Stage 2 of the Coyote Project

Tanami Desert, Western Australia.

Environmental Protection Statement

June 2007

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1 Executive Summary

1.1 Introduction

Tanami Gold NL is proposing to develop Stage 2 of the Coyote Project in the Tanami Desert of Western Australia. Stage 2 of the Project will involve development of two small satellite pits, minimal associated infrastructure and a 35km haul road for transport of ore south to the existing treatment plant at the Coyote mine site.

The Coyote Project is located approximately 280 km southeast of Halls Creek, and 20 km west of the Western Australia-Northern Territory border.

1.2 Approvals Process

Following acceptance of the Works Approval Application by the Department of Environment and the Notice of Intent by the Department of Industry and Resources (DoIR), Stage 1 operations commenced in March 2006 with construction of a processing plant, development of mine site infrastructure and an upgrade of an existing exploration camp. Mining commenced in May 2006.

A Mining Proposal for Stage 2 of the Coyote Project was lodged with DoIR in August 2006. The proposal was referred to the EPA and deemed to require preparation of an Environmental Protection Statement (EPS). Notification of this requirement was received in early January 2007. The first draft of the EPS was lodged with the EPA Service Unit in February 2007. Liaison has continued since that time to produce this document. Environs Kimberley and the Conservation Council of Western Australia were also issued the Draft EPS to allow the provision of stakeholder feedback. This document incorporates the comments and recommendations made by the EPA Service Unit, Environs Kimberley and the Conservation Council of Western Australia.

1.3 Mining Schedule

Mining of the Sandpiper and Kookaburra open pits is scheduled to commence in early September 2007 and is expected to take 9-12 months to complete. The actual completion date for mining will be dependent on the 2007/2008 wet season. Site infrastructure will be minimal with ore being periodically transported to the Coyote mine site for processing. No crushing or processing will be conducted on site.

The Sandpiper pit is expected to produce 89,000 tonnes of ore at an average grade of 3.6 g/t. The Kookaburra pit is expected to produce 328,000 tonnes of ore at an average grade of 3.0 g/t. An estimated 42,000 ounces of gold will be produced from the mining operation.

1.4 Area of Disturbance

Stage 2 of the Coyote Project will result in a total disturbance area of 112ha, which includes 22.5ha of an existing track that will be upgraded to construct the haul road. Approximately 102ha will be able to be rehabilitated on completion of the project. The pits will remain open after mining but will be appropriately bunded to prevent accidental entry and excessive inflow of surface runoff. The ramps will be left in tact to allow animal access and egress. Table 1.1 provides a breakdown of the disturbance.

Description of Mining Disturbance	Area (ha)
Sandpiper open pit and surrounds	5
Kookaburra open pit and surrounds	5
Waste dump	25
ROM pad	2.5
Evaporation pond	8
Haul and access roads	2
Office, workshop, laydown area	2
Gravel pit	1
Topsoil storage	4
Existing exploration disturbance	12
Haul road *(includes existing exploration disturbance of 22.5 ha)**	45.5
Total Disturbance	**112.0**

Table 1.1 Stage 2 disturbance areas.

1.5 Stakeholder Consultation

Environs Kimberley and the Conservation Council of Western Australia (CCWA) have been consulted as stakeholders in this project. Representatives from both groups visited the site on the 1st of March 2007 to view the area first hand. Comments on the Draft EPS were received from both groups and have been incorporated into this document.

CCWA have expressed concerns relating to the potential for increases in populations of feral animals as a result of the mining operation, impact on threatened fauna as a result of haul road activity and mine closure. Environs Kimberley expressed similar concerns and these issues have been addressed in this document. Table 1.2 provides the location in this document where the main issues raised by these stakeholders have been addressed.

Issue raised	Where addressed in this document

Issue raised	Where addressed in this document
Conservation Council of Western Australia	
Landfill and Dingo management.	Sections 4.9, 8.12
Mulgara and haul road.	Sections 3.6, 8.4
Chemical management.	Sections 3.8, 8.12, 8.13
Backfilling of pits.	Sections 4.9, 6.3, 8.4, 9.1
Greenhouse gases and carbon offsets.	Sections 3.11, 8.8
Closure and completion criteria.	Sections 6.2, 8.11
Environs Kimberley	
Landfill and Dingo management.	Sections 4.9, 8.12
Weed management.	Sections 4.6, 8.5
Energy efficiency and Greenhouse Gas emissions.	Sections 3.11, 8.8
Emergency response plans.	Sections 3.8, 8.13
Backfilling of pits.	Sections 4.9, 6.3, 8.4, 9.1
Closure planning.	Sections 6.2, 8.11
Significant faunal habitats.	Sections 3.6, 4.7, 8.4
Waste management.	Section 3.7, 8.12
Ongoing research.	Section 8.4
Indigenous employment.	Section 9

Table 1.2 Issues raised by stakeholders and location where the item is addressed in this document.

1.6 Environmental Issues

The key environmental issues associated with this project are considered to be:

- Presence of threatened fauna;
- Disturbance of threatened fauna habitat;
- Feral species management; and
- Mine closure and post-mining pits.

1.6.1 Threatened fauna

There are 12 species of fauna known to inhabit the project area or considered likely to be found in the region. Table 1.3 lists these species and the conservation ranking of each.

Species	WA Cons. Level	IUCN Cons. Ranking	EPBC Ranking	Recorded in the Surrounding Area
Mulgara *Dasycercus cristicauda*	Schedule 1	VU	VU	**Yes**
Bilby *Macrotis lagotis*	Schedule 1	VU	VU	**Yes**
Southern and Northern Marsupial Mole *Notoryctes typhlops* and *N. caurinus*	Schedule 1	EN	EN	No
Giant Desert Skink *Egernia kintorei*	Schedule 1	VU	VU	No
Peregrine Falcon *Falco peregrinus*	Schedule 4	-	-	No
Major Mitchell's Cockatoo *Cacatua leadbeateri*	Schedule 4	-	-	**Yes**
Woma *Aspidites ramsayi*	Schedule 4	EN	-	**Yes**
Gravel Dragon *Cryptagama aurita*	Priority 1	-	-	No
Ctenotus uber johnstonei	Priority 2	-	-	No
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	Priority 3	LR	-	No
Bush Stone-curlew *Burhinus grallarius*	Priority 4	NT	-	**Yes**
Australian Bustard *Ardeotis australis*	Priority 4	NT	-	**Yes**

Table 1.3 Threatened fauna known or considered likely to inhabit the project area.

Tanami has developed management strategies to ensure impact of the mining operation on threatened species is minimised. Many of the strategies, including the induction, regular awareness programs and reporting procedures have been implemented successfully at the Coyote mine site and will be transferred to the Stage 2 operations. Other management strategies will include speed limits on the haul road, a cat control program and ongoing fauna monitoring and survey work.

1.6.2 Fauna habitat

Vegetation and habitat in the mine area is common throughout the Tanami Region and, although it may periodically support threatened fauna, is not considered significant for any of the species listed above. The mine site will not impact on any areas of habitat specifically suitable for threatened fauna.

The haul road will pass through habitat suitable for the Bilby (*Macrotis lagotis*) and the Mulgara (*Dasycercus cristicauda*), although these habitats are also widespread and relatively common in the Tanami Region. Approximately 2.8ha of habitat potentially suitable for Mulgara will be affected by placement of the haul road as it passes through a series of small sand dunes. Less than 1ha of laterite rise habitat, considered to be preferred by the Bilby, will be affected by placement of the haul road. There has been no Bilby activity recorded in this area. The haul road will not affect a significant area of suitable habitat for either species.

1.6.3 Night haulage

Night-time use of the haul road is recognised as a potential threat to Mulgara, Bilby and other nocturnal species. Ore haulage will occur over less than a six month period and will be conducted in a series of 24 hour campaigns. During this time trucks will travel along the road at approximately 30 minute intervals at relatively low speeds (40-80km/hr). The intervals and speed of the trucks, combined with the straight road and flat terrain will allow sufficient time for animal movement across the road and the operation is not expected to have an impact on the populations of threatened species known or potentially inhabiting the area.

Tanami have committed to conducting daily monitoring of the haul road during periods of ore haulage as part of an ongoing impact assessment study.

1.6.4 Feral species

The potential for Stage 2 of the Coyote Project to provide conditions that may result in an increase in populations of feral species is recognised and management strategies have been discussed in this document.

The volume of domestic waste produced at the Stage 2 site will be minimal as personnel working on site will be accommodated at the existing Coyote camp. In particular, the volume of food waste produced on site will be kept to a minimum. Waste disposal will be strictly controlled with all domestic and non-toxic industrial waste being disposed in an onsite rubbish tip within the footprint of the waste dump. Waste will be covered regularly to deter scavengers such as dingoes and cats. Tanami has environmental policies and procedures in place which are communicated through the site induction and environmental handbook and include the requirement that site personnel do not feed or encourage animals. A cat control program at the Coyote mine site is due to recommence during 2007 and will include periodic trapping at the Stage 2 site.

Camels are not expected to benefit from the mining operation. On completion of mining groundwater will slowly return to the pits to a depth of approximately 20 metres below surface level. The relatively low rainfall and extremely high evaporation rate is expected to result in a final water level of between 10 and 20 metres below surface level. The final water quality will be variable depending on the time of year. The surface water is expected to be fresh in the wet season and brackish to saline during the dry. Long-term monitoring of abandoned pits from other mining activity in the Tanami region has indicated that camels are not attracted to water in the pits. There are numerous other permanent, semi permanent and temporary fresh water sources in the area including Slatey Creek to the north of the site, stock watering points and gravel pits along the Tanami Road. During the wet season when fresh water will be available in the pits there is abundant fresh water in the surrounding region that is much more accessible to wildlife. The additional water source is not considered likely to alter the breeding or feeding patterns of camels or other introduced species in the area.

1.6.5 Mine closure

The objective of mine closure is to return disturbed areas as close as possible to their original state. Site decommissioning and closure will be carried out on completion of mining with all rehabilitation work expected to be complete by mid-2008. Mine closure will include:

- removal of all infrastructure;
- removal and treatment of any contaminated material (i.e. hydrocarbons);
- removal and burial of bund liners;
- rehabilitation of disturbed areas;
- ensuring the pits are made safe to prevent accidental access;
- closure of the abandonment bund; and
- establishment of a revegetation monitoring regime.

1.7 Summary of Environmental Principles and Factors

The application of the Principles of Environmental Protection within the Stage 2 of the Coyote Project, as described by EPA Position Statement No. 7 (EPA August 2004), are addressed in Table 1.4.

Principle	Relevance	Comments
1. *The precautionary principle* Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by – a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and b) an assessment of the risk – weighted consequences of various options.	Yes	The precautionary principle has relevance to the project through the protection of the region's threatened fauna and their associated habitats. Refer to: • Flora and Vegetation (Section 4.6); • Fauna (Section 4.7); • Fauna of Conservation Significance (Section 4.8); and • Fauna (Section 8.4).

Principle	Relevance	Comments
2. *The principle of intergenerational equity* The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	Yes	The principle of intergenerational equity has some relevance to the project. The surrounding area has a number of places of Aboriginal significance that hold cultural value. Refer to: • Land Use (Section 4.10); • Landscape/Visual Amenity (Section 8.11); and • Social Issues and Management (Section 9).
3. *The principle of the conservation of biological diversity and ecological integrity* Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Yes	The principle of the conservation of biological diversity and ecological integrity has particular relevance to the project, given the presence of 12 threatened fauna species. Refer to: • Fauna (Section 4.7); • Fauna of Conservation Significance (Section 4.8); and • Fauna (Section 8.4).
4. *Principles relating to improved valuation, pricing and incentive mechanisms* (1) Environmental factors should be included in the valuation of assets and services. (2) The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance and abatement. (3) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste. (4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximize benefits and/or minimize costs to develop their own solutions and responses to environmental problems.	Yes	The principles relating to improved valuation, pricing and incentive mechanisms have relevance to the project, through the management of the project's wastes and hazardous materials, and the project's rehabilitation, decommissioning and closure. Refer to: • Waste Management and Disposal (Section 3.7); • Hydrocarbon Storage (Section 3.8); • Dangerous Goods and Hazardous Substances (Section 3.9); • Rehabilitation, Decommissioning and Closure (Section 6); and • Waste Products (Section 8.12).

Principle	Relevance	Comments
5. *The principles of waste minimisation* All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge to the environment.	Yes	The principles of waste minimisation have relevance to the project through the management of the project's waste and rehabilitation, decommissioning and closure on completion of activities. Refer to: • Waste Management and Disposal (Section 3.7); • Hydrocarbon Storage (Section 3.8); • Dangerous Goods and Hazardous Substances (Section 3.9); • Rehabilitation, Decommissioning and Closure (Section 6); and • Waste Products (Section 8.12).

Table 1.4 Application of the Principles of Environmental Protection

2 Introduction

2.1 Background

Tanami Gold NL (Tanami) operates the Coyote Project in the Tanami Desert of Western Australia. Tanami is currently developing Stage 2 of the project, which focuses on an area approximately 35kms north of the existing Coyote mine site. A short-term mining operation is proposed involving the development of two small open pits at the Sandpiper and Kookaburra deposits to provide ore for the Coyote processing plant. Ore will be transported to Coyote by road train on a purpose built haul road linking the two sites. Tanami proposes to upgrade an existing track for this purpose with the finished haul road being suitable for dry season use only.

Mining is due to commence in mid-2007 and is scheduled for completion by early 2008.

This area is locally known as Bald Hill, although the exact location of the namesake hill is uncertain. While extensive exploration has been conducted in this area, no previous mining has been undertaken.

Gold was first discovered in the Bald Hill area by government geologist, H. Talbot between 1908 and 1910 while accompanying A. Canning, on a survey of the newly discovered Canning Stock Route. Talbot is credited with collecting a 5g/t rock chip sample from the hill currently known as the Hawk Prospect.

Alcoa identified weak gold anomalies in RAB drilling undertaken in conjunction with auger geochemical and airborne radiometrics surveys as part of a uranium exploration programme between 1976 and 1977.

Energy Reserve Canada held tenure over the area between 1979 and 1984 and flew further radiometric and INPUT surveys, but did not contribute further to the discovery of gold in the region.

A private syndicate held tenure to the ground between 1984 and 1994. Weak rock chip gold anomalies were identified in 1984 and a joint venture managed by CRAE was arranged between 1985 and 1986. Rock chip, soil sampling and follow-up costeaning returned best results of 0.4m at 2.18g/t Au from a fractured limonitic quartz vein in what is now known as the Cuckoo Prospect.

Between 1992 and 1994 Perilya Mines conducted regional auger sampling to the north of the Kookaburra and Sandpiper deposits and located the Maynard Prospect with a 3km long, >3ppb Au anomaly with a maximum of 6740ppb Au. The Maynard Prospect has subsequently been subdivided into the Tern, Vulture and Eagle prospects. Follow-up RAB drilling did not intersect any significant mineralisation, but further rock chip sampling located outcropping quartz veins returning up to 26.5g/t Au at what is now known as the Vulture Prospect.

The Tanami Joint Venture, between Tanami Exploration NL and Glengarry Resources NL commenced exploration in the area in 1994 with reconnaissance sampling, which confirmed anomalism at the Maynard Prospect (Vulture-Eagle prospects) and at the Desert Point Prospect (now renamed the Dove Prospect). Under Glengarry Resources NL's management systematic regional geochemical auger sampling and follow-up vacuum and then RAB drilling led to the discovery of the Kookaburra Deposit in 1995. Exploration in 1995 also identified a >100ppb Au lag anomaly at the Hawk Prospect.

The Sandpiper Deposit was identified as a separate anomaly from Kookaburra and first RAB drilled in 1996. Exploration during the 1996 field season also included the first RAB drilling at the Hawk and Cuckoo prospects, and the discovery of a 17.5ppb Au auger anomaly in palaeochannel country to the south of the Kookaburra-Sandpiper deposits which was named the Finch Prospect. Follow-up RC drilling was also undertaken at Finch that year.

The 1997 field season saw further RAB, RC and diamond core drilling on the Kookaburra, Sandpiper, Hawk and Cuckoo prospects. Four new prospects were discovered in 1997. The Robin prospect was located by geologically targeted lag sampling and tested by RAB drilling. Soil sampling over an auger anomaly and follow-up RAB drilling led to the definition of the Albatross Prospect. The Osprey and Tern prospects were both discovered through regional vacuum drilling and follow-up RAB drilling. In 1998 the Tern South prospect was identified through soil and follow-up RAB drilling and regional reconnaissance RAB drilling led to the discovery of three >1g/t bedrock anomalies named the Ibis, Gull and Pelican prospects. Drilling and soil sampling was undertaken to further define mineralisation in 1999.

Management of the tenements passed back to Tanami Exploration NL in 2000 who drilled two deep RC holes into the Sandpiper deposit and undertook a limited geochemical sampling programme before Barrick Gold of Australia Ltd (Barrick) farmed in to the tenements and became managers of a three-way joint venture between Barrick, Tanami and Glengarry Resources NL later that year. Barrick managed the tenements until the end of 2003 during which time they drilled two deep diamond core holes, successfully intersecting mineralisation at depth beneath the Sandpiper Deposit (21m @ 3.58g/t Au from 366m), and drilled an extensive 400m x 200m spaced RAB and aircore (AC) drilling programme targeting the stratigraphy to the south and east of the main mineralised zones in the area.

Tanami Exploration NL took over management of exploration in mid-2004 under an agreement to conduct sole funded exploration aimed at identifying further resources for the Coyote Gold Project. Barrick withdrew from the joint venture retaining a royalty on future production. Throughout the remainder of 2004 Tanami undertook an extensive programme of diamond core, RC, AC and RAB drilling aimed at proving the established resources at Kookaburra, Sandpiper and Hawk, completing a geotechnical feasibility study at Kookaburra and Sandpiper, and testing for extensions to mineralisation within and around the other established prospects. In November 2004 Tanami Exploration NL acquired Glengarry Resources’ remaining interest in the joint venture.

Existing facilities in the Bald Hill area were developed for exploration activities. The main access track to the site was formed in 2004 during seismic surveys of the area by the Western Australian Geological Survey. The track has been graded in the past but has had no further development. Miscellaneous Licence L80/45 was placed over this route.

A small exploration camp was located two kilometres north of the Sandpiper deposit. Most of the infrastructure was dismantled in 2006 and transferred to the Coyote accommodation camp. Two fuel tanks remain in place and will be moved to the Stage 2 laydown area for use during mining. The camp area will be rehabilitated when the tanks have been removed.

Stage 1 of the Coyote Project commenced in March 2006 following grant of the required approvals. Coyote mine site now comprises an open pit mining operation with a processing plant and associated infrastructure. Mining was suspended in October 2006 following problems with the processing plant. The operation is due to recommence in March 2007.

2.2 Proponent Details

Information pertaining to Tanami Gold NL:

Address:	Level 4 50 Colin Street WEST PERTH 6005
Telephone:	08 9212 5999
Facsimile:	08 9212 5900
ABN:	51 000 617 176
Directors:	Dennis Waddell (Executive Chairman) Frank Sibbel (Operations Director) Martin Kavanagh (Non-Executive Director)

2.3 Location

The Coyote Project is located approximately 280 km southeast of Halls Creek, and 20 km west of the Western Australia-Northern Territory border. Figure 2.1 shows the location of the Coyote Project.

Stage 1 of the Project commenced in February 2006 with development of the Coyote mine site, which currently consists of an open pit mining operation supported by a processing plant and associated infrastructure.

Figure 2.1 Location of the Coyote Project.

Stage 2 of the Coyote Project will focus on the Sandpiper and Kookaburra deposits located to the north of the existing mine site. The Sandpiper and Kookaburra mining operation is referred to as Stage 2 in this document.

Figure 2.2 shows the location of Stage 2 in relation to the existing mine site.

2.4 Land Tenure

Stage 2 of the Coyote Project is located on Mining Lease M80/563 (deposits) and Miscellaneous License L80/45 (haul road). Both tenements are held by Tanami Exploration, a 100% subsidiary of Tanami Gold NL.

Tenement	Date Granted	Expiry Date
M80/563	02/12/2005	01/12/2026
L80/45	17/02/2006	16/02/2027

Table 2.1 Current status of tenements.

2.5 Timing of Operations

Mining of the Sandpiper and Kookaburra open pits is scheduled to commence in early September 2007 and is expected to take 9-12 months to complete. The actual completion date for mining will be dependent on the 2007/2008 wet season. Site decommissioning and closure will be carried out on completion of mining with all rehabilitation work expected to be complete by late 2008.

2.6 Legislation

The following legislation is potentially applicable to the environmental management of the Project:

Commonwealth

- Environment Protection and Biodiversity Conservation Act 1999

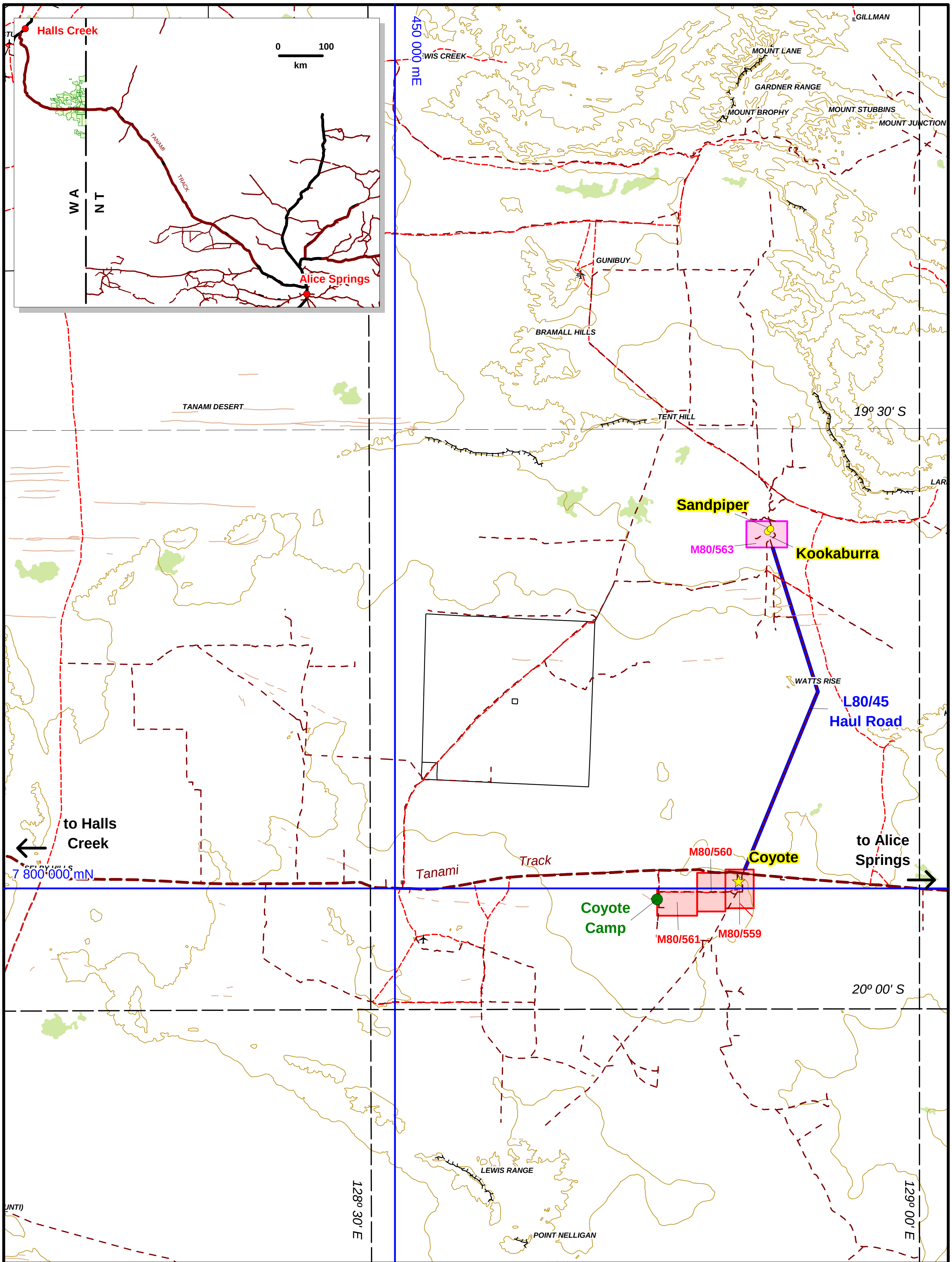
State

- Aboriginal Heritage Act 1972
  - Aboriginal Heritage Regulations 1974
- Conservation and Land Management Act 1984
  - Conservation and Land Management Regulations 2002
- Contaminated Sites Act 2003
- Environmental Protection Act 1986
  - Environmental Protection Regulations 1987
  - Environmental Protection (Abrasive Blasting) Regulations 1998
  - Environmental Protection (Clearing of Native Vegetation) Regulations 2004

- Environmental Protection (Controlled Waste) Regulations 1997
- Environmental Protection (NEPM -NPI) Regulations 1998
- Environmental Protection (Noise) Regulations 1997
- Environmental Protection (Rural Landfill) Regulations 2002
- Environmental Protection (Unauthorised Discharges) Regulations 2004

- Explosives and Dangerous Goods Act 1961
  - Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992
- Mining Act 1978
  - Mining Regulations 1981
- Mines Safety and Inspection Act 1994
  - Mines Safety and Inspection Regulations 1995
- Native Title Act 1973
  - Native Title (State Provisions) Regulations 2000
- Occupational Safety and Health Act 1984
  - Occupational Safety and Health Regulations 1996
- Rights in Water and Irrigation Act 1914
  - Rights in Water and Irrigation Regulations 2000
- Soil and Land Conservation Act 1945
  - Soil and Land Conservation Regulations 1992
- Wildlife Conservation Act 1950
  - Wildlife Conservation Regulations 1970
  - Wildlife Conservation (Reptiles and Amphibians) Regulations 2002

Tanami will comply with all applicable legislation during construction, operation and closure of Stage 2 of the Coyote Project.



TANAMI GOLD NL

WESTERN TANAMI

COYOTE PROJECT STAGE 2 LOCATION PLAN

ORIGINATOR:	DATE:	DRAWN:
J. Shepherdson	Aug 2006	A. Weston

PLAN No: WTP_1_0_019

1 : 500,000

0 10 20 30

MGA Zone 52 (GDA94) kilometres

FIGURE 2.2

3 Proposal

3.1 Key Characteristics of the Project

Stage 2 of the Coyote Project is a small-scale open pit mining operation intended to provide ore for blending with ore from underground mining at the existing operation.

The Sandpiper pit is expected to produce 89,000 tonnes of ore at an average grade of 3.6 g/t. The Kookaburra pit is expected to produce 328,000 tonnes of ore at an average grade of 3.0 g/t. An estimated 42,000 ounces of gold will be produced from the mining operation.

Site infrastructure will be minimal with ore being periodically transported to the Coyote mine site for processing. No crushing or processing will be conducted on site.

A haul road will be constructed between the Stage 2 site and the existing Coyote operation, a distance of approximately 35km.

Mining will be carried out on a 24 hour basis, utilising two 12-hour shifts. Transport of ore to the processing plant at the Coyote mine site will be carried out in “campaigns” involving short 24-hour periods of haulage activity.

Element	Description
Life of project	Approximately 12 months
Size of ore bodies:	Ore: Sandpiper - 89,000 tonnes Kookaburra - 328,000 tonnes Waste: 2,330,000 BCM (combined)
Depth of pits	Sandpiper - 50m Kookaburra - 72m
Area of disturbance (including pits, associated infrastructure and haul road).	112 hectares
Power supply	Portable generators
Water supply (dust suppression, construction)	Dewatering bores
Potable water supply	Reverse osmosis treatment of bore water or trucked from Coyote mine site.
Fuel storage and use	50,000 litre bunded storage tank. Approx 1.8 million litres required for life of project.

