Later fragmentation of quartz and arsenopyrite is filled with brown (Fe bearing) carbonate. Gold was primarily deposited together with early quartz and subsequently enclosed by secondary quartz (recrystallised stage-1 quartz) and carbonate. There is secondary As-pyrite associated with carbonate and secondary quartz.
Plate right. Gold intergrown with plastically deformed stage-1 quartz, secondary (recrystallised quartz) and carbonate overgrowth. 300 μm. ppl/rl.



SAMPLE NUMBER: 26003.01b
LOCATION: TID0012/250.7 metres
ROCK NAME: Deformed/sheared, carbonate cemented, quartz veined meta-sediment.
FIELD DESCRIPTION: Quartz and carbonate veined meta-sedimentary rock

OFFCUT DESCRIPTION:

A mottled medium grey to brown-grey-green, unweathered/unoxidised, quartz and carbonate veined meta-sedimentary rock. Arsenopyrite is concentrated within and about the quartz veining. The veining has been sheared and deformed together with the wallrock.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The wallrock has a very poorly preserved primary fragmental texture. Sparse to moderate amounts of ghosted or partly preserved detrital silt-sized fragments contained within a secondary mica matrix define the primary fragmental texture. Resolvable silt-sized detrital fragments are predominantly of quartz with less abundant muscovite and trace amounts of zircon and tourmaline also present. The secondary mica assemblage has formed after an abundant primary mud-sized matrix component. A crude lamination structure is defined by the variation in concentration of silt-sized (mainly quartz) detrital framework clasts.

ALTERATION

REPLACEMENT

Replacement of the primary wallrock lithology is complete. Detrital quartz is recrystallised. Matrix is replaced by pervasive fine-grained muscovite. The muscovite has a strong preferred orientation, locally anastomosing about abundant detrital quartz, and defining a penetrative strain fabric. Plates of chlorite are intergrown with the muscovite. Some of the chlorite has formed after biotite and in some places biotite is partly preserved. Abundant Ti-oxides (rutile altering to leucoxene) and minor amounts of pyrite are dispersed about the secondary silicate assemblage. In places, very fine-grained carbonate overprints the secondary silicate minerals.

DEPOSITION

Early microfracturing is filled with very fine-grained quartz interlocking with plates of chlorite and biotite (→ chlorite). Some late carbonate has formed interstitially to the quartz and mica minerals.

More voluminous fractures are filled mainly with fine to medium grained, anhedral, tabular quartz. The quartz is interlocking with minor to trace amounts of apatite, and more abundant, tabular, euhedral arsenopyrite and arsentiferous pyrite. Some apatite occurs as inclusions within arsenopyrite. The quartz has widespread undulatory extinction and sub-grain boundary development. With progressive deformation quartz is recrystallised along grain boundaries, penetrative shears and about (in strain shadows) arsenopyrite grains. Early microfracturing of arsenopyrite is filled with very fine grained, attenuated quartz. Grains of secondary arsenopyrite and pyrite are intergrown with the secondary quartz (stage-2). Further fracturing of arsenopyrite and fracturing of quartz is filled/cemented with fine to very fine-grained brown carbonate. The carbonate encloses grains of pyrite and chalcopyrite.

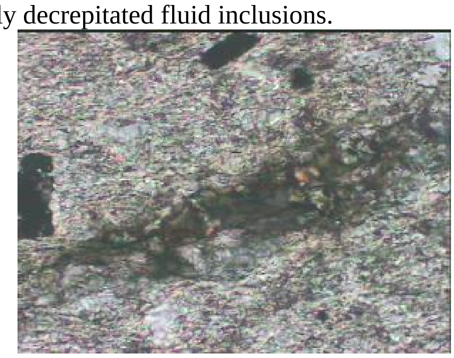
Native gold occurs as inclusions and grains interstitial to stage-1 quartz, as intergrowths with recrystallised stage-1 quartz (stage-2 quartz), as inclusions and infillings to cavities and fractures within arsenopyrite; and as intergrowths with and as inclusions within carbonate. Some gold is intergrown with secondary pyrite and stage-2 quartz. Coarsest grained gold occurs as inclusions within or as infillings with (stage-1) arsenopyrite. Gold also fills microfractures in stage-2 quartz.

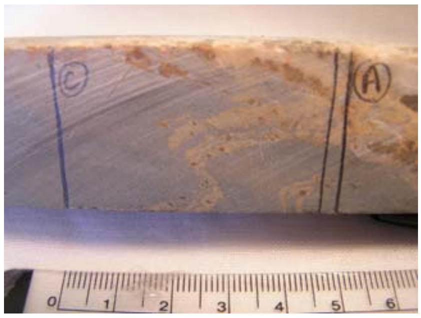
The quartz is host to abundant, secondary and pseudosecondary, mainly decrepitated fluid inclusions.

COMMENTS

Gold is primarily associated with stage-1 (framework) quartz, but is also associated with successive stage-2 quartz and finally brown carbonate. There has been mobilisation of gold (together with As and Fe) from a stage-1 association through to final carbonate deposition.

Plate right. Quartz biotite veinlet oblique to strain fabric. 300 μm. ppl.





SAMPLE NUMBER: 26003.01c
LOCATION: TID0012/250.7 metres
ROCK NAME: Quartz and carbonate veined meta-sedimentary rock
FIELD DESCRIPTION: A quartz & carbonate veined, deformed, meta-sedimentary rock

OFFCUT DESCRIPTION:

A medium grey to brown-grey meta-sedimentary wallrock is host to plastically deformed quartz and carbonate veining. Carbonate within the wallrock is distributed such that some (monoclinally/crenulately folded) laminae highlighted by the brown carbonate.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The wallrock has a moderately to poorly preserved primary fragmental texture. Variable amounts of ghosted, moderately well sorted, silt to fine sand-sized detrital fragments define the fragmental texture. The detrital fragments are interpreted to have been predominantly of quartz. Minor amounts of detrital muscovite are present, and trace amounts of detrital zircon and tourmaline are present. Variable amounts of secondary mica minerals after detrital mud-sized material are interstitial to the framework clasts. Primary lamination is defined by grain-size variation amongst the framework clasts and proportion of former, interstitial mud-sized material. The laminae are monoclinally and crenulately folded, the appearance in hand-specimen being enhanced by the distribution of secondary minerals.

ALTERATION

REPLACEMENT

Replacement of the primary fragmental texture is complete. Detrital quartz is recrystallised, the secondary quartz intergrown with pervasive very fine to fine-grained muscovite. Some amounts of chlorite are intergrown with the muscovite. A strain fabric is defined by a strong preferred orientation of the muscovite. Trace amounts of relict biotite are present, and significant amounts of chlorite after biotite are present also. The relict biotite and ghosted biotite are present mainly within the coarser grained primary textural domains, as plates interstitial to detrital quartz. Ghosted biotite micro-porphyroblasts, also altered to chlorite, are present within the finer grained sedimentary domains. The mica replacement assemblage is overprinted by pervasive, very fine to ultra fine-grained carbonate. The secondary silicate assemblage is dispersed with very fine-grained rutile and less abundant ultra fine-grained pyrite. Arsenopyrite "porphyroblasts" are present, with strain shadow cavities lined with quartz and filled with brown carbonate. The strain shadows are elongate parallel to fold axial plane structures within the crenulate folding highlighted by the concentration of late carbonate.

DEPOSITION

Early microfractures are filled with very fine-grained anhedral quartz, interstitial to which places are minor to moderate amounts of late-stage carbonate. Microfractures // to strain fabric are filled with pyrite.