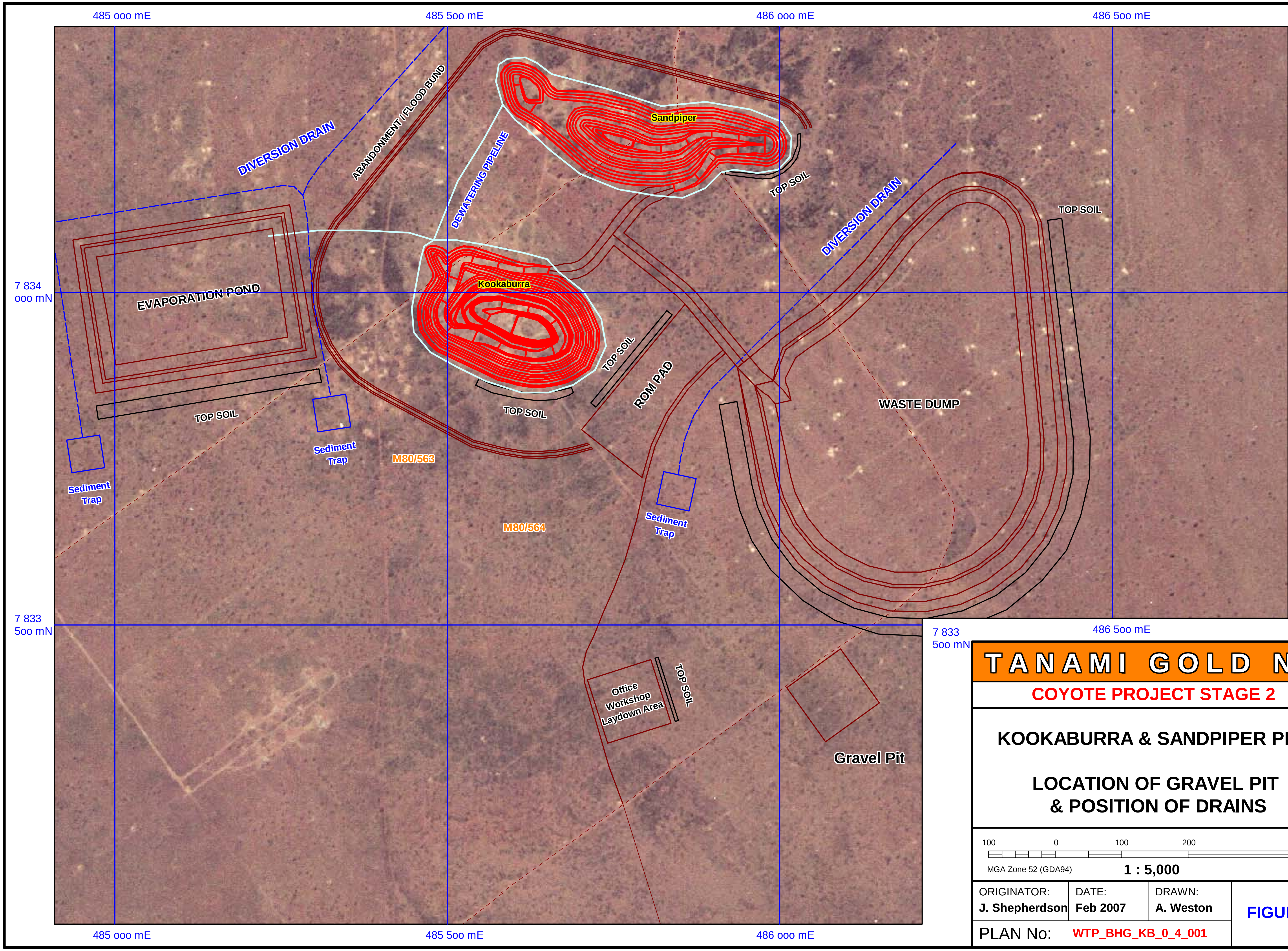
3.2 Site Selection and Layout

3.2.1 Infrastructure

Minimal infrastructure will be required for this operation as the facilities of the existing mine site will be utilised for processing of the ore and accommodation of the workforce. Stage 2 site infrastructure will comprise:

- two small open pits;
- a single waste dump for disposal of waste rock;
- a ROM pad for ore stockpiling;
- a hardstand area for laydown, workshop and site office;
- an evaporation pond for storage and disposal of groundwater;
- site access roads; and
- a haul route from Stage 2 to the Coyote processing plant.

The site layout is intended to produce the minimum disturbance possible and allows direct access to the haul road. Figure 3.1 shows the proposed site layout.



TANAMI GOLD NL

COYOTE PROJECT STAGE 2

KOOKABURRA & SANDPIPER PITS

LOCATION OF GRAVEL PIT & POSITION OF DRAINS

100 0 100 200 400

MGA Zone 52 (GDA94) **1 : 5,000** metres

ORIGINATOR:	DATE:	DRAWN:	
J. Shepherdson	Feb 2007	A. Weston	**FIGURE 3.1**
PLAN No: WTP_BHG_KB_0_4_001			

3.2.2 Waste Dump

Waste rock from both pits will be disposed in a dump located south of the Sandpiper open pit. The waste dump will have a footprint of 25 hectares with a volume of approximately 2,330,000 BCM and will be designed to blend into the existing landscape as much as possible. The dump will reach a maximum height of 20m using 10m lifts with 8m wide berms. The outer faces of the waste dump will be battered to a maximum angle of 15^0 and then rehabilitated using stockpiled topsoil and cleared vegetation. Topsoil will be applied by truck dumping at the top of the slope and spreading with a bulldozer. Batters will be contour ripped to minimise water erosion.

3.2.3 ROM Pad

A 2.5ha ROM pad will be positioned between the pits and adjacent to the northern end of the haul road. Ore from both pits will be stockpiled on the ROM before being loaded into road trains and transported to the processing plant.

3.2.4 Gravel Pit

A 1ha gravel pit has been proposed to source material for construction of the hardstand area, roads and the evaporation pond. This is located in an area of gravely soil adjacent to an existing track to allow access. Topsoil will be removed and stockpiled before an anticipated 20,000m^3 of material is removed. The gravel pit will then be rehabilitated.

3.2.5 Hardstand Areas

A 2ha hardstand area will be required for the mining operation. The site offices, temporary workshop, laydown yard, fuel farm and vehicle parking will be accommodated in this location. The hardstand area will be slightly elevated above the natural ground level and constructed of compacted laterite material sourced from the open pits and the gravel pit.

3.2.6 Evaporation Dam

Mining will extend below the water table and, as such, dewatering of the pits will be required. A purpose-built evaporation dam will be constructed for disposal of discharged water. The dam will occupy an area of 8ha and will be constructed with laterite and clay materials sourced from the gravel pit and open pits. The internal surface of the dam will be compacted to achieve maximum water retention.

A corner of the evaporation dam will be sectioned off and lined with High Density Polyethylene (HDPE) plastic liner to provide clean water storage. A stand pipe will be installed to enable water tankers to be filled.

3.2.7 Haul Road

A haul road will be constructed between the Stage 2 site and the existing Coyote mining operation. The final width of the road will be 14m, with some areas requiring gravel sheeting for stability. The haul road will utilise an existing track, which was originally created by the Western Australia

Geological Survey during a seismic survey of the region, and is currently used to access the area. 23ha of additional disturbance will be required over the 35km distance.

3.2.8 Area of Disturbance

The total area of disturbance for Stage 2 of the Coyote Project is 112 hectares (ha). Tables 3.1 and 3.2 provide a break down of the disturbance areas on each of the tenements affected by this mining operation.

Tenement Number: M80/563	
Description of Mining Disturbance	**Area (ha)**
Sandpiper open pit and surrounds	5
Kookaburra open pit and surrounds	5
Waste dump	25
ROM pad	2.5
Evaporation pond	8
Haul and access roads	2
Office, workshop, laydown area	2
Gravel pit	1
Topsoil storage	4
Existing exploration disturbance	12
Total Disturbance	**66.5**
Undisturbed Land	908.5
Disturbed + Undisturbed	975
M80/563 Tenement Area	975

Table 3.1 Proposed disturbance areas for M80/563.

Tenement Number: L80/45	
Description of Mining Disturbance	**Area (ha)**
Haul road *(includes existing exploration disturbance of 22.5 ha)**	45.5
Total Disturbance	**45.5**
Undisturbed Land	609.5
Disturbed + Undisturbed	655
L80/45 Tenement Area	655
** This disturbance will be utilised in construction of the haul road.*	

Table 3.2 Proposed disturbance area for L80/45.

3.3 Mining Schedule and Method

3.3.1 Mining Schedule

Mining is scheduled to commence in September 2007 with a total mine life of 9-12 months expected. The operation is planned for completion by December 2008, which will include decommissioning and rehabilitation of the site.

Clearing and stockpiling of topsoil and vegetation will commence shortly before mining.

Construction of the haul road, hardstand areas, ROM pad and evaporation pond will be undertaken in conjunction with mining.

Mining will be undertaken using standard open pit mining equipment. The work will be carried out by the mining contractor currently engaged at the Coyote mine site.

3.3.2 Pit Design

The design of the open pits will include:

Component	Design
Sandpiper	
Area	5ha
Final depth	50m
Wall batter angles	Surface - 360mRL - 45^0 360 - 330mRL - 70^0
Ramps	Surface - 355mRL Gradient 1:8, width 12m 355-330mRL Gradient 1:8, width 10m
In-pit berm width	5 metres 360 & 345mRL
Dewatering	Groundwater bores, in-pit pumps if required
Overall waste to ore ratio	10.5:1
Kookaburra	
Area	5ha
Final depth	72m
Wall batter angles	Surface - 360mRL - 45^0 370 - 340mRL - 55^0 340 - 300mRL - 70^0
Ramps	1 in 8 gradient, 12 m wide.
In-pit berm width	5 metres (nominal) 370, 355, 340 & 320mRL
Dewatering	Groundwater bores, in-pit pumps if required
Overall waste to ore ratio	6.5:1

Table 3.3 Open pit design

3.3.3 Ore Processing

No crushing or processing of ore will be carried out at the Stage 2 site. Ore will be transported to the Coyote mine site for processing and will form part of the plant's annual 250,000 tonne throughput. The tailings storage facility (TSF) has been designed with the capacity to contain tailings produced during processing of the Stage 2 ore.

Processing and tailings disposal will be carried out in accordance with conditions of the Licence to Operate.

3.3.4 Pit Dewatering

Mining will extend below the water table in both pits and dewatering will be required. A series of bores are planned to be constructed around the pit perimeters. The dewatering program will commence soon after mining with extracted water being pumped to the evaporation pond. To meet dewatering requirements, 520 kilolitres per day (kL/day) will be abstracted from Sandpiper and 1,040 kL/day will be abstracted from Kookaburra, resulting in a total dewatering requirement of 1,560 kL/day. Approximately 700 kL will be used daily for dust suppression and road maintenance, with the remainder being discharge to an evaporation dam. A total volume of approximately 540,000 kL is expected to be extracted over the life of the project.

The dam will be designed with sufficient freeboard to contain a 1 in 100 year 72 hour rainfall event. Pipelines from the dewatering pumps to the evaporation dam will be contained in open v-drains running along the road verges, enabling visual inspections and containment of water in the event of a spill.

3.3.5 Equipment and Machinery

The mining fleet will consist of:

- 1 x 110t excavator
- 1 x 60t excavator
- 4 x 90t dump trucks
- 1 x service vehicle
- 1 x water cart
- 1 x bulldozer
- 1 x grader

Four road trains will be engaged at intervals to transport ore to the Coyote processing plant.

3.3.6 Blasting and Explosives

Blasting will be required to enable mining of the Stage 2 pits. Explosives will be stored in the existing magazine at the Coyote mine site and transported to the Stage 2 site as required by the drill and blast contractor in an approved manner. No explosive equipment will be stored at the site.

3.3.7 Power Supply

On site power will be provided by mobile diesel generators.

3.3.8 Fuel Supply

Fuel will be stored on site in a 50,000 litre bulk tank. The tank will be contained in a lined bund and refilled on a regular basis by the company’s bulk fuel supplier. Much of the onsite fuelling will be carried out by a service truck. An impermeable apron will be placed at the bulk tank to prevent contamination of soil.

3.3.9 Workforce

Approximately 25 people will be engaged on site on a daily basis with support provided by the existing workforce at the Coyote mine site. Most personnel will be employed on a fly-in, fly-out arrangement with a 2 week on, 1 week off roster.

3.3.10 Accommodation

The workforce required for the mining operation will be accommodated at the existing Coyote Camp and will consist predominately of personnel already involved in the Coyote mining operation. Workers will commute to the site daily.

3.3.11 Communication

On site communication will be via UHF radio, which will be installed in all vehicles and office buildings. A satellite phone system will be installed at the mine site office.

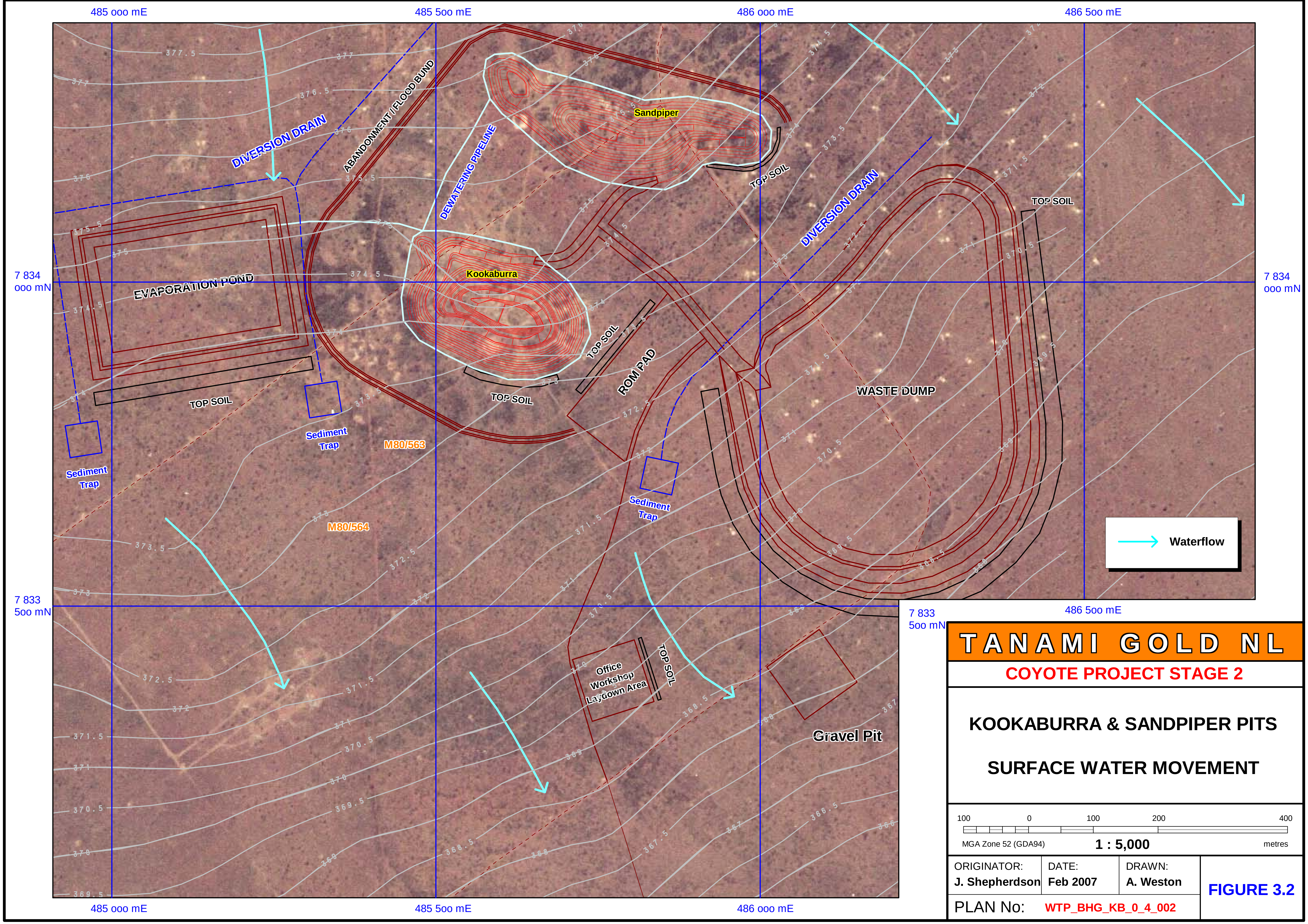
3.4 Drainage and Surface Water Diversion

The Sandpiper and Kookaburra deposits are located on a slight lateritic rise with runoff generally moving in a south-easterly direction. A fall of less than 2 metres is apparent from the northern to the southern extent of the Stage 2 project area.

Abandonment/flood bunds will be constructed around each pit to direct surface water away and prevent pit flooding in the event of a significant rain event. Water will be directed around the mine site to sediment traps, from where it will be allowed to continue on its natural course.

Internal drainage will be installed at the mine site to prevent water ponding on the upstream side of raised structures such as the ROM pad, hardstand area and waste dump. Roads will be constructed with sub-surface pipes or floodways to prevent ponding of water.

Figure 3.2 provides a surface water flow diagram based on the contours of the area.



TANAMI GOLD NL

COYOTE PROJECT STAGE 2

KOOKABURRA & SANDPIPER PITS

SURFACE WATER MOVEMENT

100 0 100 200 400

MGA Zone 52 (GDA94) 1 : 5,000 metres

ORIGINATOR:	DATE:	DRAWN:	FIGURE 3.2
J. Shepherdson	Feb 2007	A. Weston	

PLAN No: WTP_BHG_KB_0_4_002

3.5 Water

3.5.1 Water Requirements

An estimated total of 700 kilolitres (kL) of ground water per day will be required for dust suppression, construction of hardstand areas and maintenance of roads. Initially this will be sourced from the two existing bores at Sandpiper and Kookaburra. An application for a Licence to Take Ground Water has been submitted to the Department of Water (DoW).

The mining operation will extend below the water table in both pits and will therefore require pit dewatering. It is anticipated that one extra bore will be required for dewatering of the Sandpiper pit and a further three bores will be needed at Kookaburra. Excess water will be stored in a purpose-built evaporation dam. The appropriate licenses will be obtained prior to construction and operation of the bores.

A Dewatering Feasibility Investigation was conducted by URS in 2004 and is included as Appendix 6

3.5.2 Potable Water

Potable water will be sourced from an existing bore approximately 10km north of the site, or transported from the Coyote mine site, where a Reverse Osmosis (RO) plant supplies water for the plant and camp.

3.5.3 Dust Suppression

Groundwater from dewatering will be used for dust suppression at the Stage 2 site. A combination of water from the Stage 2 area and from the existing Coyote mine site will be used for dust suppression on the haul road.

Although the groundwater in the Coyote project area ranges from brackish (1600 mg/L TDS) to moderately saline (27,000 mg/L TDS), application of water to the roads is not expected to have a detrimental impact on adjacent vegetation. Water cart operators are required to avoid overspray by adjusting the output to ensure water application only within the width of the road. Runoff will be collected in shallow drains alongside the road where salt accumulation may become apparent. Previous experience at the existing Coyote mine site has shown that rainfall runoff will dilute the accumulated salt, resulting in no apparent detriment to vegetation along road verges. A similar result is expected during operation of the haul road.

Monitoring of vegetation along the length of the haul road will be conducted on a regular basis to ensure there are no detrimental effects related to the use of saline groundwater.

3.5.4 Fire Water

Water for use in fire fighting will be sourced from the water storage facility at the Stage 2 site.

3.6 Haul Road and Transport

3.6.1 Construction

Construction of the haul road is scheduled to commence in May 2007. Most of the road will be formed using material available along the route. A number of sections are susceptible to water logging, or are sandy and will be unable to be formed into a stable surface. Gravel will be imported to these areas from the proposed borrow pit at the Stage 2 mine site, or from the existing Coyote mine site.

The road will be constructed to shed water to the outer edges where a shallow drain and windrow will be formed. Culverts will be installed at necessary points to allow surface runoff to move away from the road. Each culvert will have capacity to contain any runoff resulting from road watering for dust suppression, which will be minimal. Runoff resulting from a rainfall event will also pass through the culverts and then disperse into the surrounding vegetation. The salinity content of the water in the area is not exceptionally high. Any accumulated salts on the road, along verges or in culverts will be considerably diluted following rainfall and is not expected to be of a concentration high enough to be detrimental to plant or animal life.

3.6.2 Access and Trucking Arrangements

The site will be accessed via the proposed haul road from the existing Coyote mine site. This road will not be open to the general public and appropriate signage will be positioned at the intersection with the Tanami Road.

Four road trains will be operating at intervals throughout the mining operation to transport ore to the Coyote processing plant and will run at approximately half hour intervals.

Most of the route will have a maximum speed limit of 80 km/hr.

3.6.3 Dust Management Measures

The road will be watered twice-daily by a dedicated water tanker to minimise dust produced by vehicle movement.

3.6.4 Wildlife Management

The haul road will pass through habitat suitable for the Bilby (*Macrotis lagotis*) and the Mulgara (*Dasycercus cristicauda*), although these habitats are widespread and relatively common in the Tanami Region.

A series of four small sand dunes on the haul road route provides suitable habitat for Mulgara. Approximately 2.8 ha of this habitat will be affected by placement of the haul road. Although Mulgara are known to inhabit one of these areas and activity has been observed throughout the vicinity, the species is expected to be widely distributed throughout this habitat which extends for several kilometres east and west of the haul road route at each location. Further monitoring and survey work is planned to confirm this.

Bilbies are reported as having a preference for laterite rise habitat, particularly after it has been burnt. This habitat is relatively common in the project area and surrounding region. Less than 1ha of potential Bilby habitat will be affected by placement of the haul road and this area has not been burnt in at least the last 5 years. There has been no Bilby activity recorded in this area.

Night-time use of the haul road is recognised as a potential threat to nocturnal fauna. Ore haulage will occur over a six month period and will be conducted in a series of 24 hour campaigns. During this time trucks will travel along the road at approximately 30 minute intervals. Relatively low speeds (40-80 km/hr) will be required for all vehicles using the road. Little is known about the impacts of night use of haul roads on Mulgara (Dr David Pearson pers. comm.). The known Mulgara locations are some distance from the haul road route and the range of the animals may not be impacted by the location of the road at all. Anecdotal information relating the presence of inhabited Mulgara burrows adjacent to an active haul road at another mine site was conveyed during a discussion with Dr David Pearson. The animals eventually disappeared however it is not known whether they moved away or died as a result of being run over. During consultation regarding the potential for adverse impact on the Mulgara population, Dr Pearson indicated that a study of night operation of the haul road and the impacts on the Mulgara population would provide valuable information about the species. Tanami intends to undertake such a study as part of its wildlife management strategy.

The intervals and speed of the trucks, combined with the straight road and flat terrain will allow sufficient time for animals to move across the road and enable the approach of trucks to be seen and heard from some distance. Although night haulage has potential to result in fauna deaths, the short term operation is not expected to have an impact on populations of threatened species known to inhabit the area.

Site personnel are asked to report sightings of threatened fauna and any road kills within and surrounding the existing Coyote project area. This requirement will continue for users of the haul road. Reported sightings and road kills will be recorded in an existing sightings spreadsheet. Sightings of less common threatened species will be reported to the DEC for inclusion in the threatened fauna database.

The sand dune crossings will have a speed limit of 40 km/hr to minimise potential for wildlife deaths in these areas during night haulage. Appropriate signage will be installed and all personal will be required to undertake a site-specific induction informing them of the road regulations.

A Wildlife Management Plan has been developed for the operation and is included as Appendix 3

3.6.5 Monitoring and Survey

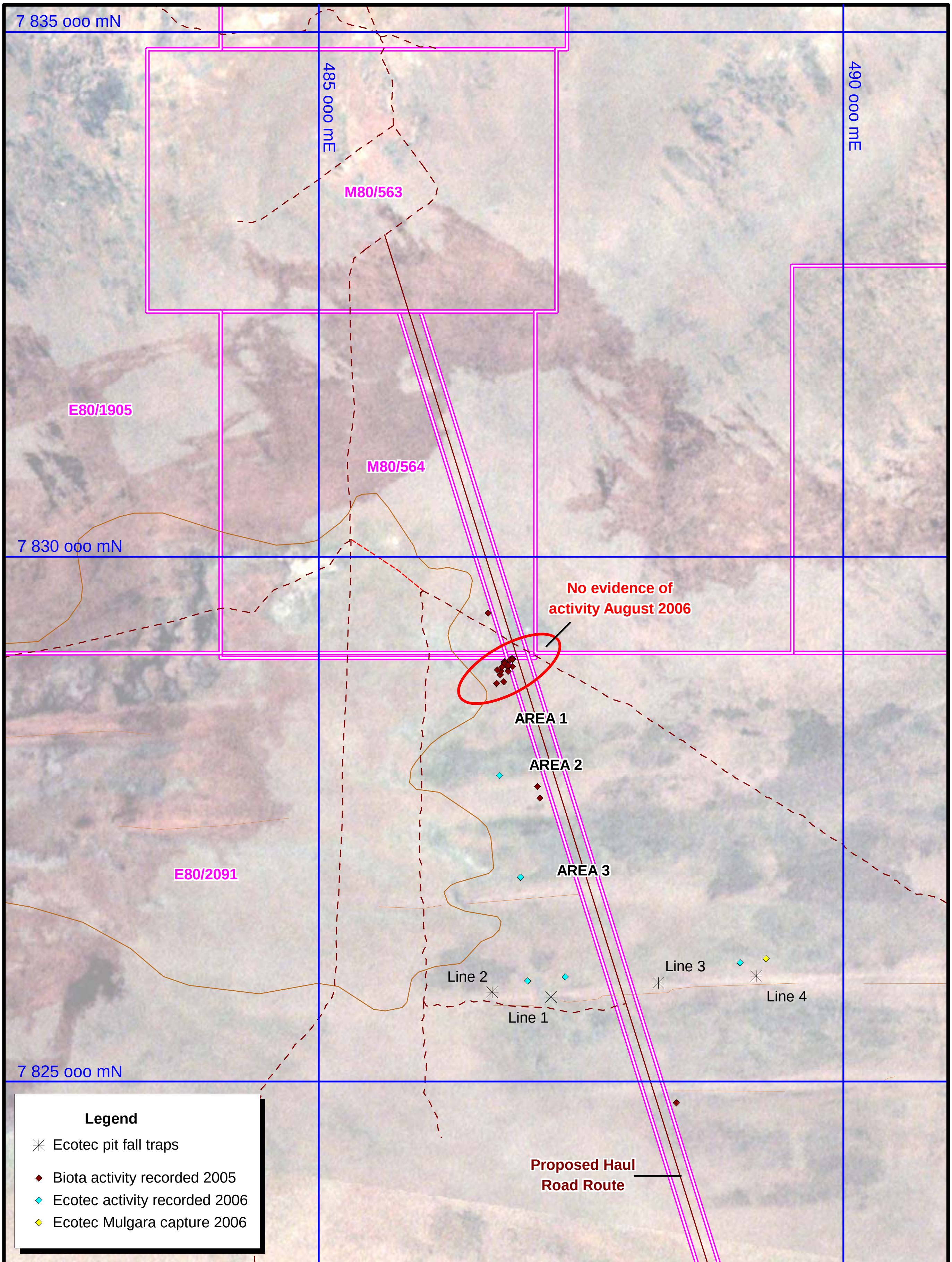
A trapping program commenced in July 2006 following installation of a series of 16 pit fall traps along a 2.5 km length of the largest sand dune intersected by the haul road. The traps have been set up in four groups of four, with a set of traps adjacent to either side of the proposed haul route and a set approximately 1 km to the east and west. The intent of this trapping exercise is to establish a baseline inventory of fauna species present in this habitat which can be used as a basis for a monitoring program while the haul road is in operation. Data is collected at monthly intervals and has provided information enabling comparison of fauna species present throughout the seasons. Preliminary results of the trapping program to December 2006 are included as Appendix 14.

The traps have been opened at approximate monthly intervals and the program has enabled collection of a significant quantity of baseline information on the fauna present in the sand dune habitat. Data collection will continue throughout the life of the haul road. The information collected over this time will help to determine the impact of the haul on the native fauna in this habitat.

Elliot trapping has been conducted in conjunction with the regular trapping program, generally targeting areas of suspected Mulgara activity. This will also continue as part of impact monitoring for the haul road.

Incidental sightings of fauna have been recorded while travelling along the route of the proposed haul road to conduct the trapping program. This has resulted in additions to the total recorded fauna for the area, as well as regular sightings of threatened fauna. Incidental sightings will continue to be an important part of the monitoring and survey work conducted in the area.