More voluminous and penetrative fractures are filled mainly with fine to medium grained, anhedral, tabular quartz. Grains and aggregates of tabular euhedral, arsentiferous pyrite are interlocking with the quartz. Less abundant grains of euhedral, tabular apatite are interlocking with or as inclusions within the early framework quartz. Subhedral to euhedral grains of chalcopyrite are interstitial to and as inclusions within the framework quartz. Undulatory extinction and sub-grain boundary development represent early plastic deformation of the quartz. With ongoing deformation, quartz is recrystallised along grain boundaries and discrete shears, and attenuated quartz has formed within strain-shadows about arsenopyrite grains. With further incremental deformation, arsenopyrite is fractured and filled/cemented with very fine grained quartz. With further deformation, quartz is also fractured and late cavities and fractures in both quartz and arsenopyrite are filled/cemented with brown carbonate. The carbonate has also formed interstitial to framework and secondary (recrystallised) quartz. Grains and aggregates of very fine-grained chalcopyrite are present as inclusions within the carbonate. Late-stage microfractures are filled exclusively with very fine-grained brown carbonate.

COMMENTS

Quartz veining is sub-parallel to axial planar structures within the crenulate folds in the wallrock, which is parallel to the strain fabric defined by fine-grained muscovite. Quartz veining is syn folding, or folding has continued after quartz veining. The strain fabric is at high angles to bedding. There is remobilisation of chalcopyrite and As-pyrite from quartz stage to the carbonate deposition stage.
Plate right. Folding defined by variation in grain-size of detrital fragments and the distribution/concentration of late carbonate. 1200 μm. rl.

SAMPLE NUMBER: 26003.02a
LOCATION: TID0012/253.5 metres
ROCK NAME: Deformed, carbonate cemented, sheared, quartz veined meta-sediment.
FIELD DESCRIPTION: As-pyrite-rich quartz + carbonate vein
OFFCUT DESCRIPTION:

The rock comprises unweathered/unoxidised, grey-brown to grey, meta-sedimentary rock host to moderately to strongly sheared/deformed, arsenopyrite bearing, quartz and carbonate vein. Veinlet veinlets transect the early quartz.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The wallrock has a poorly preserved primary fragmental texture. Variable amounts of ghosted, silt-sized detrital fragments enclosed by variably voluminous interstitial matrices define the primary fragmental textures. The resolvable silt-sized detrital fragment assemblage comprises predominant quartz, less abundant muscovite and trace amounts of zircon. The systematic variation in proportions of silt-sized framework fragments and interstitial matrix defines primary laminations.

ALTERATION

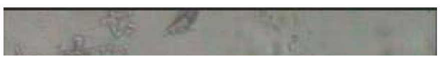
REPLACEMENT

Replacement of the wallrock is complete. Detrital quartz is recrystallised. Pervasive fine-grained muscovite, chlorite and partly preserved biotite replace intervening matrix. Biotite is altered to chlorite. The mica minerals have a strong preferred orientation defining a penetrative strain fabric. Abundant grains of Ti-oxides (rutile altered to leucoxene) are dispersed about the secondary silicate assemblage. Grains and aggregates of fine to very fine-grained carbonate overprint the secondary silicate assemblage.

DEPOSITION

Fracturing of the wallrock is filled with voluminous fine to medium grained, anhedral, tabular quartz. Sparse domains of biotite (altered to chlorite) are interposed with the quartz, and grains of apatite occur as inclusions within the quartz. Trace amounts of xenotime/monazite occur as inclusions within the quartz. The quartz is interlocking with euhedral grains and aggregates of arsenopyrite. The quartz has widespread undulatory extinction and sub-grain boundary development. With progressive deformation the quartz is recrystallised along grain boundaries, shears and about arsenopyrite crystals. Early fracturing of arsenopyrite is filled with very fine-grained (stage-2) quartz. Fracturing of quartz and further fracturing of arsenopyrite is filled with brown carbonate. The carbonate has also formed interstitially to stage-1 and 2 quartz. Some penetrative fractures within arsenopyrite are filled with arsentiferous pyrite intergrown with less abundant carbonate. Grains of galena, chalcopyrite and pyrite/arsentiferous pyrite are intergrown with or as inclusions within the carbonate.
Grains of native gold occur as inclusions within stage-1 quartz or as inclusions with granoblastic (recrystallised stage-1 quartz) stage- 2 quartz. BiTeS minerals also occur as inclusions within plastically deformed stage-1 quartz. The BiTeS minerals in some locations are overgrown by interstitial carbonate. Generally finer grained native gold occurs as inclusions within carbonate, and fills microfractures or cavities in arsenopyrite.
Early (stage-1) quartz is host to abundant generations of mostly decrepitated fluid inclusions (pseudosecondary and secondary). Late generations of fluid inclusions contained along relatively penetrative annealed microfractures comprise predominantly aqueous liquid-rich types. Native gold and BiTeS minerals have a close spatial association with the early-decrepitated inclusions. Early preserved fluid inclusions comprise gas-rich types (CO_2, CH_4 and/or N_2).

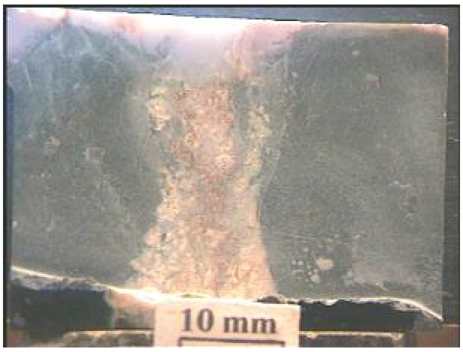
COMMENTS



Main quartz veining is at high angles to bedding but sub-parallel to strain fabric to suggest fold axial plane parallel. BiTeS minerals are preserved within the plastically deformed early (stage-1 quartz). Early fluid inclusions are mostly decrepitated, however late aqueous liquid-rich inclusions probably associated with carbonate deposition are well preserved. Veinlets at high angles to the plane of strain (//to bedding) have been crenulately folded.
Plate right. BiTeS minerals occurring as inclusions within plastically deformed stage-1 quartz µm. ppl/rl.

SAMPLE NUMBER: 26003.02b
LOCATION: TID0012/253.5 metres
ROCK NAME: Carbonate cemented, brecciated quartz-veined meta-sediment.
FIELD DESCRIPTION: Quartz-carbonate veined meta-sediment
OFFCUT DESCRIPTION:

A dark grey to medium green-grey coloured, unweathered/unoxidised, quartz and carbonate veined, fine grained meta-sedimentary rock. The carbonate appears to be leached and resulting cavities filled or partly filled with kaolin minerals.



THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The wallrock has a poorly preserved primary fragmental texture. Sparse to moderate amounts of ghosted to preserved; silt-sized detrital fragments enclosed by a voluminous secondary mica-rich matrix define the fragmental texture. The silt-sized framework clasts comprise abundant quartz, less abundant muscovite and trace amounts of tourmaline and zircon. The interstitial matrix is interpreted to have comprised mud-sized material. Domains of more concentrated silt-sized framework clasts define lamination and an associated greater concentration of late carbonate overprinting.

ALTERATION

REPLACEMENT

Replacement of the primary detrital assemblage is complete. Detrital quartz is recrystallised. The former mud-sized matrix is replaced by fine to very fine-grained muscovite or sericite interposed with very fine-grained quartz and chlorite. Dispersed about the secondary sericite and chlorite assemblage are aggregates of partly preserved very fine-grained platy, green-brown biotite. The biotite is altered to chlorite, some indistinguishable from interstitial chlorite. Trace amounts of tourmaline are present within the replacement assemblage. The quartz + mica replacement assemblage is overprinted by aggregates and grains of very fine to ultra fine grained brown carbonate. Abundant grains of Ti-oxides (rutile and leucoxene) are dispersed about the secondary silicate assemblage. Arsenopyrite "porphyroblasts" enclosing rutile and clay minerals, occur proximally to quartz veining.