A number of permanent transects have been established in areas of potential Bilby habitat near the airstrip and in a recently burnt area, also considered potentially suitable habitat for the species. These transects are traversed quarterly to search for evidence of Bilby activity. Other animal activity is also recorded at the time. To date no Bilby activity has been located in these area, although a burrow and diggings were recorded to the north of a transect near the airstrip. Similar methods of monitoring will be employed for Stage 2 of the project.



TANAMI GOLD NL			MULGARA ACTIVITY	
COYOTE PROJECT				
ORIGINATOR: J. Shepherdson	DATE: Feb 2007	DRAWN: A. Weston	1 : 50,000 0 1000 2000 3000 AMG Zone 52 (AGD84) metres	FIGURE 3.3
PLAN No: WTP_GD_BHG_1_5_001				

3.7 Waste Management

3.7.1 Waste Management Plan

A Waste Management Plan has been developed for the Coyote Project and will be applicable to Stage 2 of the operation. The Waste Management Plan is included as Appendix 7.

3.7.2 Tyres

Tyres will be transported back to Coyote mine site for storage before being transported off site for appropriate disposal.

3.7.3 Batteries

Batteries will be regularly transported back to Coyote mine site for storage before being transported off site for appropriate disposal. Batteries will be stored on portable bunds.

3.7.4 Hydrocarbon Waste

Waste oil, used filters and rags will be stored in drums and regularly transported back to Coyote mine site. Filters and other hydrocarbon waste is back-loaded to Perth for disposal by a specialist company.

Hydrocarbon contaminated soil and absorbent materials will be collected regularly and transported to Coyote mine site for bio-remediation in a purpose-built "land farm". When hydrocarbon levels are reduced to levels below that acceptable for a Class II waste disposal facility the treated material will be incorporated into the waste dump for rehabilitation.

3.7.5 Sewage

Minor quantities of sewage will be produced from a single ablution block on site. Waste will be treated using Biolytix biological treatment units. Waste water produced by the system will be directed to the evaporation pond.

3.7.6 Non-toxic Waste

All domestic and non toxic waste will be disposed of at a designated landfill site within the waste dump footprint and buried. Waste production from this small operation is expected to be minimal. Management of the landfill will include;

- Minimum weekly covering of refuse;
- No burning of refuse at any time;
- No disposal of hydrocarbons or hydrocarbon contaminated materials; and
- No disposal of toxic or hazardous materials.

3.8 Hydrocarbon Storage and Transport

A 50,000L tank currently positioned at the old camp site (2km north of the Sandpiper pit) will be transferred to the laydown area. An earthen bund lined with an impermeable HDPE liner will be constructed to enable safe containment of the tank and its contents. An impermeable membrane will be placed under the refuelling area. The bunded area will be constructed in accordance with AS1940-2004 *The Storage and Handling of Flammable and Combustible Liquids*. An estimated 1.5 million litres will be required for the life of the operation.

Minor quantities of oils and hydraulic fluid will be stored at the on site workshop on portable bunding.

Fuel will be transported to the site by a fuel haulage contractor. The contractor is required to provide an emergency response procedure for transport of fuel prior to commencement of the contract. The procedure is to provide details of what to do in the event of a fuel spill. Tanami has procedures for dealing with hydrocarbon and chemical spills in place at the Coyote mine site. These will also apply to the Stage 2 operations.

3.9 Dangerous Goods and Hazardous Substances

Minor quantities of other chemicals such as paint and solvents may be stored at the workshop. These substances will be kept in a compliant dangerous goods cabinet.

Explosives will be transported from the magazine facility at the Coyote mine site when required. There will be no storage of explosives or associated equipment on site. The drill and blast contractor has an existing emergency response procedure that will apply to this operation.

There will be no requirement for bulk storage or transport of any other dangerous goods or hazardous substances during the Stage 2 mining operation.

3.10 Noise

All mining equipment will be fitted with the required noise attenuation equipment to meet Australian occupational health and safety requirements. Hearing protection will be supplied to personnel where required.

The Project site is remote from any residence and is almost 50km from the camp, so noise will not be an issue for personnel.

3.11 Energy Efficiency and Carbon Offsetting

The increase in global Greenhouse Gas emissions (specifically carbon dioxide) is linked to the Global Warming phenomenon. The expected result of Global Warming is an increase in average temperature on a global scale and more frequent incidence of extreme climatic conditions (such as droughts, floods and storms). Dramatic, rapid changes to climate will impact severely on all ecosystems.

Tanami is committed to continuous improvement and employment of ‘Best Practice’, and as such is progressively implementing energy efficiency methodologies into daily practices. Using energy efficiently allows Tanami to reduce greenhouse gas emissions and subsequently assists in reducing the overall environmental impact of their operations.

Tanami has identified the major contributors of carbon emissions resulting from its operations as:

- Power generation for operation of the processing plant and general site electricity requirements;
- Operation of the mining fleet; and
- Flights to and from the site.

Following is an explanation of how energy efficiency practices are being implemented within the organisation to help reduce energy consumption and subsequent carbon emissions.

3.11.1 Flights

Charter flights from Perth are now direct to Coyote mine site. Initially, travel to site involved two indirect flights followed by an 80km drive to site from Balgo. Direct flights have significantly reduced the amount of fuel used, and so the quantity of carbon emitted from the fly in/fly out arrangement, which is necessary for a remote mining operation. Flights travel at maximum capacity and weight limits apply to maximise fuel efficiency.

Where possible telephone conferencing is used to reduce the need for unnecessary site visits.

3.11.2 Road vehicles

Daily transportation of site personnel to and from the mine site is by use of a bus and car pooling. All staff are expected to commence work on site at the same time to reduce the need for frequent trips and vehicles generally travel at full capacity.

Staff working in the city office are encouraged to use public transportation and alternative modes of transport to and from work. Parking is not provided for all staff and bicycles are able to be stored securely during the day.

3.11.3 Mining equipment

Trucks and other mining equipment (including excavators, front end loaders, forklifts, cranes) run only when in use and are not left idling for extended periods. Regular servicing of machinery ensures maximum fuel efficiency is achieved.

3.11.4 Alternative Sources of Energy

Tanami will continue to investigate sources of renewable energy suitable for mine site use. The most likely of these will be the use of biodiesel which could potentially be supplied from a plant under construction in Darwin. At this stage there is insufficient supply of biodiesel in Australia for this option to be viable.

Solar hot water heating will be considered as part of a proposed camp upgrade. Solar heating is unsuitable for the current facilities as insufficient hot water can be supplied to service communal shower blocks.

3.11.5 Lighting

Most onsite offices and head office in Perth are lit with fluorescent tube lighting, a more energy efficient form of lighting than conventional light globes. Over time light globes at the mine site and in the camp will be replaced with energy efficient globes. Energy efficient lighting will be installed in all new facilities. Lights are required to be turned off at the end of the working day, or when not in use.

3.11.6 Air conditioning

Perth and site office air conditioning does not run outside office hours. Site personnel are encouraged to turn off air conditioners when they leave their accommodation.

3.11.7 General amenities

Modern, energy efficient equipment such as computers, photocopiers, printers and televisions are purchased by the company.

Physical activities and utilisation of non-carbon producing facilities such as the gymnasium are encouraged.

In an effort to reduce waste and point-of-production energy use, Tanami will be supplying site staff and long-term contractors with a pack containing reusable food storage containers and a travel mug for use while on site. This will replace the plastic take away containers and disposable cups common on many mine sites.

3.11.8 Energy Efficiency Opportunities Act 2006

Tanami's operations do not trip the threshold of energy use for the Energy Efficiency Opportunities Act however the company chooses to adopt the principles the Act outlines. This includes record keeping of fuel use, calculating the capital outlay versus energy usage of machinery over the long term, investigating alternative and renewable energy sources and reducing energy use where possible.

3.11.9 Carbon offsets

Carbon offset is the process of reducing the net carbon emissions of an individual or organisation, either by their own actions, or through arrangements with a carbon offset provider. As the concept of carbon trading is still relatively new and the Coyote Project is a small, short-term operation, Tanami does not intend to engage external provision of carbon offsetting. Instead, the company will focus on ways that carbon emissions from the operation can be reduced. This will be achieved using those methods outlined above and continued investigation of new technologies and methods that assist in improving energy efficiency.

3.12 Induction and Training

All employees, contractors and visitors to the Coyote mine site are required to attend the site induction, which has a strong environmental focus. The induction is revised and re-run at regular intervals to keep personnel informed of changes and developments in environmental management of the Project. The induction will be updated to include aspects relevant to Stage 2 of the project.

An environmental handbook has also been developed and is issued to all personnel at the induction.

A copy of the current site induction and handbook is included as Appendix 5.

4 Existing Environment

4.1 Regional Setting

The Tanami bioregion comprises mainly red Quaternary sandplains overlying Permian and Proterozoic strata which are exposed locally as hills and ranges. The sandplains support mixed shrub steppes of hakea, acacia and grevillea over *Triodia pungens* hummock grasslands.

Acacia shrublands over hummock grass communities occur on the ranges. Alluvial and lacustrine calcareous deposits occur throughout. In the north they are associated with Sturt Creek drainage, and support short-grasslands often as savannas with emergent eucalypt species. The climate is arid tropical with summer rain.

4.2 Climate

Climatic information is based on data collected by the Bureau of Meteorology (BoM) from the Balgo Hills weather station, approximately 90km south-west of the site.

4.2.1 Temperatures

Mean annual maximum temperature for the region is 34^{0}C, with a mean annual minimum of 20^{0}C. Daily maxima above 40^{0}C are usual from October to March. The coldest month is July when some frosts can be expected. Diurnal temperature variations are commonly high throughout the year.

4.2.2 Rainfall

The area is semi arid and has an average rainfall of 336 mm (Balgo Hills). Most of the rain falls from December to March but the amount varies greatly both seasonally and annually. The highest recorded daily rainfall is 117 mm (Bureau of Meteorology – 2004 data). An extreme rainfall event occurred in January 2006 when 8 inches (approximately 200mm) of rainfall was recorded over night in a rain gauge at the Coyote camp.

4.2.3 Winds

The average wind speeds at Balgo Hills throughout the year vary from 11.6 - 20.7 km/h in the morning to 9.8 -11.7 km/h in the afternoon. An easterly trend is dominant throughout most of the year.

4.2.4 Evaporation and Humidity

Evaporation is high with an average daily rate of 8.9 mm, equivalent to an annual evaporation of 3,250 mm.

Humidity levels vary considerably both daily and yearly. The mean monthly 9.00 am relative humidity varies from a low of 22% in September to a high of 50% in June. The mean monthly 3.00 pm relative humidity varies from a low of 17% in July/August to a high of 35% in February.

4.3 Soils and Soil Profiles

Soils in both the Sandpiper and Kookaburra deposits are predominately sandy and relatively shallow as the deposits sit on a lateritic outcrop. Pesolite gravel is found throughout the upper soil profile.

Topsoil (0 – 200mm) will be stripped and stockpiled for use in rehabilitation. As the topsoil is shallow and may be in short supply for rehabilitation, sub-soil (200mm – 400mm) may also be stripped and blended with the topsoil to produce a suitable growing medium. The sub-soil is essentially the same sandy material as the topsoil but is devoid of organic matter. A composite sample (0 – 400mm) of topsoil and sub-soil was collected from locations throughout the two sites and has been analysed by SGS Environmental Laboratories, a NATA accredited company. The results indicate soil pH close to neutral (pH 6.9), low Electrical Conductivity (29 µS/cm) and very low levels of Nitrogen and Phosphorous (<5 and <1 mg/kg respectively). The laboratory report is included as Appendix 8.

Australian soils are typically low in nutrients and native plant species have evolved accordingly. Revegetation monitoring at the Coyote mine site has demonstrated rapid recovery of native flora in rehabilitated areas without the addition of fertiliser. Addition of nutrients can result in an influx of weeds and other “increaser” species that out-compete the normal vegetation. The revegetation strategy is discussed in Section 6.

4.4 Geology

4.4.1 Regional Geology

The Tanami Region is centred 600 km northwest of Alice Springs and straddles the Northern Territory-Western Australian border. The geology is dominated by Palaeoproterozoic metasediments and felsic intrusives, with the metasediments unconformably deposited onto Archaean felsic gneiss. Numerous siliciclastic-dominated sedimentary packages unconformably over-lie the Palaeoproterozoic basement.

4.4.2 Local Geology and Mineralisation

The Sandpiper and Kookaburra deposits are hosted within the Lower Proterozoic Killi Killi sequence of the Tanami inlier. The lithologies present within the mine sequence are turbiditic in nature and range from mudstones through to coarse sandstones (conglomeritic) in nature. Dolerite intrusions bedding parallel are common in these lithologies.

At the Sandpiper deposit mineralisation occurs along the southern, overturned limb of a recumbent anticline which plunges at approximately 60º to the east and has an axial planar dip of approximately 60º to the northeast. Mineralisation is concentrated in the fine-grained sedimentary horizons in the centre and eastern parts of the deposit where it consistently strikes east-west. A late stage steeply south dipping fault, striking approximately 290º produces a metre to decimetre-scale sinistral offset to mineralisation and stratigraphy in the eastern half of the deposit. Figure 4.1 shows a cross section of the Sandpiper deposit.

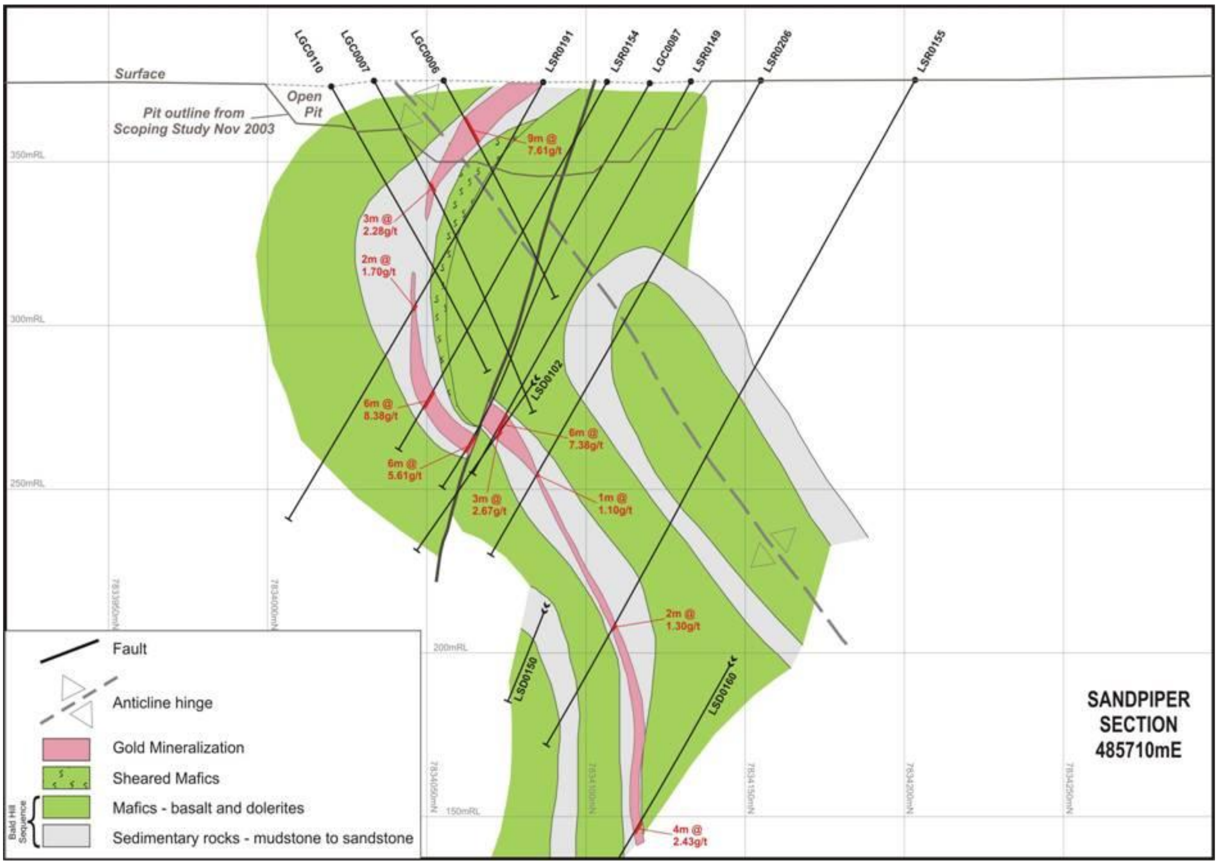


Figure 4.1 Sandpiper deposit cross section.

At the Kookaburra deposit the Bald Hill rocks are folded into a recumbent, southeast plunging syncline with an axial planar dip of approximately 50-80º to the northeast and a plunge of approximately 60º to the southeast (Figure 4.2). The interpretation of a synclinal structure is based on the facing direction of upward-fining sandstone beds with sharp basal contacts recognised in diamond core on both limbs of the fold.

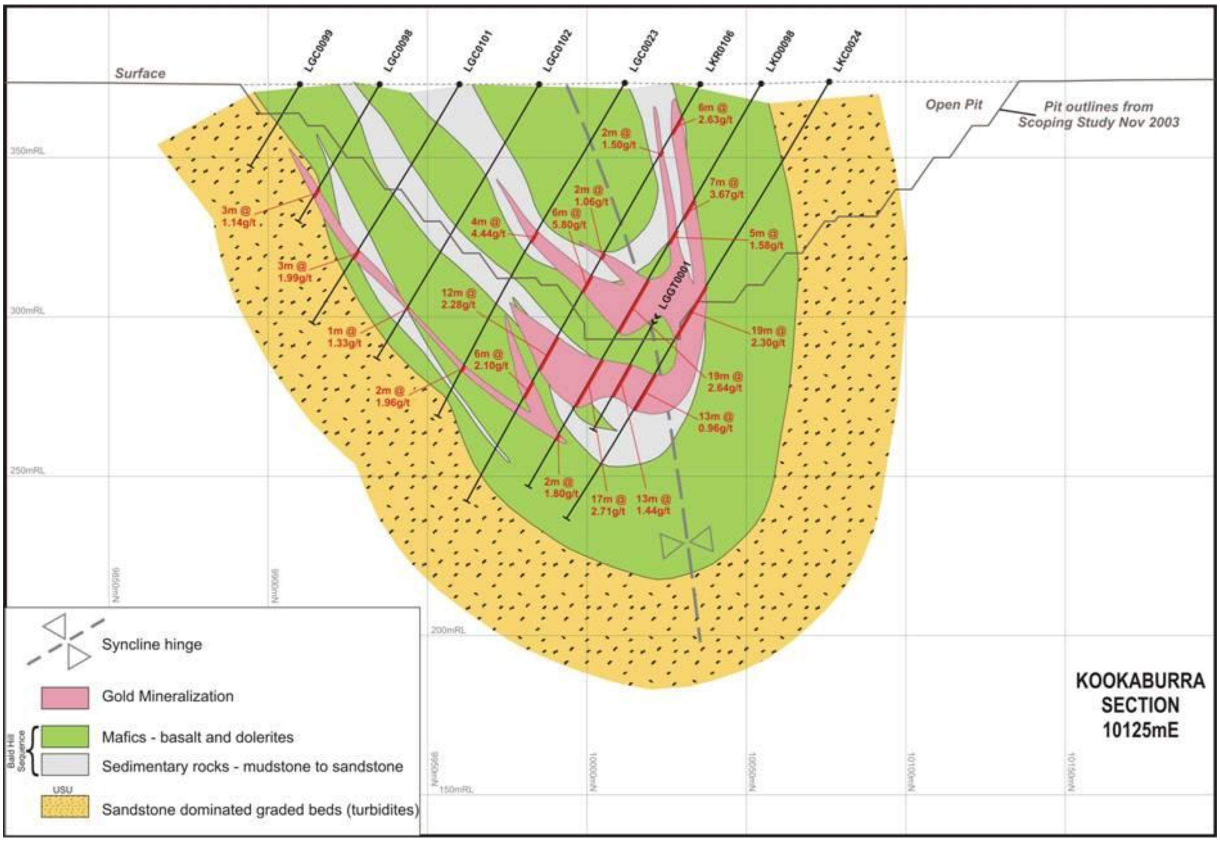


Figure 4.2 Kookaburra deposit cross section.

The mineral of intrinsic economic interest at Kookaburra and Sandpiper is gold. The resource estimation conducted on the deposits is included in the following tables.

Deposit	Indicated			Inferred			Total		
	Tonnes	g/t	Ounces	Tonnes	g/t	Ounces	Tonnes	g/t	Ounces
Kookaburra	1,146,000	2.2	80,000	296,000	1.4	14,000	1,442,000	2.0	94,000
Sandpiper	983,000	3.0	96,000	223,000	2.4	17,000	1,206,000	2.9	113,000

Table 4.1 Resource summary of the Sandpiper and Kookaburra reported resources.

The resource was created by Widenbar & Associates and was reported in accordance with the JORC code of practice. The reserves of the mine were undertaken by MineComp Pty Ltd at a gold price of US$625/oz. This was also undertaken to the JORC reporting standards. Table 4.2 shows the predicted reserves for the mining operation.

Deposit	Proven			Probable			Total		
	Tonnes	Grade	Ounces	Tonnes	Grade	Ounces	Tonnes	Grade	Ounces
Kookaburra	-	-	-	328,000	3.0	32,000	328,000	3.0	32,000
Sandpiper	-	-	-	89,000	3.6	10,000	89,000	3.6	10,000
Total Open Pits				**673,000**	**4.7**	**101,000**	**673,000**	**4.7**	**101,000**

Table 4.2 Sandpiper and Kookaburra Reserves.

The Sandpiper open pit is designed to develop to a depth of 50m, while the Kookaburra open pit will extend to 72m.

All sulphide material within the waste rock has been weathered and only relict textures (iron stained pits) have been observed in this horizon.

4.5 Hydrology

4.5.1 Surface Hydrology

Surface hydrology of the Tanami Desert is characterised by ill-defined watercourses, pervious sandy topsoils and deep sands. There is little evidence of surface runoff flows except where the soil surface has been disturbed, such as exploration grid lines and tracks. Such disturbance is typically prone to erosion.

The Sandpiper and Kookaburra deposits are located on a slight lateritic rise with runoff generally moving in a south-easterly direction. A fall of less than 2m is apparent from the northern to the southern extent of the Stage 2 project area. Figure 3.2 provides a surface water flow diagram based on the contours of the area.

4.5.2 Subsurface Hydrology

URS was commissioned to conduct a Dewatering Feasibility Investigation of Stage 1 and 2 of the Coyote mining operation.

No records were found of any previous hydrogeological investigations within the Stage 2 area. A previously constructed bore at the Kookaburra deposit (KB), and purpose-built production and monitoring bores (LPB1 and LMB1) at the Sandpiper deposit were used for the hydrogeological investigation.

Aquifers in the project area predominantly occur in zones of fractured or structurally deformed and largely unweathered bedrock. These features primarily control local groundwater occurrence and flow. The aquifers are typically inhomogeneous, anisotropic and irregular in their dimensions and form. The static groundwater level is 19 - 20m below ground surface.

The groundwater in the project area is saline. TDS (gravimetric) ranges from 23,000 to 26,000 mg/L with EC ranging from 36,000 to 41,000 µS/cm. Field measurements of groundwater samples from the two bores at the time of construction all gave values within the range pH 7.7 - 7.9. A full chemical analysis of the water samples collected was conducted by SGS Environmental Laboratories. A summary of the results is included as Table 4.3. The full analysis report is included as Appendix B of the URS investigation report (Appendix 6).

Groundwater Analysis Summary - Sandpiper and Kookaburra Deposits				
	Units	**LPB01**	**LMB01**	**KB**
pH	pH units	7.3	7.4	7.3
EC @ 250^{0}C	µS/cm	41000	41000	36000
TDS (calc. as Na CL)	mg/L	26000	26000	23000
TDS (grav.) @ 1800C	mg/L	27000	27000	23000
Total Alkalinity as CaCO3	mg/L	250	180	250
Iron, Fe (soluble)	mg/L	<0.05	<0.05	<0.05
Aluminium, Al	mg/L	0.2	0.2	<0.1
Sodium, Na	mg/L	5700	6000	5600
Potassium, K	mg/L	140	140	140
Calcium, Ca	mg/L	1000	1100	940
Magnesium, Mg	mg/L	1700	1600	1200
Chloride, Cl	mg/L	12000	12000	13000

Table 4.3 Summary of groundwater analysis in the Sandpiper and Kookaburra area.

4.6 Flora and Vegetation

4.6.1 Background and Survey Methodology

In accordance with the Environmental Protection Authority's Guidance Statement Number 51 (EPA 2004a), Stage 2 of the Coyote Project would be considered a high impact project (area of disturbance exceeds 75ha) and therefore requires Level 2 survey work. Level 2 surveys are defined by the EPA as:

Level 2 Surveys	*Incorporates Background research and Reconnaissance survey as preparation for more intensive survey that may range in form between detailed and comprehensive survey.* ***Detailed survey*** *The purpose is to enhance the level of knowledge at the locality scale. This applies where the general context is better known. This involves: i) one or more visit/s in the main flowering season and visit/s in other seasons; and ii) replication of plots in vegetation units, and greater coverage and displacement of plots over the target area.* ***Comprehensive survey*** *The purpose is to enhance the level of knowledge at the locality scale and the context at the local scale. In some cases sub-region survey may be required to provide wider context. This applies where there is only broad general context. This involves survey, at the intensity applied in detailed survey, of both the locality and parts of the local area. Such work is likely to be more structured with longer-term study and multiple visits.*

Table 4.4 Definition of Level 2 Surveys as described in Guidance Statement 51.

4.6.2 Biogeographic Region

The Coyote Project is located within the Tanami Bioregion, as defined under the Interim Biogeographic Regionalisation for Australia (IBRA). This system was developed in 1993-94 and is largely based on work by J.S. Beard completed in the 1970s. This regionalisation allows the Commonwealth, States and Territories to assess and plan for the protection of biological diversity using a uniformly recognised system.

Under the IBRA system, the Tanami Region is described as:

"Mainly red Quaternary sandplains overlying Permian and Proterozoic strata which are exposed locally as hills and ranges. The sandplains support mixed shrub steppes of Hakea suberea, desert bloodwoods, acacias and grevilleas over Triodia pungens hummock grasslands. Wattle scrub over T. pungens hummock grass communities occur on the ranges. Alluvial and lacustrine calcareous deposits occur throughout. In the north they are associated with Sturt Creek drainage, and support

Crysopogon and Iseilema short-grasslands often as savannas with River Gum. Arid tropical with summer rain." (Dept of Environment and Conservation, 2006).

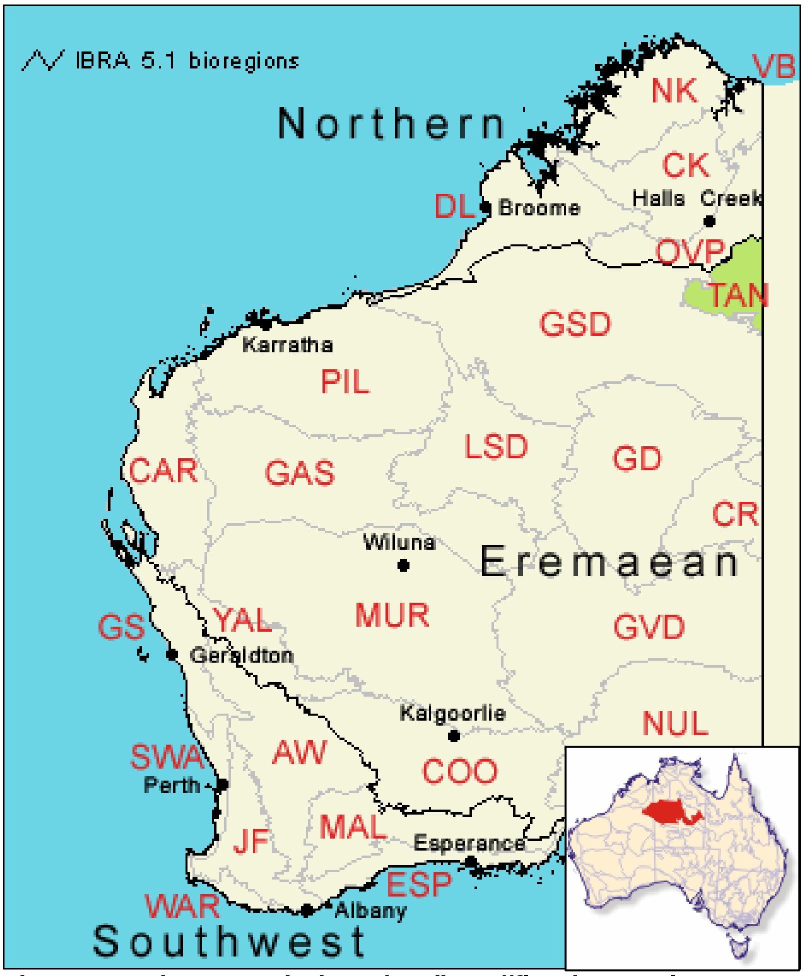


Figure 4.4 The Tanami Bioregion (http://florabase.calm.wa.gov.au)

4.6.3 Survey Effort and Coverage

The initial flora and vegetation survey was conducted by Martinick Bosch Sell Pty Ltd (MBS Environmental) in 2004 (Appendix 9). This survey was conducted prior to commencement of mining activity and covered the Coyote mine site area, proposed haul road route and the Kookaburra and Sandpiper location. The survey was carried out at the Level 1 "Reconnaissance" level however due to favourable conditions data collected exceeds the expectations of the EPA's guidance for this level of survey.

Since commencement of mining activity Ecotec (WA) Pty Ltd (Ecotec) has conducted further survey work of the region. This has included a reconnaissance survey of a large area to the south of the Coyote mine site, collection of incidental records from the Coyote mine site, haul road and Stage 2 areas and establishment of a number of vegetation monitoring sites around the existing mine site. Such survey work is intended to continue throughout the life of the Coyote Project.

The information collected over the past 12 months has resulted in a better understanding of the flora and vegetation of the area and an increased list of flora species known to inhabit the region. The information collected during survey work carried out to date is at a level meeting the EPA's requirements for a Level 2 Survey.

4.6.4 Flora

Vegetation and flora studies have been undertaken of the proposed mine site, haul road and surrounding area likely to be impacted by the Stage 2 operation.

MBS Environmental conducted a survey of the Coyote and Bald Hill areas between 8th and 13th June 2004 (Appendix 9). Ecotec has continued survey work in the Stage 2 area and the surrounding region since commencement of the Coyote Project.

A combined total of 145 flora species from 41 families have been recorded during surveys in the Stage 2 area and surrounding region. The most common families are Poaceae (26 species), Mimosaceae (12 species) and Myrtaceae (11 species). The most commonly recorded genera are *Acacia* (12 species).

A list of the flora species recorded between August 2004 and August 2006 is included as Appendix 10.

No Declared Rare Flora (DRF) or Priority Listed flora species have been located in the area.

4.6.5 Vegetation

There are three main vegetation types found in the Stage 2 area. Vegetation has been classified using the National Vegetation Information System framework, sourced from the Australian Natural Resources Atlas (http://audit.deh.gov.au/ANRA/atlas_home.cfm).

The Sandpiper and Kookaburra deposits support Acacia Shrubland and Hummock Grassland vegetation, typical of much of the surrounding region. Photographs 4.1 and 4.2 show each site and vegetation of the areas.

Photograph 4.1 The Sandpiper deposit with recent exploration activity.

Photograph 4.2 The Kookaburra deposit.

The vegetation types in the Stage 2 project area and the haul road comprise:

- Acacia Shrubland – found in the proposed mining area and at various locations along the haul road route. Typically consists of various Acacia species with scattered emergent Eucalypts (predominately *E. brevifolia* in the Stage 2 area) and occasional Grevilleas and Hakeas. The understorey is predominately *Triodia* species.

- Hummock Grassland – found in the proposed mining area and extensively along the haul road route. This vegetation type is dominated by *Triodia* (Spinifex) species (predominately *T. pungens*). On laterite rises the Spinifex is interspersed with (predominately) *Acacia hilliana* (Photograph 3.5).

- Sand Dune – found at several points along the haul road route. This vegetation type is essentially Acacia or Grevillea Shrubland growing on a sandy ridge. Typically these areas do not support Eucalypts but most other species present are found within the more common Acacia Shrubland vegetation.

Photographs 4.3 to 4.6 show vegetation typical of each of these types.

Photograph 4.3 Typical Acacia Shrubland vegetation.

Photograph 4.4 Typical Hummock Grassland vegetation along the proposed haul road route.

Photograph 4.5 Typical Hummock Grassland vegetation on a laterite rise with interspersing *Acacia hilliana*.

Photograph 4.6 Typical Sand Dune vegetation on the route of the proposed haul road.

4.6.6 Flora of Conservation Significance

A search of the databases of the Department of Conservation and Land Management (CALM) and the Department of Environment and Heritage (DEH) was conducted for the presence of threatened flora in the surveyed area prior to work carried out by MBS Environmental. The search indicated no records of Declared Rare or Priority flora species in the area.

An additional search of the Department of Environment and Conservation (DEC) Threatened Flora Database was conducted in 2006, and again returned no result for the project area. The search was extended to cover the Tanami region and indicated five Priority listed flora species. A search of Florabase indicates an additional two Priority species previously recorded in the Tanami. Table 4.2 lists the Priority flora species previously recorded in the Tanami Region. None of these species have been located within the project area.

Species	Priority	Identified via
Trachymene villosa	P1	Florabase
Goodenia crenata	P3	Florabase DEC database search
Goodenia modesta	P3	Florabase
Goodenia suffrutescens	P1	Florabase DEC database search
Hibiscus brachysiphonius	P3	Florabase DEC database search
Eragrostis crateriformis	P3	Florabase DEC database search
Kohautia australiensis	P2	DEC database search

Table 4.5 Priority listed flora species recorded in the Tanami region of Western Australia

The Native Walnut (*Owenia reticulata*) is of cultural significance to the local Aboriginal people and Tanami has made a commitment to avoid disturbance of this species. It has not been located in the Stage 2 mining area.

4.6.7 Weeds

Five weed species have been identified within the Coyote Project area. In the Stage 2 mining area and proposed haul road Gallon's Curse (*Cenchrus biflorus*) and Buffel Grass (*Cenchrus ciliaris*) have been found. The seed of these species can be transported by wind, surface water runoff, vehicles and animals. These and numerous other species are established in the Tanami Region and are not necessarily restricted to areas of disturbance.

Weeds Australia (http://www.weeds.org.au) lists 28 "significant" weeds known to occur, or with potential to occur in the Tanami Region. These species are considered to be environmental weeds and have potential for significant impact on the habitats in which they become established. Buffel Grass is included in that list.

Regular inspections of the existing Coyote mine site are carried out to locate weed infestations. These inspections will be expanded to include the haul road and the Stage 2 mining area. Weed control measures will be implemented if necessary. Appendix 10 includes the weeds identified in the Coyote Project area.

Office facilities at the Stage 2 mining area will not be long term structures. Landscaping, gardens and lawns will not be included in establishment of the site.

4.6.8 Threatened Ecological Communities

There are no Threatened Ecological Communities (TECs) in the project area.

Proposed Nature Reserves (PNR) exist some distance to the north and south of the project area. Approximately 40 km north of the Stage 2 area is PNR 219. The Ranges of The Western Desert PNR is located approximately 45km south of the Stage 2 site.

4.7 Fauna

4.7.1 Background and Survey Methodology

MBS Environmental was engaged in 2004 by Tanami Gold to undertake the initial fauna survey of the project area. Biota Environmental Sciences Pty Ltd (Biota) then undertook a 2-phase fauna habitat and fauna assemblage survey of the project area in 2004 and 2005. Further fauna survey work has been carried out by Ecotec since commencement of the mining project.

In accordance with the Environmental Protection Authority's Guidance Statement Number 56 (EPA 2004b), Stage 2 of the Coyote Project would be considered a high impact project (area of disturbance exceeds 75ha) and therefore requires Level 2 survey work. Level 2 surveys are defined by the EPA as:

Level 2 Surveys	*Incorporates Background research and Reconnaissance survey as preparation for more intensive survey that may range in form between detailed and comprehensive survey.* ***Detailed survey*** *The purpose is to enhance the level of knowledge at the locality scale. This applies where the general context is better known. This involves: i) one or more visit/s in each season appropriate to the bioregion and the faunal group being surveyed. Generally maximum survey will be the season that follows the season of maximum rainfall but there will be need to time surveys according to seasonal activity patterns of some faunal groups (e.g. molluscs or amphibians).* ***Comprehensive survey*** *The purpose is to enhance the level of knowledge at the locality scale and the context at the local scale. In some cases sub-region survey may be required to provide wider context. This applies where there is only broad general context. This involves survey, at the intensity applied in detailed survey, of both the locality and parts of the local area. Such work is likely to be more structured with longer-term study and multiple visits.*

Table 4.6 Definition of Level 2 Surveys as described in Guidance Statement 56.

4.7.2 Survey Effort and Coverage

Fauna surveys were undertaken by Biota in October 2004 (Appendix 11) and June 2005 (Appendix 12). The Biota surveys concentrated on the Coyote mine site area, proposed haul road route and the Stage 2 area. The June survey included Richard Southgate, regarded as one of Australia's foremost experts on Mulgara and Bilby. Southgate's report is included as Appendix 13.

Ecotec has continued survey work on the proposed haul road route and in the surrounding region since commencement of mining activity. The surveys have utilised trapping and incidental sightings to continue compilation of the fauna species present in the area. In June 2006 a series of pit fall traps were established along a 2.5 km length of sand dune habitat on the proposed haul road route. 16 traps were positioned in groups of four over the area and have been opened at regular intervals since that time. Elliot traps are used in conjunction with the pit falls. The intent of this trapping exercise is to establish a baseline inventory of fauna species present in this habitat which can be used as a basis for a monitoring program while the haul road is in operation. Results of the trapping program to December 2006 are included as Appendix 14.

4.7.3 Habitats

A range of habitats can be found in the project area. Habitats identified include:

- Shrubland - usually dense Acacia or Grevillea shrubs over Triodia spp;
- Hummock Grassland/Sandplain - varying between closed and open grassland dominated by Triodia spp;
- Sand Dune - in the project area these are usually densely vegetated and reach a maximum height of around 5 m above ground surface;
- Rocky Outcrop - generally sparsely vegetated and frequented by reptiles and small mammals that use the rocks for shelter;
- Laterite Rise - often indistinguishable from Sandplain vegetation until closer inspection. Supports Triodia spp and ground dwelling shrubs such as *Acacia hilliana*;
- Laterite or Stony Hill - generally sparsely vegetated with Triodia spp, with *T. basedowii* being the most common species; and
- Drainage Lines - typically ill-defined but characterised by denser stands of Eucalypts.

4.7.4 Vertebrate Fauna

The combined survey work of MBS Environmental, Biota and Ecotec has recorded 131 vertebrate species of an expected 229. Observations so far include 65 species of bird, 18 native mammals, 2 introduced mammals, 43 reptiles and 3 species of frog.

A species of Pebble Mound Mouse found during the Biota surveys on one of the hills in the area has been identified as *Pseudomys johnsoni*, a relatively common species with a range extending from Shark Bay in Western Australia to the Northern Territory. The population appears to be a southern extremity of the known distribution of the species (Dr T Start pers. comm.) The hill is over 2km north of the mining operation and will not be impacted by mining or haul road activity.

A list of the vertebrate fauna recorded between 2004 and 2006 is included as Appendix 15.

4.7.5 Invertebrate Fauna

Biota carried out an invertebrate fauna inventory survey during the work conducted in 2004 and 2005. Invertebrates collected were identified to order or family level where possible. With assistance from the Western Australian Museum it was deemed unlikely that any of the insect groups represented contained any short range endemic species. Details of the invertebrate survey are including in the documents in Appendices 11 and 12.

Stygofauna sampling of the proposed mining area was conducted by Biota in February 2005. A potentially new species of the minor crustacean group, the Parabathynellids, was recovered from bores in the Coyote area and from a bore 28km to the west. No stygofauna was found in samples collected from the bores at Kookaburra and Sandpiper. Another bore located approximately 10km north of the Stage 2 site was sampled and also returned no result. Further investigation into the distribution of stygofauna in the surrounding region will be carried out in the future.

4.7.6 Fauna Consultation

Tanami have consulted a wide range of specialists for their investigations of potential impacts on the Mulgara, Bilby and other fauna of conservation value in the region. Specialists from the Department of Environment and Conservation, the Western Australian Museum and the South Australian Museum were consulted for expert advice and the preparation of management plans to assist in prevention of adverse impacts as a result of the proposed mining project.

Most of the specialists listed below were consulted during the initial stages of seeking approval for the Coyote Project in 2004/2005. At that time the Sandpiper and Kookaburra pits formed part of the project and, as such, consultation included these areas.

Dr Pip Masters, Dr Tony Start, Dr Tamra Chapman, Dr David Pearson and Dr Bill Low have been individually consulted during preparation of the Stage 2 Mining Proposal and the EPS to provide expert advice on Mulgara, Pebble Mound Mice, wildlife management and the possible impacts of post-mining pit voids. Comments and suggestions provided by the various specialists have been considered in preparation of this document and included where appropriate.

Since preparation for the Coyote Project began specialist consultation has included:

Dr David Pearson (Mulgaras and Bilbies)
Research Scientist
Woodvale Wildlife Research
Department of Environment and Conservation

Dr Ric How (General fauna)
Senior Curator
Terrestrial Vertebrates
Western Australian Museum

Dr Pip Masters (Mulgaras)
PO Box 305
Kingscote
Kangaroo Island, SA, 5223

Ms Norah Cooper (Mammals)
Head of Department
Terrestrial Vertebrates
Western Australian Museum

Mr Ric Southgate (Bilbies)
PO Box 305
Kingscote
Kangaroo Island, SA, 5223

Dr Paul Doughty (Herpetofauna)
Curator
Terrestrial Vertebrates
Western Australian Museum

Mr John Dell (Mulgaras and Bilbies)
Environmental Officer
Conservation Branch
Policy and Coordination Division
Department of Environment

Mr Ron Johnstone (Avifauna)
Senior Curator
Terrestrial Vertebrates
Western Australian Museum

Dr Mark Harvey (Short range endemics)
Head of Department
Arachnology
Western Australian Museum

Dr Tamra Chapman (Wildlife management)
Zoologist
Species and Communities Branch
Department of Environment and Conservation

Dr Tony Start (Pebble mound mice)
Zoologist
Department of Environment and Conservation

Mirjana Jambrecina (Mulgara)
Natural Cultural Resource Manager, Uluru-Kata Tjuta National Park

Dr Bill Low (Impact of abandoned open pits)
Ecologist
Low Ecological Services Pty Ltd
Alice Springs

Mr Vern Wilson (Pit water)
Principal Hydrogeologist
Parsons Brinckerhoff
Perth

4.8 Fauna of Conservation Significance

Twelve fauna species with conservation significance are known to inhabit the project area or have been recorded in the wider Tanami Region.

Prior to commencement of mining, only four of these had been recorded within the area surrounding the Coyote Project. Since commencement of the Project, the Woma (*Aspidites ramsayi*), the Bush Stone-curlew (*Burhinus grallarius*) and the Bilby have been sighted close to the mine site. Sightings of Major Mitchell's Cockatoos (*Cacatua leadbeateri*) and Australian Bustards (*Ardeotis australis*) are almost daily occurrences. Considerable evidence of Mulgara activity has been found in the vicinity since survey work commenced in 2004 including the capture of one female in 2005 (Biota, 2005) and two males in Elliot traps in December 2006 (Ecotec, 2007).

Table 4.7 lists the species of conservation significance in the Project area, with the Western Australian, International Union for the Conservation of Nature and Natural Resources (IUCN) and Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) conservation levels.

The IUCN categories are based on the perceived threats to the survival of the species as a whole.

Tables 4.8 and 4.9 provide definitions for the codes used, with the EPBC category definitions being essentially the same as those of the IUCN.

Following Table 4.9 is a description of each of the threatened species and the perceived threats and management methods proposed to be implemented during the Stage 2 mining project.

Species	WA Conservation Level	IUCN Conservation Ranking	EPBC Ranking	Recorded During Surveys
Mulgara *Dasycercus cristicauda*	Schedule 1	VU	VU	**Yes**
Bilby *Macrotis lagotis*	Schedule 1	VU	VU	**Yes**
Southern and Northern Marsupial Mole *Notoryctes typhlops* and *N. caurinus*	Schedule 1	EN	EN	No
Giant Desert Skink *Egernia kintorei*	Schedule 1	VU	VU	No
Peregrine Falcon *Falco peregrinus*	Schedule 4	-	-	No
Major Mitchell's Cockatoo *Cacatua leadbeateri*	Schedule 4	-	-	**Yes**
Woma *Aspidites ramsayi*	Schedule 4	EN	-	**Yes**
Gravel Dragon *Cryptagama aurita*	Priority 1	-	-	No
Ctenotus uber johnstonei	Priority 2	-	-	No
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	Priority 3	LR	-	No
Bush Stone-curlew *Burhinus grallarius*	Priority 4	NT	-	**Yes**
Australian Bustard *Ardeotis australis*	Priority 4	NT	-	**Yes**

Table 4.7 Fauna species with conservation significance recorded or potentially inhabiting the Coyote Project area.

Classification of rare and endangered fauna under the Wildlife Conservation (Specially Protected Fauna) Notice 2006 recognises four distinct schedules of taxa:	
Schedule 1	Fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection.
Schedule 2	Fauna which are presumed to be extinct and are declared to be fauna in need of special protection.
Schedule 3	Birds which are subject to an agreement between the governments of Australia, Japan and China relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection.
Schedule 4	Fauna that are in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 and 3.
In addition to the above classification, fauna are also classified under five different Priority codes:	
Priority One (P1)	Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two (P2)	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Three (P3)	Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four (P4)	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
Priority Five (P5)	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Table 4.8 Categories for threatened fauna as defined by the Department of Environment and Conservation.

IUCN Category	Description
EXTINCT (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
EXTINCT IN THE WILD (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
CRITICALLY ENDANGERED (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
ENDANGERED (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
VULNERABLE (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
NEAR THREATENED (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
LEAST CONCERN (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
DATA DEFICIENT (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

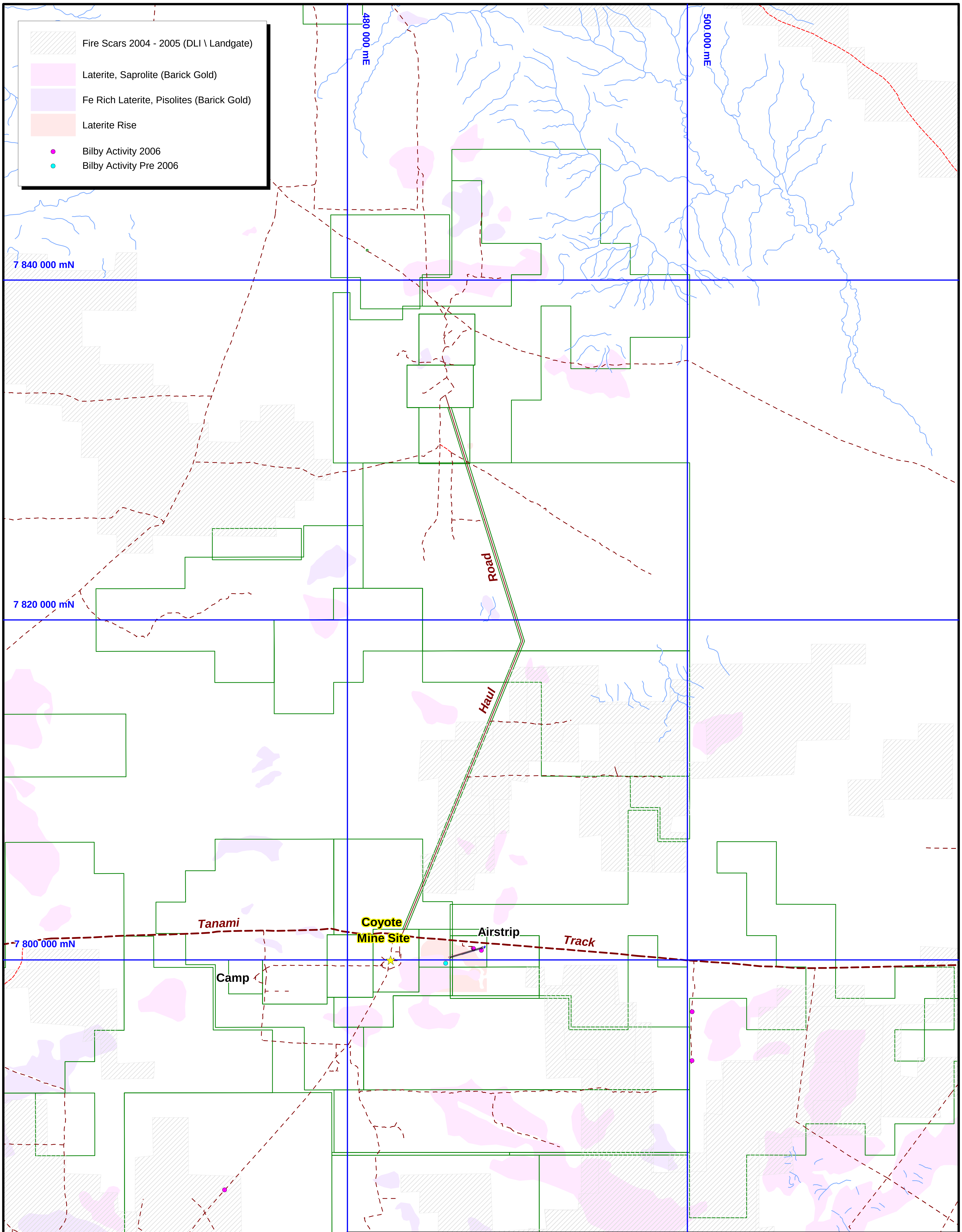
Table 4.9 IUCN categories for threatened species (IUCN Red List - www.iucnredlist.org)

4.8.1 Bilby

An area of habitat potentially suitable for the Bilby is located approximately 2km to the west of the Kookaburra deposit with another being located at the southern end of the proposed haul road, approximately 3km north of the Coyote mine site. There has been no evidence of Bilby activity found in either of these areas to date. Preferred Bilby habitat in the Tanami region is reported to be laterite rises with the probability of activity increasing if the area is burnt (Southgate, 2005 [Appendix 13] and Ecotec, 2006). These areas support a range of shrubs, including *Acacia hilliana,* the roots of which often contain insect larvae, an important food source for the Bilby. Much of the burrowing activity observed has been located on the edge of laterite rises in sandier soils, where digging appears to be easier (personal observation J. Shepherdson). Figure 4.5 shows areas of laterite rise, fire scars 2-3 years old and the locations where Bilby activity has been observed in recent survey work.

The potential habitat to the west of the Stage 2 area will not be affected by mining activity. The laterite rise near the existing mine site will have minor disturbance as a result of widening the existing track to construct the haul road. The impact on the total area of potentially suitable habitat caused by this disturbance will be insignificant and not expected to have any impact on the species.

Several Bilby sightings have been recorded within 1 km of the Coyote camp and one sighting has occurred within the active mining area. Recent burrowing and foraging activity was noted at the airstrip in December 2006. An area of abundant Bilby activity was located approximately 30 km south of the mine site during a recent survey by Ecotec for Tanami Exploration. The area had been burnt by bushfires in 2004 and supported numerous active burrows and abundant foraging activity. The Ecotec survey report is included as Appendix 16.



TANAMI GOLD NL

WESTERN TANAMI

BILBY ACTIVITY & POTENTIAL HABITAT 2006

ORIGINATOR:	DATE:	DRAWN:
J. Shepherdson	Feb 2007	A. Weston

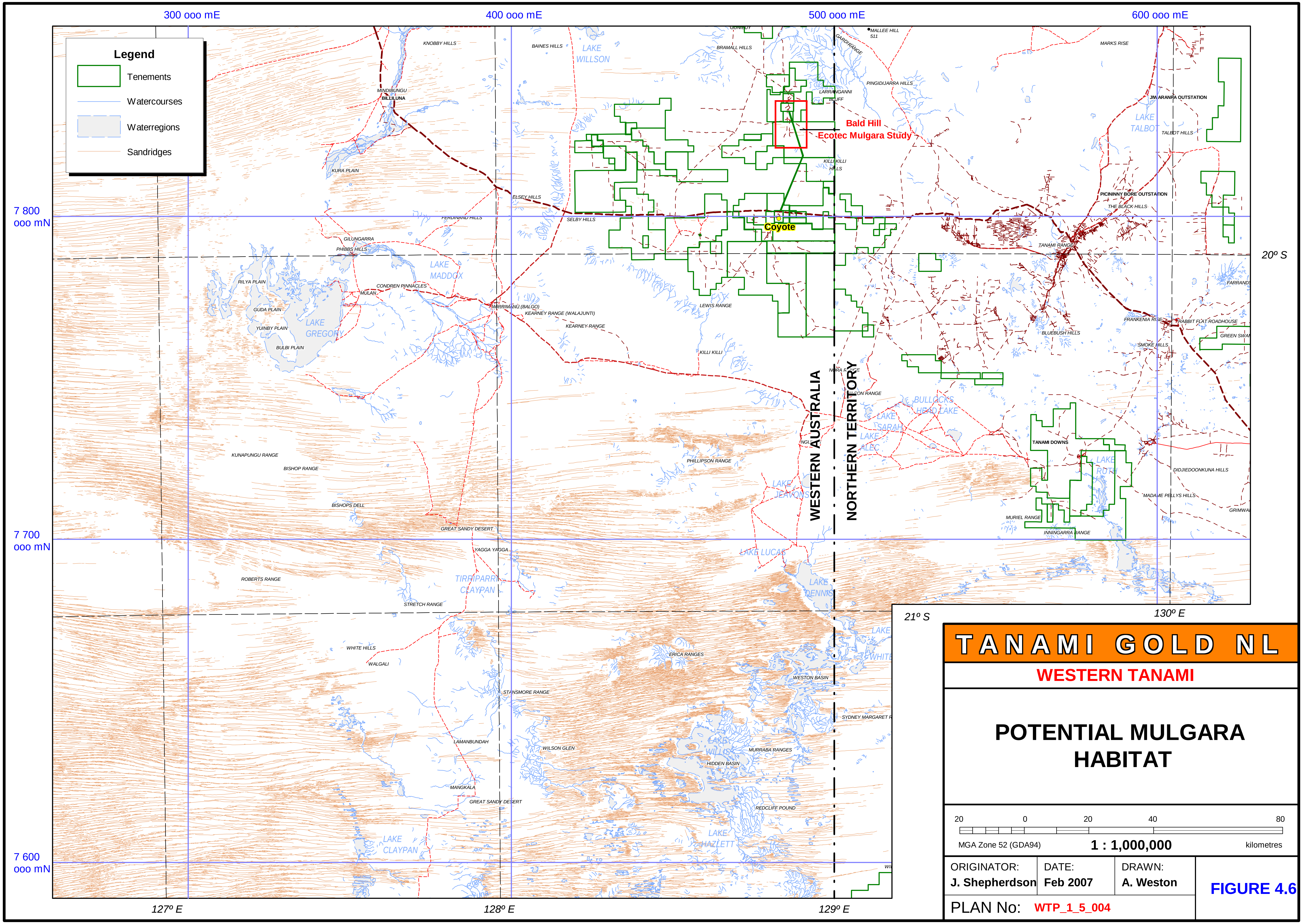
PLAN No: WTP_1_5_001

1 : 200,000

0 4 8 12

MGA Zone 52 (GDA94) km

FIGURE 4.5



TANAMI GOLD NL
WESTERN TANAMI
POTENTIAL MULGARA HABITAT
MGA Zone 52 (GDA94)
1 : 1,000,000
kilometres
ORIGINATOR: J. Shepherdson
DATE: Feb 2007
DRAWN: A. Weston
FIGURE 4.6
PLAN No: WTP_1_5_004

4.8.2 Mulgara

Mulgara occupy a range of habitats including sandplain and sandy ridges, but are normally associated with hummock grasslands. Abundant activity has been found by Biota and Ecotec within a series of small sand dunes and hummock grassland located between the Coyote mine site and the Stage 2 deposits. Biota retrieved one specimen from a burrow during the 2004 survey. Two individuals were caught in Elliot traps by Ecotec during the December 2006 trapping period (Photograph 4.7) and three in June 2007. Figure 3.3 shows the locations of recorded Mulgara activity. The Mulgara were caught in the same location on both occasions.