Strain shadows formed about arsenopyrite or arsentiferous "porphyroblasts" are occupied by very fine-grained ribbon-shaped quartz that is locally intergrown with chlorite. Some amounts of carbonate overprint are interstitial to the quartz. Sparse grains of pyrite are intergrown with the quartz. Grains of chalcopyrite are intergrown with the quartz and carbonate.

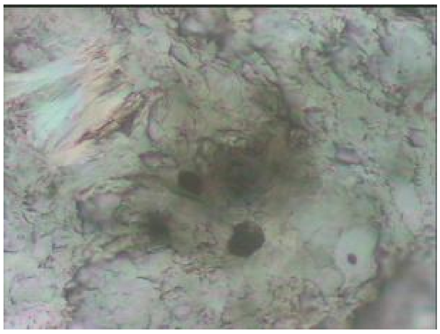
DEPOSITION

Earliest fracturing is filled with fine grained, anhedral, tabular quartz host to apatite inclusions. The quartz is host to abundant fluid inclusions that are mostly decrepitated. The quartz has widespread undulatory extinction and sub-grain boundary development. Ghosted tabular to prismatic feldspar grains are interlocking with the quartz. The quartz is interposed with domains of platy muscovite and chlorite (after biotite ?). Grains of arsentiferous pyrite and rutile are enclosed by the quartz, ghosted feldspar and mica minerals. Fracturing and brecciation of the early vein assemblage is filled/cemented with voluminous brown carbonate. The carbonate has formed interstitially to deformed quartz and is in places intergrown with fine to medium grained epidote. Grains of pyrite and chalcopyrite are intergrown with the carbonate. The carbonate has in places been leached and the resulting cavities are partly filled with kaolin clays. Late fractures are filled with exclusive carbonate.

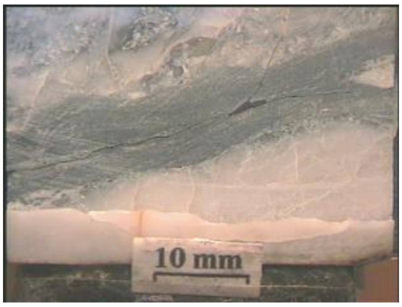
COMMENTS

The rock has no significant penetrative strain fabric that is defined by preferred orientation of secondary mica minerals, although localised strain textures are present. Partly preserved green-brown biotite is a significant part of the secondary mica assemblage. Muscovite and interpreted feldspar and biotite are part of the early quartz vein assemblage.

Plate right. Partly preserved green-brown biotite amongst secondary mica minerals. 120 μm. ppl.



SAMPLE NUMBER: 26003.03
LOCATION: TID0012/253.5 metres
ROCK NAME: Carbonate overprinted quartz veined, meta-sedimentary rock.
FIELD DESCRIPTION: Quartz and carbonate veined meta-sedimentary rock



OFFCUT DESCRIPTION:

A medium grey to brown grey, fine-grained pyrite bearing, meta-sedimentary rock is host to milky quartz veining. The vein quartz is interspersed with brown carbonate and crosscut by late brown carbonate veinlets.

THIN SECTION DESCRIPTION

LITHOLOGY: PRIMARY MINERALOGY, TEXTURES

The wallrock has a moderately well to poorly preserved primary fragmental texture. Moderate amounts of silt-sized, angular detrital fragments contained within a relatively abundant secondary mica matrix define the fragmental texture. Quartz dominates the silt-sized detrital component. Minor to trace amounts of detrital muscovite, tourmaline and zircon are present in the silt-sized fraction.