Photograph 4.7 Mulgara captured in December 2006.

The sand dune habitat to be intersected by the haul road route equates to a very small portion of potentially suitable habitat in the Tanami. Figure 4.6 shows the extent of sand ridges and sand dunes in the Tanami Region.

The most recent activity was recorded approximately 1.5 km to the east of the proposed haul road route in a small patch of vegetation left after a fire passed through the area (Photograph 4.8). The size of the population is not. It is likely that more than one population exists in this area as activity has also been observed to the west of the existing track. Further monitoring and survey work will continue to collect information on the activity and range of the species in this area.

The species is nocturnal, generally being active between the hours of dusk and dawn. Mulgara in the Tanami have been found to be generally sedentary and appear reluctant to move from established colonies. Peak activity is generally in the breeding season (May-August), when the range of males can increase quite significantly (Dr Pip Masters, pers. comm. Feb 2007).

Photograph 4.8 Patch of unburnt vegetation providing refuge to Mulgara, December 2006.

4.8.3 Marsupial Mole

The Marsupial Mole has not been recorded in the area. Suitable habitat is believed to be large sand dunes and dry sandy river beds, neither of which is found in the project area. The series of small sand dunes along the proposed haul road route are considered unlikely to support this species. The potential for the proposed mining activity to impact on the Marsupial Mole is therefore considered very low.

4.8.4 Giant Desert Skink

The Giant Desert Skink has not been recorded during any surveys carried out in the Coyote area to date. The species has been recorded in the Tanami Region and is known to inhabit sandplains vegetated with Spinifex. As such, there is potential for the Giant Desert Skink to exist in the area, however the small scale of Stage 2 of the Coyote Project is unlikely to impact the conservation status of this species.

4.8.5 Peregrine Falcon

The Peregrine Falcon occurs in a wide range of habitats including forest, woodlands, wetlands and open country. Although not recorded during the surveys it is possible that the species would be found in the area. Given the high mobility of this bird and the relatively low impact of the project, the proposed development is not considered likely to adversely impact the species.

4.8.6 Major Mitchell's Cockatoo

Major Mitchell's Cockatoo inhabits lightly or sparsely wooded country, often near water. It is dependent on large trees, particularly Eucalypts, for nesting. The species is commonly sighted in the project area.

4.8.7 Woma

The Woma or Ramsay's Python occurs in the arid zones of Western Australia, favouring open myrtaceous heath on sandplains, and dune fields dominated by Spinifex (*Triodia* spp.). Populations extend from central Australia into the south-western edge of Queensland, and northern South Australia. Other populations are known from the Pilbara coast, north to the Eighty Mile Beach area, and south-west Western Australia, from Cape Peron south and east to the eastern Goldfields. There are very few recent records of the Woma within the southern parts of its range. Loss of habitat is one of the key threats to this species. Cats and foxes may also have a significant impact.

Several Womas have been sighted since commencement of mining at the Coyote Project, including two on the existing access track to the Stage 2 area. The species is relatively common in the region (pers. comm. local Aboriginal people and several contractors who have worked in the area for many years).

4.8.8 Gravel Dragon

Little is known of the ecology of the Gravel Dragon other than that it occurs on lateritic soils supporting *Triodia* (Spinifex) species, which are found throughout the region. It is possible that this reptile is present, however it has never been recorded in the area. Stage 2 of the Coyote Project is considered unlikely to impact on the status of the species.

4.8.9 Ctenotus uber johnstonei

Ctenotus uber johnstonei is a skink known only from the Balgo Hills area of Western Australia. Preferred habitat appears to be areas of chenopod shrubland, which is not found in the Project area. Stage 2 of the Coyote Project is very unlikely to impact on the conservation status of the species.

4.8.10 Spectacled Hare-wallaby

The Spectacled Hare-wallaby is known in the area from a road kill near Balgo many years ago and from the identification of tracks to the north of the Bald Hill area during a survey in 2004. There have been reports from Tanami Exploration employees of sightings of animals fitting this description in the Slatey Creek area well to the north of the proposed mining activity where permanent water sources exist. Preferred habitat is believed to be sandplain with Spinifex and other grasses, which is common throughout the region.

4.8.11 Bush Stone-curlew

The Bush Stone-curlew is a nocturnal animal occupying a range of habitats but likely to rest in thick scrub during the day. They have been observed at the Coyote mine site feeding on insects attracted to the lights around the site and are often encountered on the Tanami Road at night.

4.8.12 Australian Bustard

The Australian Bustard (or Bush Turkey) is commonly sighted in the area, particularly alongside roads in the morning and late afternoon. The increase in road traffic as a result of development of the haul road may result in an increased mortality rate, however the relatively small scale of the operation and the mobility of the bird make the likelihood of adversely impacting the species very low.

4.9 Introduced Species

Three species of introduced fauna have been identified in the surveys completed to date.

Cats have been sighted throughout the region, in both disturbed and undisturbed locations. Cats are a recognised threat to many native species.

Camels are regularly sighted and are known to cover vast distances of the region while grazing. There are no plans to undertake control or eradication programs.

House mice are found in the camp but have also been captured in pit fall traps well away from areas of human habitation and disturbance. Mice are controlled at the camp but there is little that can be done to control the species in undisturbed areas without impacting native fauna.

Dingoes in the area do not appear to be cross-bred with domestic dogs. Residents of the communities in the region often travel with dogs so the potential for cross-breeding exists. Horses, donkeys and cattle have not been recorded in the area, although are known to inhabit the region.

The landfill facility at the Stage 2 site will contain minimal quantities of food waste and will be covered at least weekly. As a result attraction to cats and dingoes will be minimised and the landfill is therefore not expected to contribute to the increase of populations of either species.

4.10 Land Use

The closest community is Balgo, located approximately 90 km west of the Project area. There will be no direct impact on the community as a result of the Stage 2 mining operation.

The Project area is not subject to grazing or other formal land uses. A number of sites of Aboriginal significance in the vicinity are occasionally visited by the Traditional Owners for cultural purposes. None of these will be impacted by the mining operation.

4.10.1 Aboriginal Heritage

The Coyote Project is located on the traditional land of the Tjurabalan People. Heritage surveys were conducted in 2002 utilising qualified consultants and elders from a number of the local communities. Areas of significance were identified during that time and Tanami has agreed not to access these locations. These processes were formalised in Native Title and Heritage Protection Agreements signed in April 2003.

4.10.2 Native Title

The Coyote Project is located entirely on land that has been the subject of a consent determination of native title in favour of the Tjurabalan people. Under this determination the native title is held in trust for the Tjurabalan people by the Tjurabalan Native Title Land Aboriginal Corporation (TNTLAC). Tanami entered into a Native Title, Heritage Protection and Mineral Exploration Agreement for the Tjurabalan Lands in April 2003. Following the notification by the State pursuant to Section 29 of the *Native Title Act 1993* of the intention to grant the project titles, Tanami entered into a Negotiation Protocol with TNTLAC and the Kimberley Land Council (KLC). In April 2005, Tanami signed an agreement with the TNTLAC. The purpose of the agreement is to allow the grant of mining leases to Tanami and provide benefits to the Tjurabalan people. The agreement allows for financial consideration linked to key dates and production levels as well as contribution to an education trust for the Tjurabalan people. Under the agreement Tanami employs Tjurabalan people in the current workforce and provides contracting opportunities to local Tjurabalan entities.

4.10.3 European Heritage

There are no areas or sites of European heritage located on or near the mining leases.

5 Waste Characterisation

The waste rock at Bald Hill is comprised of sediments and dolerites. The sediments are strongly weathered to a depth of 80 m.

The sediments are weathered to a saprock. The dolerites have resisted the weathering process and as such, it is anticipated that dolerites encountered will only have surficial joint weathering at the base of the pit.

The sulphides that were present within the waste rock include pyrite and arsenopyrite. These are only present in trace amounts and have subsequently been weathered and oxidised in the waste profile of the material to be mined.

The rocks themselves are a series of turbiditic sandstones, siltstones and dolerites. These rocks are considered inert, being composed predominantly of silica and silicate minerals.

Figure 3.3 illustrates the weathering profile encountered at both these deposits. This particular example shows the effect of weathering deeper than planned pit depths at both the Sandpiper and Kookaburra pits.

Saprock after Sandstone: Preservative weathering of sandstone units results in a 'bleached' saprock at 105-112m depth. Texture is recognisable (LGGT0002, Kookaburra Deposit).

Figure 3.3 Typical lithologies to be encountered and weathering profiles.

Graeme Campbell & Associates Pty Ltd (GCA) was commissioned to carry out geochemical testwork on tailings-slurry samples derived from a bench-scale-metallurgical study. The Static Testwork Programme focused on the Acid Formation Potential, Multi-Element Composition, and Mineralogy of the tailings solids samples. In addition, the quality of the tailings slurry waters was determined. The GCA report concluded that the formation of Acid Rock Drainage should be a "non-issue" for the process tailings solids to be produced from these deposits (referred to in the report as the Larranganni Deposits). The full report is included as Appendix 17.

Martinick Bosch Sell Pty Ltd (MBS Environmental) conducted characterisation analysis of the waste material to be produced from the Sandpiper and Kookaburra deposits in 2004. Analysis of samples collected from the deposits demonstrated that acid generation was very unlikely. Arsenic levels within the waste material were high but not considered likely to become significantly mobile unless pH levels were $\leq$ 3.7. Given the low potential for acid generation and the generally alkaline nature of the material tested, arsenic contamination from the waste produced from the Sandpiper and Kookaburra pits is considered unlikely. The report concluded that there were no significant geochemical problems likely. The report is included as Appendix 18.

6 Rehabilitation, Decommissioning and Closure

6.1 Guidelines

The Strategic Framework for Mine Closure (ANZMEC/MCA, 2000) will be used as a guideline for closure of the Stage 2 site.

The objective of mine closure is to return disturbed areas as close as possible to their original state. Mine closure will include:

- removal of all infrastructure;
- removal and treatment of any contaminated material (i.e. hydrocarbons);
- removal and burial of bund liners;
- rehabilitation of disturbed areas;
- ensuring the pits are made safe to prevent accidental access;
- closure of the abandonment bund; and
- establishment of photographic monitoring sites at various locations around the site.

The Coyote Project Stage 2 Decommissioning and Closure Plan has been included in Draft form as Appendix 4. This plan is intended as a “living document” and will be reviewed regularly throughout the project to take account of changing circumstances,

The Stage 2 Project area is not subject to grazing or other land uses, other than occasional activities by local Aboriginal people. Post mining land use is likely to be occasional visits by traditional owners of the land. Tanami aims to return the disturbed areas as near as possible to the original state.

6.2 Provision of funding

Tanami has allocated $120,000 to complete site closure and rehabilitation requirements in the budget for the Stage 2 project. An approximate breakdown of the costs is included in Table 6.1. Provision for rehabilitation of existing disturbance including tracks, the old camp site and exploration sites has been factored into the cost of the initial set up of the site.

Component	Approximate cost to complete
Remove buildings and other infrastructure.	$10,000
Batter waste dump to 15^0, complete water management structures, spread topsoil, contour rip.	$50,000
Backfill evaporation pond, spread topsoil, contour rip.	$10,000
Respread topsoil and rip roads, ROM and hardstand areas.	$ 5,000
Rehabilitate gravel pit.	$ 2,000
Rehabilitate haul road.	$ 3,000
Construct abandonment bunds.	$ 6,000
Seed supply and broadcast.	$12,000
Establish monitoring sites. *(ongoing monitoring is budgeted separately)*	$ 2,000
Miscellaneous work, over-runs etc.	$20,000
Approximate Total	**$120,000**

Table 6.1 Allocated budget for rehabilitation and closure.

In addition to the rehabilitation and closure budget allocated to the project, the Tanami will be required to lodge an Environmental Disturbance Bond of over $560,000 prior to commencement of operations. The bond is held by the Department of Industry and Resources to ensure that rehabilitation and site closure is completed to an appropriate standard.

6.3 General Procedures

6.3.1 Minimising Erosion

Strategies to minimise erosion caused by wind and water movement will include:

- Vegetation will be cleared progressively to minimise soil exposure time;
- Rehabilitated areas will be contour ripped following return of topsoil;
- Bunding and drainage will be constructed and sediment catchments incorporated to minimise the potential for surface water erosion across the site.

6.3.2 Clearing of Vegetation

Vegetation will be cleared progressively to minimise erosion and to enable movement of fauna away from the site.

All cleared vegetation will be stockpiled for later use in rehabilitation.

6.3.3 Topsoil Management

Topsoil will be stripped from the site prior to mining or work on infrastructure commencing. Topsoil will be stripped to a minimum depth of 250 mm and stockpiled in strategic locations for later use in rehabilitation. Topsoil will be stockpiled to a height of no more than 1 m and deep ripped to maintain aeration if it is to be stored for longer than 6 months.

6.3.4 Rehabilitation

Rehabilitation will generally involve

- Completion of earthworks to achieve a desired landform;
- Replacement of topsoil and previously cleared vegetation to a depth of approximately 150 mm;
- Contour ripping of sloping areas; and
- Seeding with locally collected seed if necessary.

Rehabilitation of disturbed areas will be carried out progressively with obsolete tracks being rehabilitated as the site is developed.

Access to rehabilitated areas will not be permitted and signage or other means of identifying these areas will be utilised. All personnel will be made aware of this requirement in the site induction.

6.4 Project Specific Areas

6.4.1 Pits

It is not planned to backfill the pits. On completion of mining each pit will be bunded in accordance with DoIR criteria for abandonment bunds. The bunds will also be utilised to prevent excessive surface water inflow. It is anticipated that water levels in the pits will return to the natural groundwater levels within three years of completion of mining. The addition of rainfall and surface runoff is likely to result in an increase in the water level. However the relatively low rainfall and extremely high evaporation rate (+3m annually) will maintain the final water level at between 10 and 20 metres below surface level. Water quality will be variable but is expected to consist of a fresh to brackish surface layer over saline subsurface water. The pit ramps will be left in place to enable fauna access and egress. Further discussion of the potential impacts and mitigation measures is included in Section 8.4.

6.4.2 Waste Dump

The waste dump will be rehabilitated progressively commencing with the lower batter. The following techniques will be used:

- Faces will be battered down to an angle of not greater than 15^0 using a bulldozer;
- An 8 m berm will be constructed at 10 m of vertical height and will be back sloped to enable containment of water;
- Bunds will be constructed across the berm at regular intervals to form water holding compartments;
- The final waste dump height will be no greater than 20 m;
- A windrow will be constructed around the outer perimeter of the upper surface of the waste dump to prevent runoff;
- A layer of topsoil will be applied over the surface of the dump and will not exceed 200 mm to minimise erosion potential;
- Vegetation will be spread over the top surface of the waste dump;
- The waste dump will be contour ripped using a bulldozer equipped with a triple tine ripper;
- It is expected that significant revegetation of endemic species will be achieved without the addition of seed. Seed will be applied at a later date if it is determined that particular flora species are missing; and
- Monitoring sites will be established at various points on the waste dump and monitoring will be undertaken until full rehabilitation of the site is considered to have been achieved.

6.4.3 Bunded Areas

Bunded areas such as the fuel farm will be rehabilitated by:

- Removal of the infrastructure;
- Removal and appropriate treatment of any contaminated material;
- Removal and burial of the liner;
- Filling the bunded area by pushing the walls in to the centre;
- Applying topsoil; and
- Contour ripping if necessary.

Saline sediment is likely to be left as a residue in the evaporation dam. On decommissioning of the dam this material will be pushed in to a trench at the centre of the structure, backfilled and then covered with a layer of coarse rock. Material forming the bund walls will then be used to create a dome-shaped mound over the saline material to assist in shedding water. The coarse rock will form a capillary break and thus reduce the potential for salts to rise to the surface.

6.4.4 Infrastructure, Roads and Hardstand Areas

Compacted areas will be rehabilitated by respreading topsoil and deep contour ripping the area. The areas will be monitored for regrowth and seed will be applied at a later date if necessary.

6.4.5 Landfill

A landfill facility for the disposal of a small volume of domestic and inert industrial waste will be constructed incorporated into the waste dump. It will be covered weekly to minimise access by scavengers and will be finally buried under several metres of waste rock. Disposal of hydrocarbon products, filters, tyres, chemicals or any other toxic materials will not be permitted. The trench will be well above the natural water table and contamination as a result of the landfill is unlikely.

6.4.6 Contaminated Material

Hydrocarbons

Spill cleanup equipment and appropriate training for site personnel will be provided. Small hydrocarbon spills are expected as a result of refuelling and servicing of vehicles and machinery. A bioremediation area has been established at the Coyote mine site for treatment of hydrocarbon contaminated soil and organic absorbent materials. Small to medium quantities of contaminated soil will be transported to this facility for treatment. Large spills will be treated *in situ*.

Hydrocarbon contaminated material is treated with hydrocarbon utilising bacteria to reduce levels to those meeting acceptance criteria for Class 1 landfill facilities (DEP, 2002). Average levels to be achieved are:

- C_6-C_{15} petroleum hydrocarbons – 2800 mg/kg;
- C_{16}-C_{35} petroleum hydrocarbons (aromatics) – 450 mg/kg; and
- C_{16}->C_{35} petroleum hydrocarbons (aliphatics) – 28,000 mg/kg.

Soil around the refuelling area is considered most likely to be hydrocarbon-contaminated at the end of the Project. If possible, this material will be removed and treated in the Coyote mine site bioremediation area, otherwise treatment will be carried out on site.

Salt Affected Areas

Any areas of the mine site or haul road affected by accumulation of saline water resulting in visible salt crust will be deep ripped to allow water penetration and dilution. This approach has proven effective in the Goldfields of Western Australia where salinity levels in ground water are considerably higher. Heavy accumulations of salt are considered unlikely, however should they occur the material will be removed for disposal in the base of one of the pits which will have comparative salinity levels.

6.5 Completion Criteria

Completion criteria for closure of the Stage 2 mine site will be based on:

- Data collected from vegetation monitoring sites established at the existing Coyote mine site;
- Data collected from baseline vegetation surveys previously conducted and from monitoring sites that will be established prior to commencement of Stage 2 mine site preparation; and
- The success of rehabilitation techniques employed at the existing Coyote mine site.

Tracks, pads, hardstands and other flat areas have been observed to revegetate rapidly and display a full complement of the surrounding native vegetation within a couple of years. Flat areas at the Stage 2 site will be deemed to have achieved closure when the diversity and density of flora present are comparable with that of surrounding undisturbed areas.

There is little comparative information available to determine the most successful methods of rehabilitation of slopes such as the batters of the waste dumps. Work has commenced at the Coyote mine site and the techniques being trialled will assist in determining the best methods of rehabilitating the Stage 2 waste dump. As the soil structure and profile of the waste dump will be considerably different to that of natural slopes in the area, the species present on completion of revegetation are likely to be different to that existing on natural comparable landforms. Rehabilitation will aim to achieve stable landforms with flora diversity and density similar to that of the surrounding area.

7 Community and Government Liaison

7.1 Background

Tanami liaised with various community and government groups during the approvals process for the first stage of the Coyote Project. During the planning stages of Stage 2 of the project continued to liaise with the recognised stakeholders to ensure input from all interested parties was included in the approvals documentation.

Recognised stakeholders of Stage 2 of the Coyote Project are:

- Department of Industry and Resources;
- Department of Environment and Conservation;
- Department of Water;
- Conservation Council of Western Australia;
- Environs Kimberley;
- Kimberly Land Council;
- Tjurabalan Native Title Land Aboriginal Corporation; and
- Halls Creek Shire.

7.2 Consultation with Stakeholders

Tanami commenced development of the Mining Proposal in July 2006. During the development period Tanami met with representatives of the various stakeholders to discuss details of the project and obtain feedback. Following the decision that an EPS was required a number of these stakeholders were again consulted. The Table 7.1 provides details of meetings and consultations with stakeholders.

Stakeholder	Date of Meeting/ Consultation	Purpose	Outcome
Kimberley Land Council	11th August 2006	To discuss Stage 2 of the Coyote Project.	No objections raised during this meeting. Employment and training opportunities to continue.
Environs Kimberley	11th August 2006	To discuss Stage 2 of the Coyote Project.	Expressed concern over the pit voids that would remain after mining.
DoIR	17th August 2006	To discuss Stage 2 of the Coyote Project and seek advice on the details to be included in the Mining Proposal.	Advice given, Mining Proposal written accordingly.

DoIR, DoW, DEC	7th & 8th December 2006	To conduct the annual environmental inspection and view the Stage 2 area.	Hole capping to be undertaken at Sandpiper and Kookaburra (completed Dec 2006). No further issues raised regarding Stage 2 operations.
DEC/EPA Service Unit	17th January 2007	To discuss the requirements of the EPS.	Description of the issues to be addressed in the EPS provided to Tanami
Environs Kimberley	25th January 2007	To inform EK of the requirement to produce and EPS and ask for input.	Advised that a site visit would be required before input could be provided.
Conservation Council of WA	8th February 2007	To advise of the requirement to complete an EPS for Stage 2 and to provide a copy of the Mining Proposal.	No input provided at this time.
EPA Service Unit	19th February 2007	Draft EPS supplied for comment.	
Environs Kimberley and Conservation Council of WA	1st March 2007	Site visit to view the existing mine site and Stage 2 area.	
Environs Kimberley and Conservation Council of WA	7th March 2007	Draft EPS supplied for comment.	
EPA Service Unit	15th March 2007	Comments on Draft EPS received.	Comments incorporated into the final document.
Conservation Council of WA	26th March 2007	Response to Draft EPS and site visit received.	Issues raised addressed in the final document.
Environs Kimberley	28th March 2007	Response to Draft EPS and site visit received.	Issues raised addressed in the final document.
EPA Service Unit	1st May 2007	Comments on Draft EPS received.	Comments incorporated into the final document.
EPA Service Unit	26th June 2007	Comments on Draft EPS received.	Comments incorporated into the final document.

7.3 Distribution of the EPS

The final EPS, incorporating the comments received to date, will be distributed to all stakeholders listed in Section 7.1. Further meetings will be conducted if necessary following the review period.

7.4 Issues Raised by Stakeholders

Conservation Council of Western Australia

Following the site visit and review of the EPS, the Conservation Council of Western Australia (CCWA) expressed a number of concerns relating to the potential environmental impact of the mining operation. These include:

Issue raised	Where addressed in this document
Landfill and Dingo management.	Sections 4.9
Mulgara and haul road.	Sections 3.6, 8.4
Chemical management.	Sections 3.8, 8.13
Backfilling of pits.	Sections 4.9, 6.3, 8.4, 9.1
Greenhouse gases and carbon offsets.	Sections 3.11, 8.8
Closure and completion criteria.	Sections 6.2,

Environs Kimberley

Environs Kimberley (EK) responded to the site visit and EPS with similar concerns as raised by CCWA. These include:

Issue raised	Where addressed in this document
Landfill and Dingo management.	Sections 4.9
Weed management.	Sections 4.6, 8.5
Energy efficiency and Greenhouse Gas emissions.	Sections 3.11, 8.8
Emergency response plans.	Sections 3.8, 8.13
Backfilling of pits.	Sections 4.9, 6.3, 8.4, 9.1
Closure planning.	Sections , 6.2
Significant faunal habitats.	Sections 3.6, 4.7, 8.4
Waste management.	Section 3.7
Ongoing research.	Section 8.4
Indigenous employment.	Section 9

The above issues and a number of other concerns were detailed in a letter received by Tanami in late March 2007 (pages 80-85). Tanami has addressed the concerns relevant to Stage 2 in this document, as indicated in the table above. Tanami also responded in a letter, included as pages 86-89.

Save the Nature of the Kimberley
environs KIMBERLEY INC

PO Box 2281 Broome WA 6725
Phone – 08 9192 1922
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28th March, 2007

Jeremy Shepherdson
Environmental Advisor
Tanami Gold NL
C/- Level 4, 50 Colin St
West Perth WA 6005

By email: jshepherdson@tanami.com.au

Dear Jeremy,

RE: Mining Proposal – Coyote Project Stage 2

Environs Kimberley thanks Tanami Gold for hosting a site visit from our Chairperson, Jacqui Remond, and Board member Pat Lowe on March 1st 2007. The visit was extremely worthwhile as it allowed us to gain further knowledge of Tanami Gold's Coyote mine site and operations. We also believe it was useful to observe the haul road and sites for the proposed new mines: Sandpiper and Kookaburra. We have also reviewed the Environmental Scoping/Guidelines and the Stage Two Mining Proposal and Environmental Management and Closure Plans.

We believe there are several environmental and social/cultural factors that require more careful and detailed investigation and attention before Stage Two EPS is finalised. Please find below an outline of some of our concerns:

1. Cumulative effects of the mines;
2. Landfill and Dingo management;
3. Weed management;
4. A shift to using sustainable fuels and greenhouse gas emissions;
5. Remedial action plans and emergency clean up plans;
6. Backfilling of pits;
7. Closure plans, including management of the rehabilitation and revegetation;
8. Significant faunal habitats located within the proposed area for clearing and the haul road, namely: Mulgara, Bilby and the Pebble Mound Mouse habitat;
9. Waste management;
10. Ongoing research; and
11. Indigenous employment.

Details about the issues of concern and recommendations are given below.

1. **Cumulative effects of the mines.**

We note that the footprint of the existing mine and the two proposed new mines is relatively small. However, the size of the footprint would change with any new or expanded mine.

EK recommends that, when evaluating the Stage 2 plans, the EPA take account of the cumulative effects of the mines, with their associated accommodation and infrastructure, and consider and plan for worst-case-scenario expansion.

2. **Landfill and Dingo management.**

Food waste will be 'covered to prevent access by animals'. This is not adequate to deter dingoes, which are notorious scavengers and can dig deeply to retrieve items of food etc. Dingoes play an important role in the ecology, especially in reducing/controlling cat populations, and their normal behaviour patterns should not be disrupted.

EK recommends that a dingo-proof cage system should be installed at food waste disposal points.

The plan includes measures for recycling certain materials and removal of toxic waste, the rest to go into landfill. We note that recycling is not happening at present.

EK recommends that all non-biodegradable waste should be removed from site, whether toxic or not, including all plastics.

3. **Weed management.**

Lawns and gardens at plant or accommodation could be a source of weeds. We were advised that all trees and other plants would be local to the area, and we endorse this plan. However, a clear written policy prohibiting the introduction of exotic plants to the site is required.

EK recommends that a policy be included in the EPS about prohibiting the introduction of exotic plants to the site and that local native flora be planted where any gardens are planted.

4. **A shift to using sustainable fuels and greenhouse gas emissions.**

We note that 'Investigate the potential' (pg 18) to use alternative fuel sources does not constitute an action. EK is looking for a commitment to sustainable practices.

EK recommends that actions in relation to using sustainable fuels be included in the EPS.

Responsible mining operations include details about their greenhouse gas emissions and the actions they plan to take to reduce greenhouse gas emissions.

EK recommends that actions to reduce greenhouse gas emissions (which are produced at the mine site and from fly in fly out arrangements) be clearly stated in the EPS.

5. **Remedial action plans and emergency clean up plans.**

The plan commits to various monitoring activities, eg of levels of contamination and EK endorses such practises. However, there are no clear plans for action, for example, should the levels of cyanide exceed 50mg or a cyanide spill occur.

EK recommends that remedial action plans be described in full including emergency clean up plans.

6. **Backfilling of pits.**

Pits will be left open after closure and 'fresh water will accumulate on top of saline water' (pg 21). Firstly, such fresh water will attract wildlife, especially bird species from outside the area, with possible harmful effects on the local natural ecosystem. It could also attract introduced species such as cattle, horses and camels. Secondly, during dry weather or normal periods of drought, evaporation is extremely high. Species that have become dependant on the semi-permanent supply of fresh water may suffer if the water supply again turns saline.

EK recommends that all mining pits be filled in at or before project closure.

7. **Closure funds, including management of the rehabilitation and revegetation and closure plans.**

In relation to closure funds no figures are given (see p 26 of Closure Plan).

EK recommends that the company be required to set aside 10% of its budget throughout the life of the operation for rehabilitation and revegetation activities before and on closure. This should be a condition of operation.

The current expected life of the open-cut mine is three years. However, as has already happened with Stage 1, plans can change with emerging conditions. Closure plans drawn up at the beginning of a project may not be adequate for the end stage of a project. Furthermore, praiseworthy efforts such as stockpiling topsoil for re-use during rehabilitation may be rendered worthless if the life of a mine is significantly extended: stockpiles may erode in wind and weather, lose their biological content, lose the viability of their seed bank and so forth.

EK recommends that new environmental and closure plans be required to cover increased length of life of a mine. We suggest that no existing plan should be considered valid for more than one year after the expiry of the original estimated term of a mine's life.

8. **Significant faunal habitats located within the proposed area for clearing and the haul road, namely: Pebble Mound Mouse, Mulgara and Bilby and habitats.**

A species of pebble-mound mouse has mounds in the area of the planned haul road for Stage 2 of the project. The numbers in this colony are not known, nor do we know about the presence of other colonies nearby. We are concerned that the known colony will be disturbed, possibly destroyed, by the widening of the existing road and/or the vehicles using the proposed haul road. Similarly, the endangered Mulgara, which has disappeared from some parts of the north-western Great Sandy

Desert, has been trapped on several sand dunes that the haul road traverses, and could be threatened by vehicles travelling along the haul road, especially at night.

Bilbies and their burrows have also been found in the study area. We have noticed the following discrepancy between the account of bilby behaviour and the recommended action (p 31 &33): the bilby is found 'in fire scars and laterite', but action is 'avoid burnt laterite rises'. We believe the latter should read: 'avoid fire scars *and* laterite rises'.

EK recommends that comprehensive surveys be conducted to determine the size of the existing colony of pebble-mound mice and the presence of other colonies in the area, and to determine the prevalence and location of Mulgara, before the haul road is built. Further, we recommend that measures be taken to protect the existing colony, including re-aligning the haul road if this proves necessary, and allowing vehicles to use the haul road only during daylight, when the pebble mound mouse and Mulgara are unlikely to be active.

9. Waste Management.

We noticed significant exploration waste at the proposed stage 2 mine sites, consisting of numerous dumps of plastic bags filled with drilling samples (see one such dump in Plate 1, volume 2 of the Mining Proposal Coyote Project — Stage 2). The plastic bags are deteriorating, breaking up into smaller pieces most of which will eventually be spread around the site, with possible harmful effects.

EK recommends that this plastic waste be removed from the site.

The impermeable liners in the abandoned and unused leech vats are large items and will not biodegrade in landfill, where we were told they are destined to be placed.

EK recommends that the vat liners be removed from the mining site for re-use or appropriate disposal now that they are no longer serving any useful purpose on site.

10. Ongoing Research.

EK notes the high biodiversity in the area of the mine sites and is pleased by the company's commitment to ongoing research and monitoring in the nearby Tanami desert area, including rare flora, fauna and stygofauna. We would like to see a formal commitment to this ongoing research to ensure that this work continues.

EK recommends that an on going commitment to research be made in the EPS.

11. Indigenous Employment.

EK notes that, while the company claims to be friendly to the idea of Indigenous employment on site, it does not have an Indigenous training and employment policy. Furthermore, we note from reports of environmental survey work that no Indigenous ecological advisers appear to have been employed on surveys, despite Indigenous people's extensive, detailed knowledge of local fauna and ability to read tracks. For instance, scientists expressed surprise at finding Black-headed Pythons within the area, yet these are common desert reptiles, and any local Indigenous person could have advised the scientists of their presence.

EK recommends that the company institutes an Indigenous Training and Employment Strategy, and makes a practice of employing Indigenous people as ecological advisers.

Please contact Jacqui Remond on 08 9192 8586 or Pat Lowe on 08 9193 5079 if you would like to further discuss Environs Kimberley's concerns and recommendations.

Yours faithfully,

Maria Mann
Director

TANAMI GOLD NL

Maria Mann
Director
Environs Kimberley Inc
PO Box 2281
Broome WA 6725

30th March 2007

Dear Maria,

Thankyou for your letter dated 28th March 2007 in which you have outlined the concerns held by Environs Kimberley regarding the proposed Coyote Project Stage 2 operations.

The Environmental Protection Statement (EPS) has now been completed and most of EK's concerns have been addressed. There are a number of items raised however that do not relate to the Stage 2 operation, or are incorrect. The intention of this letter is to provide explanation of those concerns that have not been addressed in the EPS.

1. Cumulative effects of the mines.

Tanami Gold understands this concern and intends that the high standard of impact assessment and environmental management undertaken as part of the Coyote Project will continue for any future mining operations.

2. Landfill and Dingo management.

Addressed in Sections 4.9 and 8.12 of the EPS.

Please note that although the Dingo-proof cage system will not be used at the Stage 2 mining operation it is planned to be used at the Coyote mine site where there is a high volume of food waste generated by the accommodation camp.

3. Weed management.

Addressed in Sections 4.6 and 8.5.

4. A shift to using sustainable fuels and Greenhouse gas emissions.

Addressed in Sections 3.11 and 8.8 of the EPS.

5. Remedial action plans and emergency clean up plans.

Addressed in Sections 3.8 and 8.13 of the EPS.

No processing will be undertaken at the Stage 2 site, and as such there will be no requirement to transport, store or handle cyanide. Remedial action plans are being developed for the revised processing operation at the Coyote mine site.

Bulk fuel storage will be required and will be transported to site by road. The fuel supplier and haulage contractor are required to provide an emergency response plan under the Dangerous Goods (Transport) Act 1998. Tanami requires provision of the emergency response plan as part of the supply contract. Tanami also has spill response procedures for dealing with spills of hydrocarbon and chemical products, and provides the appropriate equipment and training to enable spills to be dealt with effectively.

6. Backfilling of pits.

Addressed in Sections 4.9, 6.3, 8.4 and 9.1 of the EPS.

7. Closure funds, including management of the rehabilitation and revegetation and closure plans.

Addressed in Sections 6.2 and 8.11.

Tanami considers that 10% of the Stage 2 budget is an excessive amount to allocate to closure of the site. $120,000 has been budgeted for this purpose and is considered adequate to achieve the required outcome. In addition, Tanami will be required to lodge an Environmental Disturbance Bond with the Department of Industry and Resources prior to commencing any work at the Stage 2 site.

Tanami recognises the changing nature of a mining project. As such closure plans are reviewed at least annually and updated to reflect changes in the operation, legislative requirements, technology and best practice. The Stage 2 Decommissioning and Closure Plan supplied with the EPS is a Draft and will be reviewed during the operation. A revised Decommissioning and Closure Plan for the Coyote mine site is due for submittal to the Department of Industry and Resources by 30th April 2007.

8. Significant faunal habitats located within the proposed area for clearing and the haul road, namely: Pebble Mound Mouse, Mulgara and Bilby habitats.

Addressed in Sections 3.6, 4.7 and 8.4 of the EPS.

Please note that the Pebble Mound Mouse (*Pseudomys johnsoni*) habitat viewed during the site visit is located approximately 2.5km **north** of the Stage 2 mine site. The haul road will run **south** from the Stage 2 mine site and as such will not impact on this area. Stage 2 operations will have no impact at all on the Pebble Mound Mouse habitat.

9. Waste management.

Addressed in Sections 3.7 and 8.12.

The exploration sample bags noted during the site visit will be removed and disposed of on commencement of the exploration season in April/May 2007.

The vat liners are not reusable and will be disposed of by burial under the waste dump, which is an accepted method of disposal under current environmental regulations.

10. Ongoing research.

Tanami has made a commitment to ongoing research in the EPS - see Section 8.4.

11. Indigenous employment

Addressed in Section 9.

Tanami has an agreement with the Tjurabalan people that clearly states a commitment to provide training and employment opportunities. The company has provided employment and training opportunities for the Tjurabalan since commencement of mining in May 2006. During this time we have continually consulted these people regarding the local environment and flora and fauna of the region. The information and advice received has been used in the development of management plans and in planning survey work. Tanami's Community Relations Policy (attached) outlines the company's commitment to supporting the local communities.

Should you have any queries regarding the above items, or require any further clarification of Tanami Gold's environmental management strategies, please contact myself or Frank Sibbel on 9212 5999.

Yours sincerely,

Jeremy Shepherdson

Environmental Advisor

COMMUNITY RELATIONS POLICY

Tanami Gold NL ("the Company") recognises the importance of developing good relationships with local communities that are in close proximity to its project operations. During the life of its projects the Company shall be proactive in its approach and shall remain sensitive to the needs and concerns of local communities.

The Company makes the following commitments in order to achieve policy requirements:

- The Company will encourage its participation of local communities and associated businesses in projects wherever possible.
- The development and implementation of community relations management procedures (as specified) that include business alliances, employment and training initiatives on safety in the workplace and practical operating skills.
- The improvement of cross-cultural awareness through the induction, training and education of all Tanami Gold personnel in local community culture and workplace relationships.
- Management and project staff shall become conversant with local community issues.
- Procedures will be put in place to manage local heritage issues on all projects.

Through honouring these commitments the Company will minimise any negative project impacts, enhance business opportunities and work skills and increase its awareness of local community cultural issues.

Denis Waddell
Executive Chairman

Date: 5/9/06

DEC

The DEC have raised concerns over environmental issues including threatened fauna, introduced fauna, weeds and fire management. These issues form the basis of this document and are addressed in previous and later sections.

8 Environmental Issues and Management

8.1 Identification of Environmental Impacts

A number of potential environmental issues associated with Stage 2 of the Coyote Project have been identified, resulting in the requirement to complete this EPS. The main issues as discussed in the January meeting with DEC representatives included:

- Fauna;
- Flora;
- Weeds;
- Feral animals;
- Fire; and
- Mine closure.

Tanami has developed management strategies and a number of Management Plans that address these issues.

8.2 Net Benefit to the Environment

The Coyote Project provides an opportunity for the collection of information relating to the flora, fauna and ecosystem of the Tanami Desert. The area is recognised as being under-surveyed from a biological point of view and the presence of the mine and associated infrastructure provides a base from which ongoing survey work can be conducted over the life of the mining operation. The information collected can be used to add to the various databases managed by organisations such as the DEC and the Western Australian Herbarium.

8.3 Area of Disturbance

The total area of disturbance to be created by Stage 2 of the Coyote Project is 112 ha. This includes the pits, waste dump, site infrastructure and haul road.

Tanami intends to minimise disturbance and will conducting clearing only as required. Disturbed areas will be rehabilitated as soon as possible to promote rapid revegetation.

8.4 Fauna

Fauna surveys have been undertaken by Biota Environmental Sciences in October 2004 and June 2005. Ecotec has continued survey work in the proposed mining area and surrounding region as part of Tanami Gold's commitment to undertake broader biological surveys. The surveys have utilised trapping and incidental sightings to determine the fauna species present in the area. These surveys have established that within the greater project area:

- A cumulative total of 131 of an expected 229 vertebrate species, 65 species of bird, 18 native mammals, three introduced mammals, 43 reptiles and three frog species have been observed;
- Twelve fauna species of conservation significance are known to inhabit or are potential inhabitants of the Tanami Region. Prior to commencement, only four of these had been recorded within the area surrounding the Coyote Project. Since commencement of the project, the Woma (*Aspidites ramsayi*), the Bush Stone-curlew (*Burhinus grallarius*) and the Bilby (*Macrotis lagotis*) have been sighted close to the mine site. Sightings of Major Mitchell's Cockatoos (Cacatua leadbeateri) and Australian Bustards (*Ardeotis australis*) are almost daily occurrences. Mulgara (*Dasycercus cristicauda*) have been found in sand dune habitat between the existing mine site and the Stage 2 deposits; and
- Three introduced species were recorded being the cat (*Felis catus*), the camel (*Camelus dromedarius*) and the common house mouse (*Mus musculus*).

A species of Pebble Mound Mouse found during the Biota surveys on one of the hills in the area has been identified as *Pseudomys johnsoni*, a relatively common species with a range extending from Shark Bay in Western Australia to the Northern Territory. The population is over two kilometres north of the mining operation and haul road and will thus not be impacted by the mining operation.

Biota carried out an invertebrate fauna inventory survey during the work conducted in 2004 and 2005. Invertebrates collected were identified to order or family level where possible. With assistance from the Western Australian Museum it was deemed unlikely that any of the insect groups represented contained any short range endemic species. Details of the invertebrate survey are included in Appendices 11 and 12.

Stygofauna sampling of the proposed mining area was conducted by Biota in February 2005. A potentially new species of the minor crustacean group, the Parabathynellids, was recovered from bores in the Coyote area and from a bore 28 km to the west. No stygofauna was found in samples collected from the bores at Kookaburra and Sandpiper. Another bore located approximately 10 km north of the Stage 2 site was sampled and also returned no result. Further investigation into the distribution of stygofauna in the surrounding region will be carried out in the future.

8.4.1 EPA Objectives

- To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
- Protect Specially Protected (Threatened) and Priority fauna and their habitats consistent with the provisions of the Wildlife Conservation Act 1950 and the EPBC Act 1999.

8.4.2 Standards and Legislation

- Environmental Protection Act 1986;
- Wildlife Conservation Act 1950;
- EPBC Act 1999; and
- EPA Guidance Statement No. 56 (Terrestrial Fauna).

8.4.3 Potential Issues

Clearing of 112 ha within the mine site and haul road will involve the temporary or permanent loss of habitat, which may impact on rare, threatened or vulnerable fauna species. Potential issues associated with the development of the Stage 2 Project are related primarily to the construction of the haul road, which will pass through known Mulgara habitat and habitat that may support Bilby and other fauna species of conservation significance. Potential impacts on fauna include:

- Disturbance of fauna habitat and fauna species;
- Death on haul roads due to increased vehicle traffic;
- Attraction of predators to the roads and tracks of the project area;
- Mine lakes providing a source of fresh water that may benefit introduced species; and
- Increased dust and noise potentially deterring some animals from original home ranges.

8.4.4 Impact Assessment

Vegetation and habitat in the mine site is common and well represented throughout the Tanami Region and, although it may periodically support threatened fauna, is not considered significant for any of the species listed above. The mine site will therefore not impact on any areas of habitat specifically suitable for threatened fauna.

Mulgara

The proposed haul road will pass through known populations of Mulgara (*Dasycercus cristicauda*) and potential therefore exists for impact on the population as a result of increased road traffic. These areas have been regularly inspected for Mulgara activity since commencement of the Coyote Project with evidence of activity having been found in a number of locations. Two Mulgara were caught in Elliot traps on one of the sand dunes in December 2006. Another three were caught in the same location in June 2007. The sand dunes extend for several kilometres in an east-west direction in the four locations where it is found along the route. Investigation of these areas has found that animal activity, including that belonging to the Mulgara, increases with distance from the existing track. Approximately 2.8 ha of habitat will be cleared in these areas.

Bilby

Less than one hectare of potentially suitable Bilby (*Macrotis lagotis*) habitat will require clearing. This area is located at the southern end of the haul road route close to the Tanami Road and the existing Coyote mine site. No Bilby activity has been observed in this area prior to or since commencement of mining activity at the Coyote mine site. Such habitat (laterite rise) is common throughout the region and the area to be cleared is an insignificant proportion of the total area of this habitat.

Other threatened fauna

Tracks of the Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*) were observed to the north of the Stage 2 area during a survey in 2005 (Biota, 2005). There are unconfirmed reports of sightings of an animal meeting the description from an area near Slatey Creek, approximately 40km north of the site. Survey work, including spot lighting will continue throughout the life of mining in the area. The small scale of the mining activity in the Stage 2 area is considered unlikely to impact on the conservation status of the species.

Development of the haul road and increased traffic may increase the potential for road deaths of the Woma (*Aspidites ramsayi*). However development of a network of roads associated with the existing mining project has resulted in very few reptile deaths. Lined dams and other bunded areas are a recognised threat to this and other reptile species. Any lined structures will have egress structures in place to enable fauna to escape. Given that the Woma is reported to be relatively common in the region, and the noted lack of impact as a result of development of the existing operation, Stage 2 is unlikely to impact on the conservation status of this species.

Construction of the haul road will require removal of some trees to enable the existing road to be widened. These trees represent a very small proportion of large trees in the area and little or no impact on the Major Mitchell's Cockatoo population is expected.

There is potential for an increased mortality of the Bush Stone-curlew (*Burhinus grallarius*) associated with increased road traffic. Haulage will occur predominately during daylight hours, the operation is unlikely to impact on the conservation status of this species. The small scale of clearing required for the operation is unlikely to impact significantly on the available habitat.

On the basis of limited extent and location of the mining proposal, the Stage 2 project will not have any adverse impacts on short range endemic invertebrate fauna species within the area. No adverse impact on subterranean fauna as a result of mining and water abstraction is expected.

Night haulage

Night-time use of the haul road is recognised as a potential threat to nocturnal fauna species. The potential for Mulgara to be adversely impacted by operation of the haul road at night has been raised as an issue. There is little known about the impacts of night use of haul roads on Mulgara (Dr David Pearson pers. comm.), and therefore insufficient evidence to support claims that night operation of the Stage 2 haul road will result in detriment to the known population.

Ore haulage will occur over a six month period and will be conducted in a series of fortnightly, 24 hour campaigns. During this time trucks will travel along the road at approximately 30 minute intervals at relatively low speeds (40-80 km/hr). The intervals and speed of the trucks, combined with the straight road and flat terrain will allow sufficient time for animal movement across the road.

The operation is not expected to have a significant impact on the populations of any of the threatened species known to inhabit the area.

Clearing

The impact of clearing on species-specific habitat will be minor, with the permanent loss of 10 ha associated with the pits and the temporary loss of 102 ha that will be rehabilitated with native flora species. Faunal recolonisation of disturbed areas will occur as vegetation is progressively re-established and as the site is decommissioned on cessation of activities.

All of the fauna habitats that will be impacted as a result of the project are well represented within the region. The development of the project will not reduce the conservation value of these habitats. The majority of the birds and larger fauna species are highly mobile and any individuals residing in these areas are likely to naturally move away from the areas of increased human activity and relocate to adjacent areas. Minimal impact on fauna species of conservation significance is predicted as the habitat suitable for most of the species identified as existing or potentially existing in the project area is widely represented on a regional scale.

Due to the relatively small scale of impact resulting from widening the existing track, food and habitat availability for fauna is not expected to be significantly affected.

Post-mining pits

The issue of post-mining pit voids has been considered in preparation of this document and is not expected to have significant impact on the natural environment. The introduction of a water resource may result in attraction of native and introduced fauna to the area, however information obtained from Dr. William A. (Bill) Low, an ecologist with more than 16 years experience with mining operations in the Tanami Region, indicates little change in faunal assemblage and distribution in association with post mining pit voids. Dr. Low has 20 years experience in central Australia conducting flora and fauna surveys, impact assessment and long-term monitoring projects with government departments and mining companies.

Pit water will be predominately saline groundwater with a layer of fresher water on the surface, varying in depth and quality depending on the time of year and quantity of rainfall. The relatively low annual rainfall and extremely high evaporation rate of more than 3 metres annually is expected to maintain the water level in the pit at between 10 and 20 metres below surface level. The abandonment and pit perimeter bunds will divert surface water flows away from the pit, resulting in the only water addition being what falls directly into the pit. The saline nature of the groundwater is expected to result in pit water being sterile and therefore unable to support the plant or animal life necessary to maintain other water dependent animals. As a result it is improbable that permanent colonies of water dependent animals, being predominantly birds in the Tanami Region, will become established in or around the abandoned pits.

Pit ramps will be left intact to enable animal access and egress, however the abandonment bund surrounding the pit is likely to deter larger animals, such as camels and kangaroos, from entering the pit to access water. Dr Low's observations from other abandoned pits in the Tanami Region have indicated that there has not been an increase in the presence of grazing animals around the pits, and that these animals rarely access pits for water. He has observed occasional nesting by ducks and establishment of a breeding pair of Peregrine Falcons in an abandoned pit that he has monitored regularly. A letter summarising Dr Low's observations of fauna prior to and following mining operations in the Tanami Desert is included as Appendix 1.

Parsons Brinckerhoff (PB) were engaged to undertake a pit water balance model of the Sandpiper and Kookaburra pits based on climatic data available for the region. As a result of the water balance modelling PB have confirmed that a layer of fresh water up to 1 metre deep is likely to exist over the saline water in the pits for a short period during the wet season, when fresh water sources are abundant throughout the region. The fresh water layer will diminish rapidly as a result of the extremely high evaporation rate, leaving saline water in the pits. The PB report is included as Appendix 2.

Introduced fauna

There is recognised potential for introduced fauna species, particularly cats, to increase as a result of the mining operation. With appropriate management and mitigation measures there is not expected to be a significant change in population size or distribution.

Camels are known to travel up to 70km daily while foraging and can exist for long periods without water. They are essentially nomadic and generally not territorial. The species do not breed prolifically as females are capable of producing only one calf every two years (AgWA, 2005 and DEH, 2004). Previous monitoring work in association with mining operations in the Tanami Region shows little evidence of camels being attracted to water in abandoned pits (Appendix 1).

Cats are known to benefit from mine site waste disposal facilities if not appropriately managed. The landfill at the Stage 2 mine site will be small and will predominately contain inert industrial waste. Food waste will be minimal as the accommodation facilities at the existing mine site will be utilised by site personnel.

Within the surrounding region there are existing permanent, semi-permanent and temporary water resources, all currently accessible to wildlife. These include permanent water at Slatey Creek, approximately 40km north of the site, numerous gravel pits along the Tanami Road that hold water for several months each year and stock watering points on active pastoral stations to the north, north-west and north-east. Native wildlife as well as camels and cats currently utilise these resources and are considered unlikely to benefit greatly from water contained in the pits, which will be relatively difficult to access and unlikely to be palatable during the dry season. Figures 8.1 to 8.5 show water availability in the surrounding region at various times over the last two years. The photographs are Moderate Resolution Imaging Spectroradiometer (MODIS) Imagery and have been sourced from the MODIS Rapid Response System website (http://rapidfire.sci.gsfc.nasa.gov/). Water is depicted in shades of blue, with darker shades denoting deeper water. The images demonstrate that water is present in the region throughout the year and is abundant at times when fresh water is likely to be available in the pits.

Based on available information, Stage 2 of the Coyote Project is considered unlikely to have a significant impact on the diversity, population sizes or distribution of introduced fauna in the vicinity of the pits or in the surrounding region.

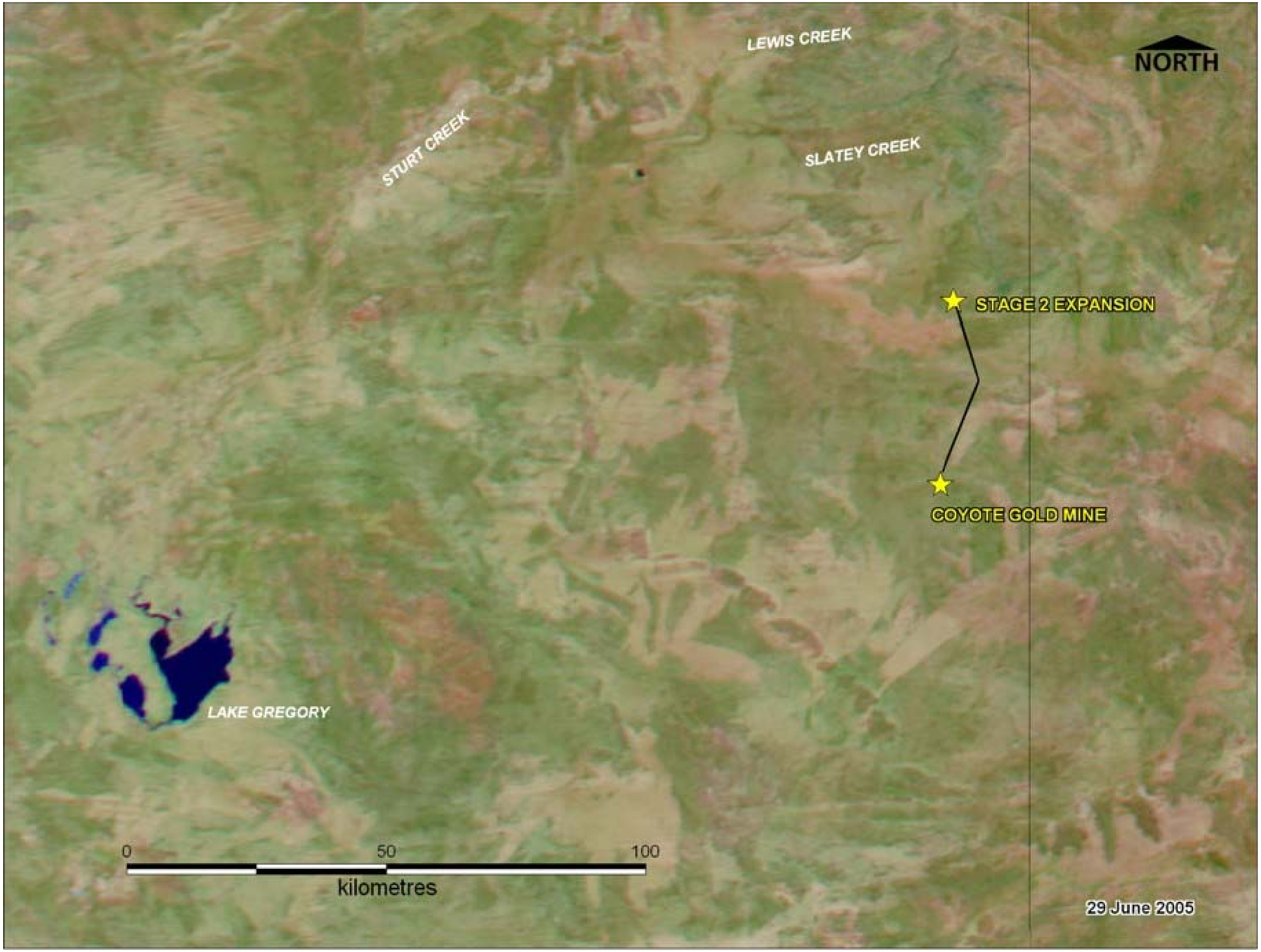

LEWIS CREEK
NORTH
STURT CREEK
SLATEY CREEK
STAGE 2 EXPANSION
COYOTE GOLD MINE
LAKE GREGORY
0
50
100
kilometres
29 June 2005