ALTERATION

REPLACEMENT

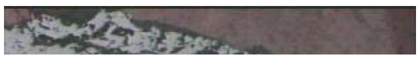
Replacement is complete. Detrital quartz is recrystallised whereas the interstitial clay component is replaced by pervasive fine-grained muscovite. The muscovite has a strong preferred orientation defining a strain fabric throughout the rock. Interstitial to and interlocking with the quartz and muscovite are less abundant amounts of chlorite, a significant proportion of which is interpreted to be a replacement of biotite. In some of the finer grained textural domains, abundant ghosted micro-porphyroblasts (of biotite?) are present. Chlorite and carbonate replace the micro-porphyroblasts. Much of the mica replacement assemblage is overprinted by very fine-grained brown carbonate. Abundant grains of Ti-oxides (rutile and leucoxene) and less abundant pyrite are dispersed about the secondary silicate assemblage. "Porphyroblasts" of arsentiferous pyrite are present. The arsentiferous pyrite contains inclusions of chalcopyrite. Strain shadows developed parallel to the strain fabric are filled with intergrowths of quartz and pyrite interstitial to which are variable amounts of brown carbonate.

DEPOSITION

Early microfractures, sub-parallel to strain fabric are filled with equigranular quartz interlocking with aggregates of biotite. The biotite is altered to chlorite. Later voluminous fracturing is filled mainly with fine to medium grained anhedral, tabular quartz interlocking with less abundant, tabular euhedral arsenopyrite and arsentiferous pyrite. With early deformation the quartz has undulatory extinction and sub-grain boundary development. With further deformation, strain-shadows about arsenopyrite are filled with attenuated quartz some intergrown with biotite (altered to chlorite). Early fracturing of arsenopyrite is filled with very fine-grained quartz. Fracturing of both arsenopyrite and quartz is filled with fine to very fine-grained brown carbonate. The carbonate has also formed interstitially to early and late quartz. Trace amounts of very fine-grained sphalerite occur as inclusions within the quartz. Abundant grains of very fine-grained chalcopyrite are enclosed by carbonate in some places. Abundant early fluid inclusions within early (stage-1) quartz are mostly decrepitated, whereas stage-2 quartz (recrystallisation of stage-1) contains only a few inclusions also decrepitated. Sparse early preserved inclusions are gas bearing or gas-rich. Late fluid inclusions within secondary quartz are liquid-rich.

Gold primarily occurs as inclusions within or interstitial to stage-1 quartz. Some gold occurs as inclusions within or fills cavities within arsenopyrite. Some gold as inclusions within quartz is coincident with stage-2 quartz formed along shears within stage-1 quartz, or is coincident with carbonate formed interstitial to quartz or along shears within stage-1 quartz. Some gold as inclusions within quartz is intergrown with arsenopyrite. Some of the finer grained native gold occurs as abundant inclusions within carbonate. Some gold fills microfractures within arsenopyrite together with ultra fine-grained quartz, carbonate and secondary arsenopyrite.

COMMENTS



Gold is primarily occurring with stage-1 quartz, but in some places has been remobilised with or introduced with the late carbonate stage. The later or remobilised gold is finer grained than that occurring primarily with quartz. Deformation has continued after carbonate deposition.

Plate right. Gold occurs as inclusions or fills cavities within arsenopyrite contained in quartz veins. 1200 μm. rl/ppl.

Appendix 3:

Report Metadata Form

(Bibliographic Data Sheet)

Northern Territory Department of Business, Industry & Resource Development

REPORT METADATA FORM

(MINERAL EXPLORATION)

PART A (DME USE ONLY)					
Report Number	Date Received				
Collation	___ pp.	___ figs	___ logs	___ maps	___ apps.
Media	___ CDs	___ 1.5”	___ Exab.	___ DLT	___ vols.

PART B			
Tenure Number(s)	SEL23662	Company Report Number	31423
Report Date	April 2004	Anniversary Date	03/04/2003
Group Project Name	Tanami Central		
Report Title	1st Annual Report for SEL23662 (Cave Hills) for the period		
03/04/2003 to 02/04/2004			
Author(s)	Walter, M.	Lowe, G.	
Corporate Author(s)	Newmont Tanami Pty Ltd		