Figure 8.1

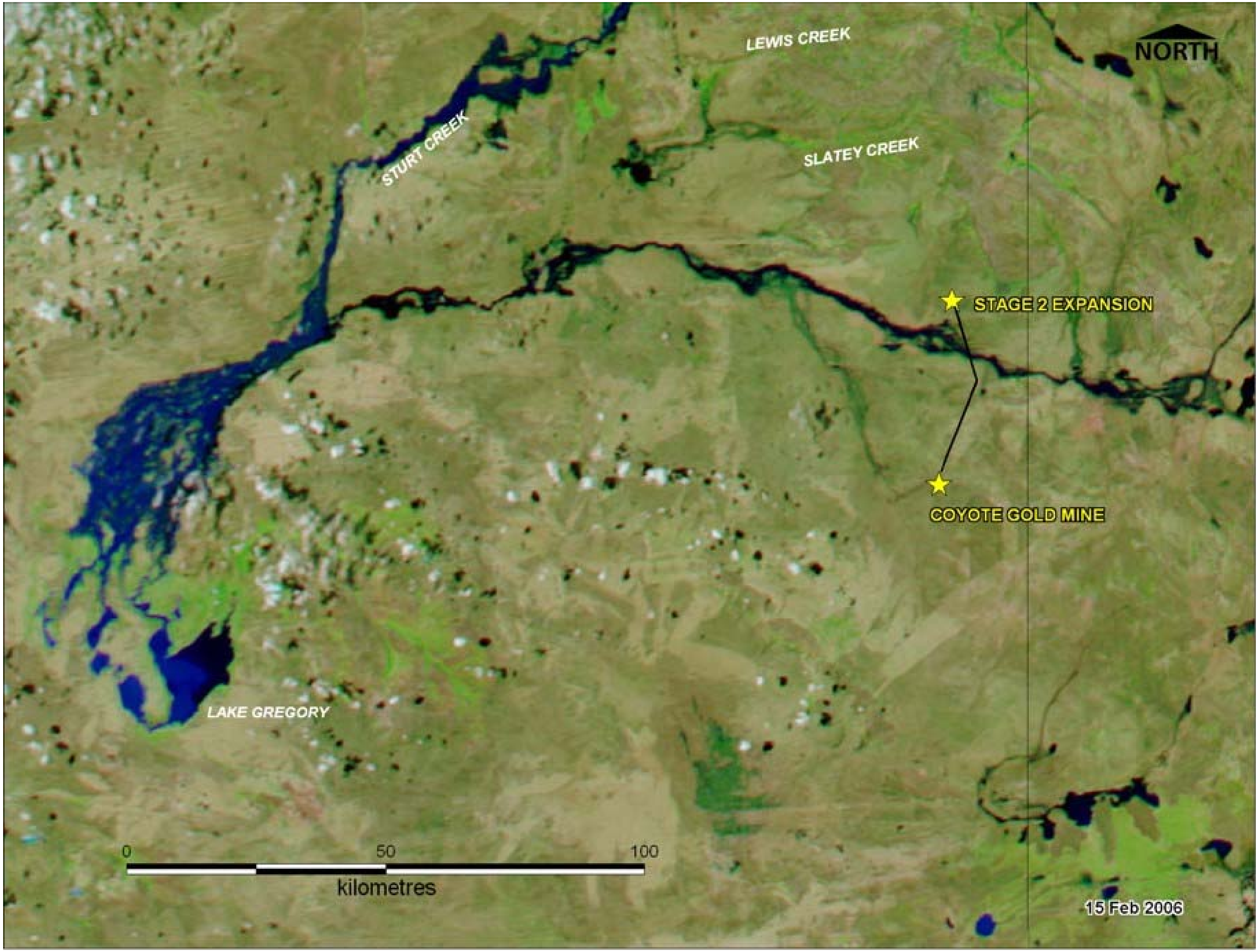
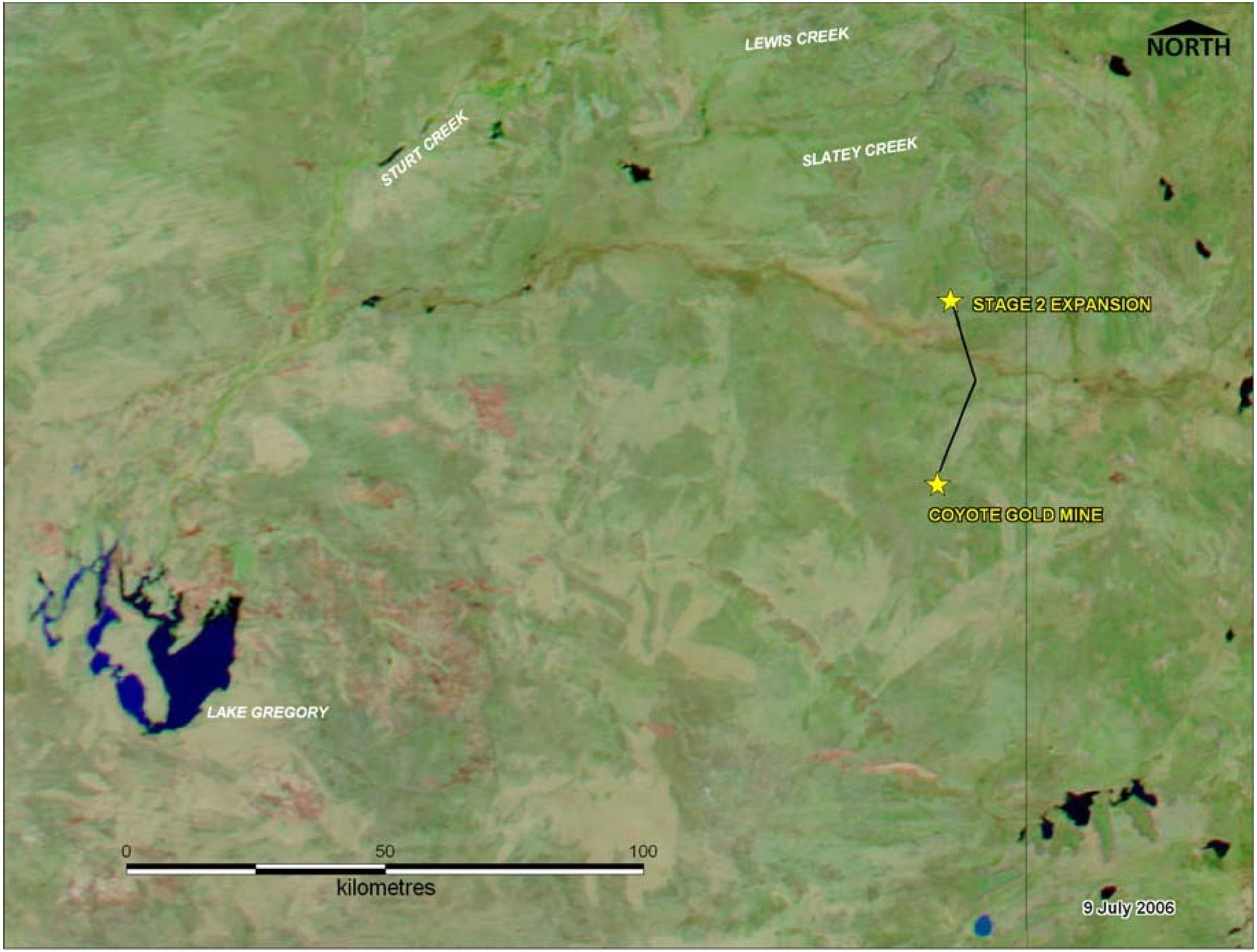

LEWIS CREEK
NORTH
STURT CREEK
SLATEY CREEK
STAGE 2 EXPANSION
COYOTE GOLD MINE
LAKE GREGORY
0
50
100
kilometres
15 Feb 2006

Figure 8.2


LEWIS CREEK
NORTH
STURT CREEK
SLATEY CREEK
STAGE 2 EXPANSION
COYOTE GOLD MINE
LAKE GREGORY
0
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kilometres
9 July 2006

Figure 8.3

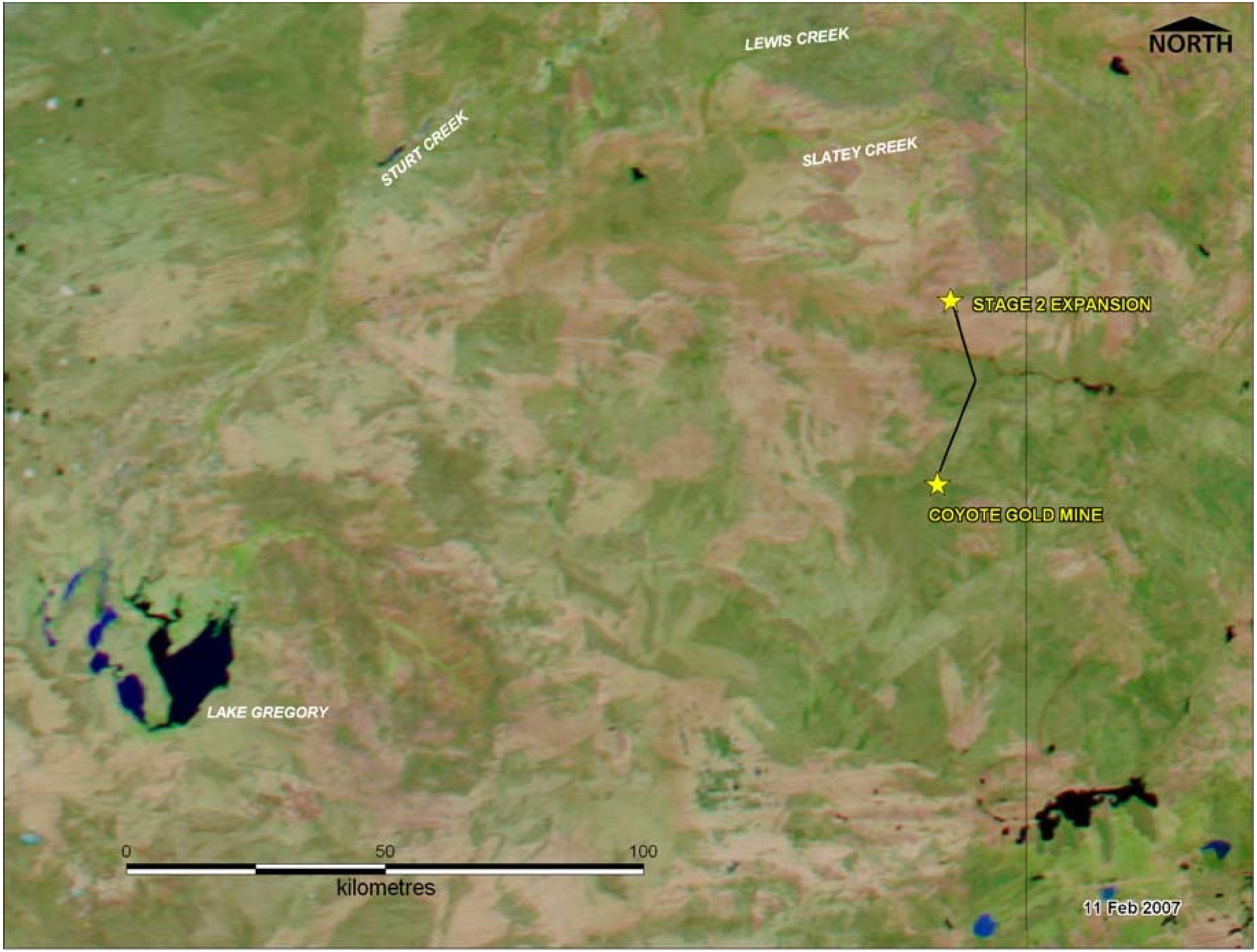
NORTH
LEWIS CREEK
STURT CREEK
SLATEY CREEK
STAGE 2 EXPANSION
COYOTE GOLD MINE
LAKE GREGORY
0
50
100
kilometres
11 Feb 2007

Figure 8.4

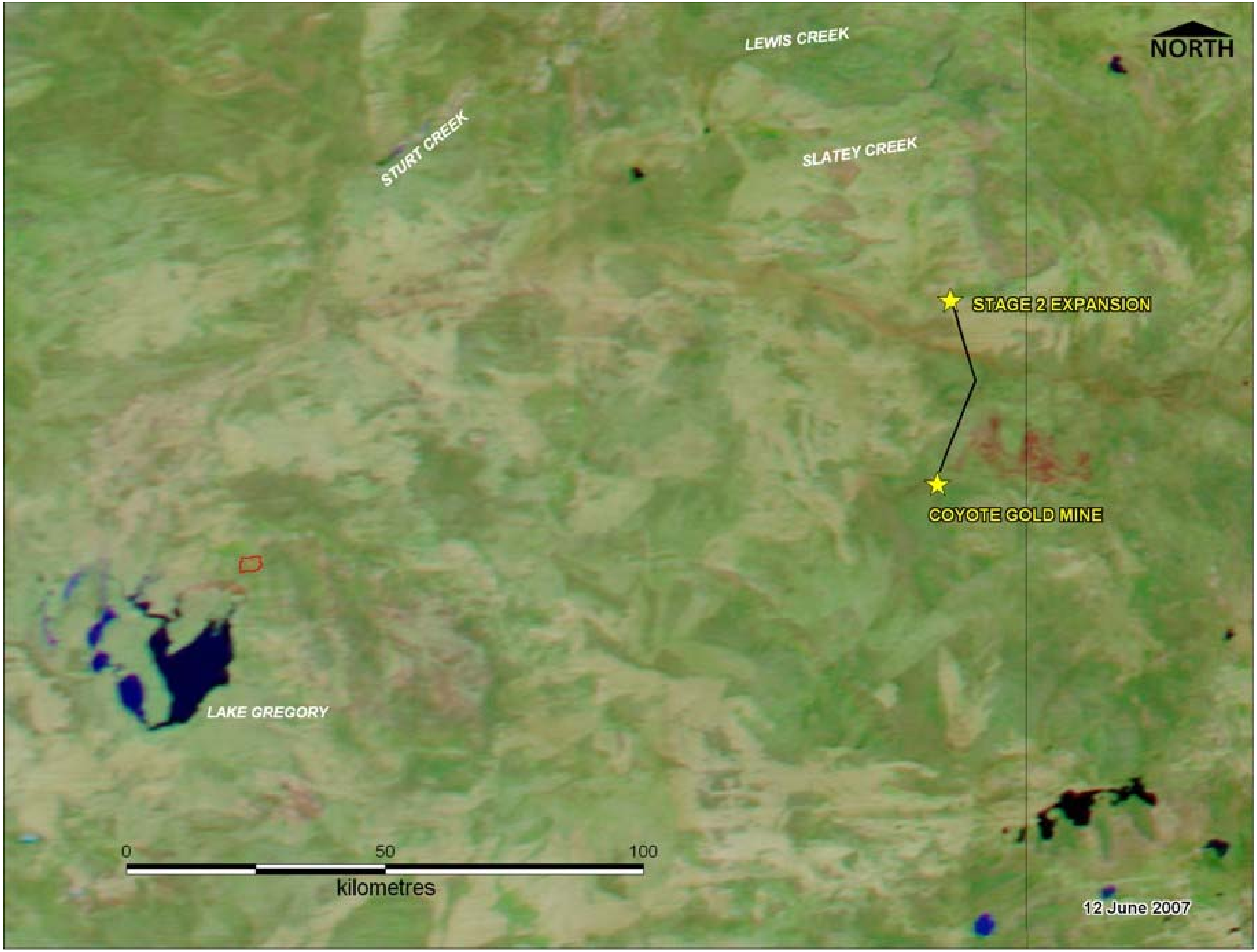
NORTH
LEWIS CREEK
STURT CREEK
SLATEY CREEK
STAGE 2 EXPANSION
COYOTE GOLD MINE
LAKE GREGORY
0
50
100
kilometres
12 June 2007

Figure 8.5

8.4.5 Management and Mitigation Measures

The following measures will be implemented during the project to minimise the impact on fauna:

Mine site

- Clearing of vegetation will be restricted to the minimum necessary to implement the project;
- An egress will be provided from pits and trenches to enable wildlife to escape;
- Lined dams and bunded areas will have egress matting installed to enable wildlife to escape;
- Drill hole capping will be regularly checked to ensure the integrity of the capping is maintained;
- The environmental induction programme and ongoing provision of information will raise the awareness of the workforce about the conservation of fauna (particularly rare, threatened or vulnerable fauna) and their habitats;
- An environmental handbook will provide pictures of threatened species known or potentially inhabiting the region (Appendix 5);
- Vehicles and machinery will be parked in designated locations only to minimise habitat damage;
- All putrescible waste will be disposed of in a landfill facility within the waste dump which will be covered weekly as a minimum;
- Direct contact with fauna will be avoided whenever possible;
- Cat deterrent measures and/or eradication programmes will be implemented in conjunction with those already undertaken for the Coyote project; and
- Restricting traffic to established roads and parking areas.

Haul road

- Internal reporting and recording of animals killed along the haul road;
- All mine personnel will be made aware of the potential for injured wildlife as a result of collisions with vehicles;
- Signage will be posted at each end of the haul road alerting drivers to the presence of threatened fauna;
- A speed limit of 40 km/hr will be required through the sand dune areas, with appropriate signage positioned accordingly; and
- The haul road will be watered regularly in order to suppress dust.

A study will be undertaken during the Stage 2 operation to determine the impacts of the haul road on the Mulgara population. This will include:

- Daily inspections of the haul road to record and remove road kill and search for evidence of Mulgara and other threatened fauna activity;

- Regular inspections of areas of known Mulgara activity to assess the impact of the haul road on the species. This will include recording activity such as tracks and burrows and periodic trapping in areas of activity;
- Data to be collected will include a record of fauna killed on the road, the location of Mulgara burrows and activity and observations over time on the changes in Mulgara activity; and
- Monitoring results will be forwarded to the DEC on a monthly basis if required, as well as being reported in the Coyote Project Annual Environmental Report, produced in February each year.

Introduced fauna

Tanami will not have the capability to address the issue of the presence of camels in the Tanami Region, however will assist in any future control programs initiated by government agencies. If appropriate, Tanami will provide accommodation facilities and assist in monitoring camel movements in the local area.

Tanami is committed to predator management to assist in preservation of the populations of threatened species in the area and will implement a cat trapping program in 2007 utilising a “gas chamber” and carbon dioxide to euthanise the captured animals. This will extend to the Stage 2 area.

On completion of mining Tanami will enclose the pits with an abandonment bund capable of diverting surface water runoff away from the open pits. This will minimise the volume of water retained in the pits and will reduce the attraction of wildlife.

Ongoing surveys

Fauna surveys of the project areas and surrounding region will be carried out at intervals for the life of the mining project and will include:

- Continuation of the pitfall and Elliot trapping program;
- Incidental sightings of fauna along the haul road route; and
- Periodical biological surveys of the surrounding region.

Tanami is committed to continued biological survey and monitoring of the project area and surrounds.

8.4.6 Environmental Outcome

The habitats within the project area are well represented throughout the region. The fauna recorded or expected to occur within the project area are unlikely to be significantly impacted by clearing and temporary removal of these habitats. Consequently, the impact of the proposed Stage 2 project on fauna and habitat will be negligible in a regional conservation context. Clearing measures, mining and exploration procedures, feral animal programmes and rehabilitation methods will assist in mitigating the impacts on fauna and habitats.

8.5 Vegetation and Flora

Vegetation and flora studies have been undertaken of the proposed mine sites and surrounding areas likely to be impacted by mining operations. MBS Environmental conducted a survey of the Coyote and Bald Hill areas between 8th and 13th June 2004. Ecotec has continued survey work in the Stage 2 project area and surrounding region since commencement of the Coyote Project. These surveys established that within the project area:

- Flora and vegetation types are typical of much of the surrounding region;
- No Declared Rare Flora or Priority Listed flora species are located in the area;
- No Threatened Ecological Communities occur within the region; and
- Five weed species have been identified within the Coyote Project area, three of which have been located within the Stage 2 mining area or along the haul road route.

A total of 145 flora species from 41 families have been recorded during surveys of the project area and surrounding region by MBS Environmental (2004) and Ecotec.

Vegetation has been classified using the National Vegetation Information System framework, sourced from the Australian Natural Resources Atlas. There are three main vegetation types found in the Stage 2 area. These include:

- Acacia Shrubland - found in the proposed mining area and at various locations along the haul road route. Typically consists of various Acacia species with scattered emergent Eucalypts (predominantly *E. brevifolia* in the Stage 2 area) and occasional Grevilleas and Hakeas. The understorey is predominantly Triodia species;
- Hummock grassland - found in the proposed mining area and extensively along the haul road. This vegetation type is dominated by Triodia (Spinifex) species (predominately *T. pungens*). On laterite rises the Spinifex is often interspersed with *Acacia hilliana*;
- Sand dune - found at several points along the haul road route. This vegetation type is essentially Acacia or Grevillea Shrubland growing on a sandy ridge. Typically these areas do not support Eucalypts but most other species are found within the more common Acacia Shrubland vegetation.

The Stage 2 project will require the disturbance of 112 ha of vegetation. Approximately 66.5 ha (will occur on M80/563 for the Sandpiper and Kookaburra open pits and surrounds, waste dump, evaporation ponds, access roads and associated mining infrastructure. 12 ha of prior exploration disturbance exists on this tenement. Approximately 45.5 ha will occurs on Miscellaneous Licence L80/45 for a haul road to transport ore from the Sandpiper and Kookaburra open pits to the processing plant approximately 35 kilometres south. 22.5 ha of disturbance exists in the form of an exploration track originally cleared by the Western Australian Geological Survey.

The baseline work undertaken to date provides the opportunity for longer-term monitoring of changes in species composition and community structure. The species recorded during baseline studies provides a sound basis for a rehabilitation programme.

8.5.1 EPA Objectives

- To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge;
- Protect declared rare and priority flora, consistent with the provisions of the Wildlife Conservation Act 1950 and the EPBC Act 1999; and
- Protect other flora species of conservation significance.

8.5.2 Standards and Legislation

- Environmental Protection Act 1986;
- Wildlife Conservation Act 1950;
- EPBC Act 1999;
- EPA Guidance Statement No. 51 (Terrestrial Flora).

8.5.3 Potential Issues

Clearing of 100 ha within the mine site and haul road will involve the temporary or permanent loss of native vegetation.

The Native Walnut (*Owenia reticulata*) is of cultural significance to the local Aboriginal people and Tanami Gold has made a commitment to avoid disturbance of this species. It has not been found in the Stage 2 mining area or along the proposed haul route.

Activities associated with the project have the potential to cause:

- The introduction of weed species not already present in the project area;
- The spread of weed species that may already be present in the project area;
- Uncontrolled fire resulting in changes to vegetation structure and diversity; and
- Land degradation and increased erosion.

8.5.4 Impact Assessment

Vegetation and Flora

Approximately 23 ha of Acacia Shrubland and Hummock (Spinifex) Grassland vegetation will be disturbed to construct the haul road. The existing track occupies an area of approximately 22.5 ha. A number of Eucalypt trees will require removal to construct the haul road.

Approximately 10 ha of Acacia Shrubland / Spinifex Grassland will be permanently removed for the open pits. The remaining 56.5 ha (including 12 ha of existing disturbance) is predominately Acacia Shrubland, and will be rehabilitated on completion of activity in the area.

There are no Threatened Ecological Communities pursuant to Schedule 2 of the EPBC Act 1999 located within the project area or along the haul road route.

With management measures in place it is not likely that significant erosion or land degradation will occur as a result of vegetation clearing.

Vegetation Clearing

Clearing of native vegetation will be required for the proposed mining operation. The Ten Principles for Clearing Native Vegetation as stated in the Environmental Protection Amendment Act have been considered during preparation of approvals documentation. Each of these principles is addressed as they relate to Stage 2 of the Coyote Project.

In accordance the Ten Principles for Clearing Vegetation, native vegetation should not be cleared if:

a) it comprises a high level of biological diversity

Although a high degree of biological diversity is present within the Tanami Region, disturbance of the small area required for this mining operation will not impact on the larger region. Revegetation trials within the Coyote mine site have demonstrated rapid recovery of native flora following disturbance. It is expected that substantial habitat restoration in disturbed areas will be achieved within a few years.

b) it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia

Clearing the mine area will not impact on habitat specifically supporting any of the significant fauna known in the region. Disturbance of a series of small dunes will be required for construction of the haul road (Photograph 5.1). Scattered evidence of Mulgara activity has been found throughout these dunes, although most activity has been located well away from the existing track, which is the proposed haul road route. A Wildlife Management Plan has been developed to assist in minimising the impact of the haul road on this habitat. Considerable survey work has been conducted in this area and will be ongoing throughout the life of mining. The proposed management strategies are summarised in Section 8.4 with a detailed description provided in the management plan.

c) it includes, or is necessary for the continued existence of, rare flora

No Declared Rare or Priority Listed flora has been located within the Project area. The Desert Walnut, which holds significance to the Traditional Owners of the region, has not been located within the mining area or along the haul road route.

d) it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community

There are no Threatened Ecological Communities in the region. A Proposed Nature Reserve is located over 50km to the north of the Stage 2 site. The operation will not impact on this area.

e) it is significant as a remnant of native vegetation in an area that has been extensively cleared

No remnant vegetation will be affected by this mining operation.

f) it is growing in, or in association with, an environment associated with a watercourse or wetland

There are no permanent water bodies in the vicinity of the Stage 2 operation. The haul road route passes through an area that is subject to flooding following heavy rainfall events, known locally as "the palaeochannel" (Photograph 4.4). The area potentially forms part of the catchment for Sturt Creek. However, as the Sturt Creek system is over 100 km west of the haul road route surface flows from the area are only expected to contribute in extreme rainfall events. The haul road will be designed for use in the dry season only and will not impede the flow of water.

g) the clearing of the vegetation is likely to cause appreciable land degradation

Soils in the area are typically prone to erosion when vegetation is removed. This will be managed through:

- avoiding vertical clearing on slopes;
- installation of water management structures such as bund walls;
- contour ripping and rehabilitation of disturbed areas immediately when no longer required.

h) the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area

Clearing in the Stage 2 area will not impact on conservation areas. A Proposed Nature Reserve is located approximately 50 km north of the site but will not be affected in any way by the mining activity.

i) the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water

Short term dewatering of the pits will be required, however bore testing in the area has demonstrated rapid recovery of groundwater levels. Groundwater in the area is saline and is of little value to native flora or fauna. The quality of surface water runoff is not expected to be impacted by the operation. With the exception of a bulk storage fuel tank and minor quantities of lubricants stored at the work shop, there will be no potential sources of significant contamination associated with the operation. The fuel tank will be bunded in accordance with AS1940-2004 and all minor storage will be on bunded pallets.

The haul road will be constructed to allow water to flow unimpeded and, as such, is not expected to effect surface water flow or quality.

j) the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding

Clearing of the relatively small area of vegetation required for the mining operation is not likely to significantly alter surface water flow. Soils in the Tanami Region are typically sandy and infiltration of surface water is rapid. The site infrastructure will be constructed to avoid ponding of surface water runoff.

The haul road will not be raised significantly in the palaeochannel area and as such will allow water to flow unimpeded. Surface water flow is not expected to be affected.

Significant Flora

No Declared Rare, Priority or Threatened Flora was recorded within the project area.

Long Term Impacts

The long-term impact of clearing on vegetation and flora for mine development and operation, with the exception of the pit, is expected to be minor, with the temporary loss of approximately 92 ha. This area will be rehabilitated with native species either progressively during mining life or on cessation of mining operations. This will not result in a significant loss of biodiversity as all vegetation types occurring within the project area and on the adjoining plains area are commonly represented in the region.

There will be a permanent loss of 10 ha of Acacia Shrubland within the Kookaburra and Sandpiper pit perimeters, which is not considered significant given the extent of these vegetation types in the surrounding region.

Weeds

Three weed species have been recorded in the Stage 2 area. The spread of weeds is influenced by:

- Proximity to settlements and other disturbed sites where the weeds currently occur;
- Past and current land use;
- Movement of people, livestock and vehicles; and
- Wind and surface water runoff.

Weeds are commonly found along the Tanami Road and are potentially able to be spread by other users of this public road. Likewise, there is potential for new weed species to be brought to the area by non-mine related users of the road.

8.5.5 Management and Mitigation Measures

Tanami will implement the following measures during the project to minimise the impact on vegetation and maximise the conservation of the botanical values in the project area, namely:

- The project layout has been designed to minimise the clearing of vegetation and clearing will be limited to that which is necessary for the completion of the project;
- Existing access tracks and transport routes will be used where possible;
- Pockets or strips of vegetation will be left undisturbed within areas cleared for infrastructure where the risk of fire, impacts on road safety or interference with mining operations is low;
- Areas to be cleared will be clearly defined on maps and the ground, and clearing activities will be supervised;
- Vehicles and machinery are to be parked in designated areas;
- Dust control measures will be implemented;
- Implementation of rehabilitation procedures using data from mining activities in similar environments;
- Topsoil, rootstock and cleared vegetation will be retained in designated areas for use in rehabilitation
- Disturbed areas will be progressively rehabilitated with native species and monitored;
- Topsoil will be respread over disturbed areas as soon as possible after clearing. If direct return of topsoil is not feasible topsoil will be stockpiled for as short a time as possible;
- An existing environmental induction and awareness programme will be adapted to raise the workforce awareness of conservation issues relevant to the project;
- Establishing fixed monitoring sites at various undisturbed locations around the mine site to collect data twice a year to monitor the impact of the mining operations and dewatering on the native vegetation. Monitoring sites will also be established in rehabilitated areas to monitor the progress of revegetation, diversity of plant species and soil stability.