Maps 1 : 250 000	SF52-03					
Maps 1 : 100 000	4857	4957				

Tectonic Units			
❑ Amadeus Basin	❑ Carpentaria Basin	❑ McArthur Basin	❑ Pine Creek Inlier
❑ Arafura Basin	❑ Daly Basin	❑ Money Shoal Basin	❑ Simpson Basin
❑ Arnhem Inlier	❑ Dunmarra Basin	❑ Murphy Inlier	❑ South Nicholson Basin
❑ Arunta Inlier	❑ Eromanga Basin	❑ Musgrave Block	❑ Tennant Creek Inlier
❑ Birrindudu Basin	❑ Fitzmaurice Mobile Zone	❑ Ngalia Basin	❑ Victoria Basin
❑ Bonaparte Basin	❑ Georgina Basin	❑ Ord Basin	❑ Warburton Basin
❑ Browse Basin	✓ Granites-Tanami Inlier	❑ Pedirka Basin	❑ Wiso Basin
Other structural units			

Stratigraphic Names			
Billabong Complex	MacFarlanes Peak Group	Tanami Group	Pargee Sandstone
Gardiner Sandstone	Antrim Plateau Basalts	Mt Charles Formation	Inningarra Granite

AMF Thesaurus Terms - General			
✓ Geological mapping	❑ Regional Geology	❑ Stratigraphy	✓ Structural Geology
❑ Metallogenesis	❑ Remote sensing	❑ Imagery	❑ Landsat
✓ Petrology	❑ Lithology	✓ Literature reviews	❑ Metamorphism
❑ Lineaments	❑ Photogeology	✓ Reconnaissance	❑ Indicator minerals
Other terms ...			

AMF Thesaurus Terms - Target Minerals			
✓ Gold	❑ Silver	❑ Tin	❑ Diamonds
❑ Lead	❑ Copper	❑ Platinum Group Minerals	❑ Industrial Minerals

❑ Zinc	❑ Uranium	❑ Bauxite	

AMF Thesaurus Terms - Mining			
✓ Environmental impact surveys	✓ Feasibility studies	❑ Geostatistics	❑ Metallurgy
❑ Ore reserves	❑ Resource assessment	❑ Mineral resources	❑ Mining geology
❑ Mine design	❑ Mine drainage	❑ Mine evaluation	❑ Pits

AMF Thesaurus Terms - Geophysical Surveys			
❑ Aerial magnetic surveys	❑ Aerial radioactivity surveys	❑ Aerial EM surveys	❑ Ground EM surveys
❑ Gravity surveys	❑ Geophysical anomalies	❑ Gravity anomalies	❑ Bouger anomaly maps
❑ Sirotem surveys	❑ Ground magnetic surveys	❑ IP surveys	❑ Resistivity surveys
❑ Seismic surveys	❑ Magnetic anomalies	❑ Geophysical interpretation	❑ Geophysical logs
Other terms ...			

AMF Thesaurus Terms - Geochemical Exploration – Surface sampling			
✓ Geochemical sampling	❑ Stream sediment sampling	❑ Rock chip sampling	❑ Bulk sampling
✓ Soil sampling	❑ Heavy mineral sampling	❑ Geochemical anomalies	✓ Assaying
❑ Isotope geochemistry	❑ Whole rock analysis	❑ X ray diffraction	✓ Sample location maps
Other terms ...			

AMF Thesaurus Terms - Geochemical Exploration - Drill sampling			
❑ Diamond drilling	✓ RAB drilling	❑ Percussion drilling	✓ Aircore drilling
❑ RC drilling	❑ Rotary drilling	❑ Vacuum drilling	❑ Auger drilling
❑ Drill core	❑ Drill cuttings	✓ Drill hole logs	❑ Drill core analysis

Other terms ...			

Drilling Type	**No. of holes**	**Hole name(s)**
Diamond		
Percussion		
Vacuum		
RAB	63	C1RB1300-1360
Auger		
Air	44	TITAC1122-1165
RC		
Rotary		
Other ...		

Mine / Deposit / Prospects		**Location - AMG**	**Location - Datum**
Mines			
Deposits			
Prospects	Challenger 1		
	Titania		
	Cave Hills		
	Lysander		
	Golconda		