Weeds have been encountered in both disturbed and undisturbed locations and will be managed using the following strategies:

- Tanami has a requirement for drill rigs and mining equipment to be cleaned down prior to departing for the Coyote mine site. This assists in minimising the risk of new weed species being introduced to the area, however does not prevent the spread of weeds within the local area.
- Disturbed areas, tracks and access roads will be regularly monitored for the presence of weeds and control measures will be implemented as required.
- No gardens or lawns will be established at the Stage 2 mine site.

Erosion due to clearing will be managed through:

- Avoiding vertical clearing on slopes;
- Installation of water management structures such as bund walls;

- Contour ripping and rehabilitation of disturbed areas immediately when no longer required.

Tanami has measures in place to prevent the start and spread of fire and will implement these procedures for the Stage 2 operation. Fire management strategies include:

- Hot work permits for gas cutting and welding in areas other than those designated for such work;
- Installation of fire breaks around infrastructure;
- Provision of appropriate fire fighting equipment in strategic locations; and
- Periodic training of personnel.

There are no Threatened Ecological Communities in the project area.

8.5.6 Environmental Outcome

The flora and vegetation within the Stage 2 project area are well represented outside the proposed clearing area associated with the proposal such that the temporary disturbance and permanent loss of vegetation will not adversely impact on the representation and distribution of species and plant communities in a local or regional context.

8.6 Groundwater

Kookaburra and Sandpiper occur in low permeability saprolitic clays formed from the weathering of siltstones, shales and dolerites. Abundant and highly fractured, weathered grey quartz provides localised zones of considerable permeability to the clays drilled by the water bores. However only a small yield (2 litres per second) of saline (27,000 mg/L) groundwater was produced during airlifting whilst drilling the bores and sustained for the 24-hour test program at Bald Hill in 2004. The rapid drawdown during test pumping and high salinity groundwater indicates the groundwater flow system at this location has low permeability and receives minimal recharge at a regional level.

It is considered that the flow system at Bald Hill is a localised, low permeability system separated from the main flow systems from the south that pass through Coyote and pass well to the west of Bald Hill. Aquifers in the project area predominantly occur in zones of fractured or structurally deformed and largely unweathered bedrock. These features primarily control local groundwater occurrence and flow. The aquifers are typically inhomogeneous, anisotropic and irregular in their dimensions and form. The static groundwater level is approximately 20 m below the ground surface.

The mining operation will extend below the water table and will therefore require pit dewatering to commence just prior to mining activities extending to a depth below that of the water table. There is currently one production bore at Sandpiper and one at Kookaburra which will be used for dewatering. It is anticipated that another bore will be required for dewatering of the Sandpiper pit and a further three bores will be needed at Kookaburra. In pit sumps will be used if required. An application to construct the additional bores and increase water abstraction will be lodged prior to dewatering commencing. Initially, approximately 520 kilolitres per day will be dewatered from Sandpiper and 1,040 kilolitres per day will be dewatered from Kookaburra, resulting in a total dewatering requirement of 1,560 kilolitres per day. This daily requirement will reduce over the life of the project. The groundwater in the Stage 2 area is predominantly saline, with Total Dissolved Salts in the order of 27,000 milligrams per litre.

An estimated total of 700 kilolitres per day of extracted water will be required for dust suppression, construction of hardstand areas and maintenance of roads. Excess water will be stored in a purpose-built evaporation dam. An application for a Licence to Take Ground Water has been submitted to the DoW.

Potable water will be transported from the Coyote mine site, where a Reverse Osmosis (RO) plant supplies water for the processing plant and camp.

8.6.1 EPA Objectives

- To maintain the quantity of groundwater so that existing and potential environmental values, including ecosystem maintenance, are protected.
- To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

8.6.2 Relevant Standards and Legislation

Standards

- ANZECC, ARMCANZ: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000.
- NEPC: Contaminated Sites Management Series - Assessment Levels for Soil, Sediment and Water, November 2003.
- WRC, DME and DEP: Water Quality Protection Guidelines No 1-11, Mining and Mineral Processing, 2000.

Legislation

- Environmental Protection Act 1986.
- Water and Rivers Commission Act 1995.
- Rights in Water and Irrigation Act 1914.

8.6.3 Potential Issues

Up to 540,000 kilolitres of saline water will be dewatered from the pits over a 12 month period. This water will be used for dust suppression and construction/maintenance of the mine site with excess water stored in a purpose built evaporation pond. Upon cessation of mining, groundwater seepage and incident rain will accumulate in the pit void.

The proposed mining operations pose the following potential issues in regard to groundwater:

- Dewatering may affect quality and quantity of groundwater supplies resulting in permanent alteration of the aquifer systems;
- Development of a permanent water source in the mine pit void may adversely impact native fauna and groundwater quality of adjoining aquifers;
- Alteration of groundwater levels;
- Contamination of groundwater; and
- Accidental spillage of saline water to the environment, adversely impacting vegetation.

8.6.4 Impact Assessment

The proposal does not involve treatment of ores and the construction of facilities, such as tailings dams, that would have an impact on groundwater quantity by the creation of groundwater mounds. The extent of dewatering drawdown is approximately 800 metres east-west and 950 metres north-south. Groundwater levels are expected to recover to pre-mining levels within a few years. Potential impacts to groundwater levels from the project are considered to be minimal and localised.

The closest operational pastoral bores are located approximately 85 km north of the project area on Gordon Downs Station. The aquifer is isolated from the surrounding groundwater system and as such, water draw is considered highly unlikely to have any impact on existing bores in the region. Construction and test pumping of bores will be undertaken when appropriate licences have been obtained.

The effects of any temporary lowering of water levels as a result of water abstraction from bores during the life of mining operations will be reported in aquifer reviews, as required by the site's Groundwater Licence Operating Strategy and water extraction licence.

Dewatering water will be used for dust suppression, hardstand construction and road maintenance with the remainder being transferred to purpose-built lined evaporation ponds designed with sufficient freeboard to contain a 1:100 year 72 hour rainfall event.

Hydrocarbons will be the most significant hazardous chemical (by volume) on site. Storage and handling of hydrocarbons will be undertaken to AS 1940:2004 and site licence requirements. Spillages will be reported and remediated in line with Tanami procedures.

The pit voids are expected to recharge slowly as a result of very low permeability of the surrounding geology. Saline water will flow into the abandoned pits and reach a level similar to the existing groundwater system (20 m below surface). Rainfall and limited surface runoff will accumulate as a layer over the groundwater however the low annual rainfall and high evaporation rate is expected to result in a final water level of between 10 and 20 m below surface level. Groundwater is saline and not suitable for plants or animals. The layer of fresher water is expected to vary in quality from fresh following the wet season to brackish during the dry season.

There is no impact on vegetation expected as a result of groundwater abstraction or post-mining accumulation of water in the pits. The potential for impact on fauna in the area is expected to be negligible and is discussed in more detail in Section 8.4.

8.6.5 Management and Mitigation Measures

Tanami Gold will endeavour to maintain groundwater quantity and quality and manage impacts of groundwater abstraction and dewatering so that they do not affect the environment or any other beneficial users.

Tanami Gold will implement the following measures during the project to minimise the impact on groundwater in the project area, namely:

- Lining of facilities designed for the storage and containment of hydrocarbons with an impermeable membrane to prevent leaching into the groundwater system;
- Monitoring the extraction volumes of production bores and in-pit sumps; and
- Emergency procedures to deal with major spill of hydrocarbon or other chemical.

A groundwater monitoring programme will be implemented and include measurement of groundwater levels in the production and monitoring bores as follows:

- daily for the first two weeks;
- twice a week for the next six weeks; and
- weekly for the remaining pumping period.

The monitoring program will also include:

- Monitoring of drawdown levels to assess the efficiency of the dewatering program and to confirm the predicted drawdown effects;
- Measurement and recording of aggregate abstraction volumes from each production bore and in-pit sump every week;
- A full chemical analysis of watering from selected production bores will be conducted annually as a comparison to baseline data. Analysis will determine concentrations of:
    - pH.
    - Electrical Conductivity.
    - Total Suspended Solids.
    - Total Dissolved Solids (gravimetric and calculation).
    - Total alkalinity.
    - Hardness.
    - Ions – sodium, calcium, magnesium, chloride, potassium, bicarbonate, carbonate, sulphate, hydroxide, nitrate.
    - Metals – aluminium, arsenic, iron, manganese and lead.

Data from the water monitoring programme will be collected and reviewed. Water quality results will be compared with existing baseline data and concentrations and trends analysed.

Water level and quality information will be reported to the DOW in the required annual report.

In addition to groundwater monitoring, photographic vegetation monitoring sites will be established around the perimeter of mine operations. The intention of vegetation monitoring is to determine whether groundwater abstraction has an impact on native vegetation.

The above measures are contained in a Ground and Surface Water Management Plan (Appendix 19).

8.6.6 Environmental Outcome

Water level drawdown from bores within the project area will be localised and is not considered likely to affect the surrounding groundwater system. On cessation of mining they will slowly recover to pre-mining levels.

It is not expected that the quality of the groundwater will be affected by the project.

Waste rock will not generate acid and any leachates will contain negligible concentrations of contaminants.

Spills of hazardous materials will be cleaned up and remediated immediately.

The installation of monitoring bores and a groundwater and vegetation monitoring programme will assist in ensuring that dewatering has no adverse impacts to the groundwater quantity and quality of the region.

8.7 Surface Water

8.7.1 EPA Objectives

- To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected; and
- To maintain the quality of water so that environment values or the health, welfare and amenity of people and land uses are protected, by meeting statutory requirements and acceptable standards.

8.7.2 Standards and Legislation

Standards

- ANZECC, ARMCANZ: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000.
- WRC, DME and DEP: Water Quality Protection Guidelines No 1-11, Mining and Mineral Processing, 2000.

Legislation

- Environmental Protection Act 1986.
- Water and Rivers Commission Act 1995.
- Rights in Water and Irrigation Act 1914.

8.7.3 Potential Issues

The intensity of rainfall events, usually associated with thunderstorms and cyclonic activity, results in high erosion potential that is increased with clearing of vegetation.

During the occasional periods of rainfall runoff, surface hydrology may be impacted by the diversion of existing water courses due to the construction of waste rock stockpile, roads and other infrastructure.

The proposed mining operations and disposal of waste rock poses the following potential issues in regard to surface water quantity and quality:

- Erosion and deposition of sediments;
- Increased turbidity of runoff water as a result of construction and mining activities;
- Contamination of runoff water with fuels, oils or other chemicals; and
- Mine infrastructure impeding the volumes and quality of local natural runoff discharges.

8.7.4 Impact Assessment

Storage of fuel will be required on site. Bunding will be constructed to meet the requirements of environmental legislation and the Australian Standard 1940:2004.

Waste characterisation indicates that there is very minimal potential for acid drainage. Minor concentrations of soluble contaminants that may occur within surface runoff and leachates from waste rock and ore stockpiles will be ecologically acceptable.

The 35 kilometre haul road (approximately 45 hectares) traverses very flat to slightly undulating topography comprising a significant palaeo-drainage channel. This area forms drainage for an extensive catchment and can be subjected to large flows of water following significant rainfall. The haul road will be constructed using locally obtained gravel and calcrete, and will not be raised significantly above the surrounding landscape. As a result water flow will not be impeded.

The mine site occupies an area of approximately 66 hectares of which 10 hectares will remain as a pit void after mining has ceased. No major regional drainages are intersected by the mine site.

The rainfall events that will effect the site are likely to be short duration, high volume events. The drainage system to be installed around the mine site will be designed to contain and divert the surface flows. Collected water will be diverted around the mine site, directed to sediment traps and then allowed to re-enter the natural drainage system.

8.7.5 Management and Mitigation Measures

To assist in surface water management during the Stage 2 project, Tanami Gold will employ the following methods:

- Installation of bunded storage areas for fuel and any other chemicals required for the mining operation;
- Bunded areas will be constructed to contain a minimum of 110% of the capacity of the storage tank;
- An impermeable liner will be installed at the refuelling point to provide containment of spills;
- Provision of spill kits in strategic locations and training of site personnel in their use;
- The service truck will carry spill equipment to enable spills to be dealt with quickly;
- Any spills of contaminants, such as oil or fuel, which occur outside of bunded areas will be cleaned up immediately to minimise the risk of surface water contamination;
- Waste is to be stored appropriately to prevent escape of contaminants with rainfall runoff;
- Drainage systems and catchment areas will be constructed to cater for a 1 in 100 year 72 hour rainfall event;
- Diversion bunds and sediment traps will be installed where necessary to prevent runoff entering the natural drainage system;
- Vegetation will be cleared progressively to limit disturbance and reduce potential for soil erosion;
- The time that bare soil is left exposed to surface runoff will be minimised;

- The rehabilitation process will include contour ripping of disturbed areas to control surface runoff;
- Surface water management structures will be designed and constructed to minimise erosion;
- Regular visual monitoring will be undertaken of the diversion channels and downstream drainage lines, and the condition of vegetation in the diversion channels;
- Should substantial erosion occur, the cause of the erosion will be identified, erosion/deposition areas rehabilitated as appropriate, and measures implemented to prevent further erosion;
- During periods of heavy rainfall, the open pit will be closed to ensure the safety of workers and to prevent damage to pit ramps and roads; and
- Disturbed areas will be stabilised and revegetated to minimise erosion potential.

The above measures are contained in the Ground and Surface Water Management Plan (Appendix 19).

8.7.6 Environmental Outcome

Construction of infrastructure to enable capture and containment of hydrocarbons, chemicals and sediment, and diversion of natural surface water flows, will ensure mining activities do not have a significant impact on water flows or downstream surface water quality in the surrounding area.

8.8 Air Emissions

8.8.1 EPA Objectives

Air Quality

To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

Greenhouse Gases

To minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions.

8.8.2 Relevant Standards and Legislation

Standards

- World Health Organisation Guidelines for Air Quality 2000.

Legislation

- Environmental Protection Act 1986.
- National Environmental Protection Measures (NEPMs) outlined in the National Environment Protection Council (Western Australia) Act 1996. These are:

  - Ambient Air Quality NEPM.

  - Diesel Vehicle Emissions NEPM.

  - National Pollutant Inventory NEPM.

8.8.3 Potential Issues

Gaseous emissions will result from burning of fuels for the diesel powered generators, engine exhausts of earth moving equipment, mine vehicles and transport trucks. This includes carbon monoxide, carbon dioxide and nitrous oxides. An estimated 1.5 million litres of fuel is expected to be burnt during the Stage 2 project. Approximately one million litres will be used for mining activities with 500,000 litres for haulage.

Greenhouse gases will also be released from vegetation clearing by burning, natural decay and soil carbon release.

The Greenhouse Challenge Plus spreadsheet, obtained from the Australian Government Greenhouse Office, was used to estimate the amount of greenhouse gas in carbon dioxide equivalent (CO_2-e) that will be emitted as a result of the Stage 2 operations. Based on fuel consumption of 1,000kL of diesel fuel and 470 tonnes of ANFO, emissions of 43,078.5 tonnes of CO_2-e are estimated for the Stage 2 project. Based on fuel consumption of 0.5 mega litres per annum, emissions of 1,500 tonnes of CO_2-e are estimated for the trucking of ore to Coyote.

Reporting of up to 90 substances to the NPI will potentially be required for the Coyote Project (existing + Stage 2). This may include emissions from various activities on-site such as blasting, processing, combustion and dust generation. The NPI is a database designed to provide the community, industry and government with information on the types and amounts of certain substances being emitted to the air, land and water.

8.8.4 Impact Assessment

Greenhouse gas emissions will result from onsite generation of power for general operations, flights to and from site and emissions from vehicles, machinery and mobile equipment. Given the small scale and short duration of this operation, the volume of Greenhouse gas emissions will not be significant. Nevertheless, Tanami is committed to reducing its environmental impact where practicable.

Clearing associated with the project will result in the permanent loss of 10 ha and temporary loss of 102 ha. The rehabilitation and re-establishment of native vegetation over the mining area, excluding the pit, will result in restoration of more than 90% of the carbon sink function of the current vegetated area over a period of 10 to 20 years.

8.8.5 Management and Mitigation Measures

The following management and mitigation measures will be implemented to minimise and control air emissions:

- Vehicles and power generating equipment will be regularly maintained and serviced to manufacturer’s specifications to ensure efficient running of equipment and optimum fuel consumption, thereby minimising exhaust emissions;
- Energy efficient appliances (i.e. light globes and air conditioners) will be used wherever possible;
- Low emission fuels will be used wherever possible and Tanami Gold will investigate the use of alternative fuel sources;
- Rehabilitation will, where possible, be progressive and involve careful topsoil management and re-introduction of species such that a self-sustaining vegetation complex is established; and
- Emissions will be reported as part of the National Pollutant Inventory.

8.8.6 Environmental Outcome

Greenhouse gas emissions from power generation, vehicles and equipment will be minimised by regular maintenance and efficient use of vehicles and equipment. Vegetation clearing will result in a temporary loss in the carbon sink and in the release of CO_2 over a one year mining life. Revegetation of disturbed areas with endemic flora will replace this loss within a few years.

8.9 Dust

8.9.1 EPA Objectives

To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land use by meeting statutory requirements and acceptable standards.

8.9.2 Relevant Standards and Legislation

Standards

- World Health Organisation Guidelines for Air Quality 2000.
- Mines Safety and Inspection Regulations 1995.

Legislation

- Environmental Protection Act 1986.
- The following National Environmental Protection Measures (NEPMs) outlined in the National Environment Protection Council (Western Australia) Act 1996:

  - Ambient Air Quality NEPM.

  - National Pollutant Inventory NEPM.

  - Mines Safety and Inspection Act 1994.

8.9.3 Potential Issues

Dust may be generated from the following:

- Earthworks undertaken during the construction and operation of the project;
- Topsoil stripping;
- The mining and loading of ore onto haul trucks;
- Blasting activities;
- The movement of vehicles; and
- Wind erosion of exposed surfaces such as the pit, waste rock stockpile, the ROM area and roads.

8.9.4 Impact Assessment

Fugitive dust will be generated from mining activities, vehicular movement and wind erosion. The extent of dust generated is expected to be minor and localised. Dust suppression using water sprays will mitigate dust effects from these sources.

Generation of dust from blasting activities cannot be mitigated using water sprays. Dust generated from blasting in the pit will potentially impact on vegetation downwind of the pit however due to the small scale of the mining operation this is considered unlikely to have a significant impact.

8.9.5 Management and Mitigation Measures

Dust suppression measures will be instituted using water trucks, spray bars and other means as necessary, in the event that high levels of dust are observed, and/or strong winds and dry conditions make dust generation likely.

As part of the National Pollution Inventory, quantities of air emissions will be estimated or measured and reported annually to the DEC. This may include emissions from various activities on-site such as blasting, processing, combustion and dust generation.

Progressive rehabilitation programme will reduce the risk of dust generation.

Vegetation monitoring sites will be established in appropriate locations to monitor the impact of dust.

8.9.6 Environmental Outcome

The potential for dust generation can be managed through standard dust suppression measures such that there will be no significant off site impacts.

8.10 Noise

8.10.1 EPA Objectives

To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

8.10.2 Relevant Standards and Legislation

Standards

- Environmental Protection (Noise) Regulations 1997.
- Mines Safety and Inspection Regulations 1995.

Legislation

- The noise provisions of the Mines Safety and Inspection Regulations 1995 (Part 7: Division 1).
- Environmental Protection (Noise) Regulations 1997.

8.10.3 Potential Issues

Noise generated as a result of the project will be primarily due to:

- Power generation from generator sets;
- Blasting in the pit;
- Operation of earthmoving machinery, trucks and other mechanical equipment; and
- Traffic along the transport routes.

8.10.4 Impact Assessment

The mining operations at the Stage 2 Project area will comply with legislation that governs occupational noise and noise emissions from premises.

The camp is almost 50 km south of the project site and will not be affected by noise from the operations. The nearest local station is Gordon Downs, approximately 85 km north of the project area and the nearest settlement is Balgo, approximately 90 km west of the site. These will not be affected by noise from the operation.

The haulage route will cross the Tanami Highway at the entrance to the existing mine site. Truck traffic is not subject to the noise regulations at any point along the proposed haul route.

8.10.5 Management and Mitigation Measures

Noise emissions generated by the construction and operation of the project are expected to be localised and not create a nuisance beyond the boundary of the project area. Tanami Gold will implement the following noise management measures to ensure that noise is minimised:

- All mining equipment will be fitted with the required noise attenuation equipment to meet Australian occupational health and safety requirements. Hearing protection will be supplied to personnel where required.
- Noise control equipment on stationary and mobile equipment will be regularly inspected an maintained to ensure it is operating correctly;
- Noise emissions will comply with the requirements of the Environmental Protection (Noise) Regulations 1997 and the Mining Act 1978;

The project site is remote from any residence and is almost 50 km from the camp, so noise will not be an issue for personnel or the closest residences.

8.10.6 Environmental Outcome

As there are no noise sensitive premises in close proximity to the project area, noise impacts are expected to be minimal.

Noise emissions may have a minor impact on fauna in the immediate vicinity of the haul road and mine site, however this is not expected to have long term detrimental effects. Experience at the existing mine site has shown that animals become accustomed to the noise and activity and often take advantage of increased food availability (The Bush Stone-curlew, *Burhinus grallarius*, has been observed on a number of occasions feeding under lighting towers at night) or vantage points (Photograph 8.1 shows an Australian Hobby that regularly roosts in the upper levels of the processing plant).

Photograph 8.1 An Australian Hobby regularly roosts in the processing plant.

8.11 Landscape/Visual Amenity

The Stage 2 project will focus on the Sandpiper and Kookaburra deposits located to the north of the existing mine site. The area is locally known as Bald Hill, although the actual hill bearing this name is not accurately defined on topographic maps available.

The project area comprises four types of landform, essentially supporting two distinct vegetation types. The mining area comprises sandplain and low laterite rises with occasional outcropping, both supporting Acacia Shrubland vegetation (several species) over Spinifex (*Triodia pungens*).

The haul road route includes these landforms as well as sand dunes, which also support Acacia Shrubland, and a broad palaeochannel, which supports Hummock Grassland vegetation.

The surface topography around the Sandpiper deposit can be described as a flat, low lying area covered with a thin layer (one metre) of alluvial sediments. Surface topography at Kookaburra includes a large amount of near-surface outcrop at the western end where a small area (approximately 20 m by 20 m) of rocky outcrop is visible which gradually cascades into topography similar to Sandpiper with shallow alluvial cover less than one metre deep.

8.11.1 EPA Objectives

To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable.

8.11.2 Visual Assessment

Mining will not impact on any of the hills in the area and minimal infrastructure will be required for this operation. On completion of mining activity disturbed areas will be returned as near as possible to their original condition. Post-mining landforms such as waste dumps will be constructed and rehabilitated to reflect the surrounding environment.

The waste dump will have a footprint of 25 ha with each pit having a footprint of five hectares. The waste dump will reach a maximum height of 20 m. Batter angles will be a maximum of 15^0, closely matching the angle of hills in the surrounding area. The waste dump will be revegetated with flora endemic to the immediate area such as Spinifex and several species of Acacia. It is expected that vegetation will closely resemble that in the surrounding area within 2 to 3 years of completing rehabilitation work.

The Stage 2 project area is distant from public roads and communities and the mine site will not be visible to the general public. It is therefore considered unlikely to have any visual impact.

8.12 Waste Products

8.12.1 EPA Objectives

Soil Quality

To ensure that rehabilitation achieves an acceptable standard compatible with the intended land use, and consistent with appropriate criteria.

Water Quality

To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

8.12.2 Relevant Standards and Legislation

Standards

Relevant standards and guidelines in regards to waste storage, transport, and management, include but are not limited to:

- Guidelines for Controlled Waste Generators.
- Guidelines for Controlled Waste Treatment and Disposal Sites.
- Guidelines for Acceptance of Solid Waste to Landfill.

Legislation

The key legislation regarding waste management is administered by the Waste Management Branch and is contained within the Environmental Protection Act 1986. This includes the:

- Environmental Protection Act 1986 – Part VIIA.
- Environmental Protection Amendment Regulations (No. 2) 1998.

The following legislation relates to the transport of waste that may cause environmental or health risk:

- Environmental Protection (Controlled Waste) Regulations 2004.
- Health Act 1911.

8.12.3 Potential Issues

Various wastes will be generated by the project. These include:

- General domestic and office refuse;
- Industrial wastes (e.g. tyres, packaging, infrastructure and machinery components);
- Hazardous wastes (e.g. oils, grease, lubricants); and
- Sewage.

There is the potential for incorrect waste disposal to result in the contamination of soil, surface water and groundwater and for litter to be dispersed beyond the landfill perimeter.

8.12.4 Impact Assessment

All domestic and non toxic waste will be disposed of at a designated landfill site within the waste dump footprint and buried.

Hazardous wastes will be stored in an appropriately bunded facility before being transported off site for appropriate disposal and will not present an environmental hazard.

Waste oils, grease, lubricants and filters are to be stored in an appropriately bunded facility before being transported off site for disposal or recycling by an authorised contractor. Suitable storage will prevent contamination of the surrounding environment.

A biological treatment system will be used for the disposal of sewage waste. The systems will be designed and operated in compliances with the health requirements of the Health Department of Western Australia and the Shire of Halls Creek.

The groundwater level is approximately 20 ma below the ground surface and subsurface material has very low permeability. Landfills and sewerage treatment systems will be designed to depths such that the underlying water table will not be adversely impacted.

All used tyres will be transported offsite for appropriate disposal.

8.12.5 Management and Mitigation Measures

Tanami Gold will implement management measures to minimise the potential for contamination of the surrounding environment due to general waste disposal as follows:

- Procedures for the safe storage, use and disposal of process chemicals and reagents will be developed and implemented;
- Waste disposal methods will be continually monitored using appropriate techniques to ensure contamination of the surrounding environment is prevented;
- Waste management practices will be designed and implemented to meet legal requirements;
- General domestic and office waste will be disposed of at a designated landfill site within the waste dump footprint and buried;
- Bins for the disposal of recyclable materials will be provided in convenient locations at the mine site;
- There will be no burning of refuse at any time;
- Inert industrial and domestic waste will be disposed of to an on-site landfill, located in the waste dump;
- Landfill cells will be located away from areas that may be subject to localised inundation and away from drainage lines. Surface water will be managed in the vicinity of the landfill to minimise runoff entering;

- Waste hydrocarbon products will be removed by an appropriately licensed and competent contractor;
- Hydrocarbon contaminated soil and absorbent materials will be collected regularly and transported to Coyote mine site for bio-remediation in a purpose-built “land farm”;
- All toxic waste material (i.e. used oil, batteries, tyres) will be transported to the Coyote mine site for appropriate disposal;
- Tanami Gold is in the process of establishing a recycling programme at the Coyote mine site. Suitable waste materials from the Stage 2 area will be included in this program;
- Waste rock from both pits will be disposed of in a dump located south of the Sandpiper open pit.

8.12.6 Environmental Outcome

Through appropriate management measures in accordance with standard industry practices there is expected to be minimal impact on the environment through generation and on-site disposal of waste products.

8.13 Dangerous Goods and Hazardous Substances

8.13.1 EPA Objectives

Soil Quality

To ensure that rehabilitation achieves an acceptable standard compatible with the intended land use, and consistent with appropriate criteria.

Water Quality

To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.

8.13.2 Relevant Standards and Legislation

Standards

Relevant Australian standards in regards to the storage, handling, and management of dangerous and hazardous substances include, but are not limited to:

- AS 1940:2004 - The storage and handling of flammable and combustible liquids.
- AS 1692:1989 - Tanks for flammable and combustible liquids.

Legislation

- Environmental Protection Act 1986.
- Environmental Protection (Controlled Waste) Regulations 2004.
- Environmental Protection (Liquid Waste) Regulations 1996.
- Explosives and Dangerous Goods Act 1961.
- Dangerous Goods (Transport) Act 1996.

8.13.3 Potential Issues

There is the potential for incorrect storage and handling of dangerous and hazardous substances to result in the contamination of soil, surface water and groundwater.

8.13.4 Impact Assessment

Crushing and treatment of the ore does not occur on this project area. The greatest hazardous material on site by volume will be diesel fuel, along with small quantities of oils and grease.

A 50,000 litre diesel fuel tank will be positioned within a bunded area on site and constructed in accordance with AS1940-2004. Oils and other hydrocarbons will be stored at the one site workshop on portable bunding.

Explosives will be transported from the magazine facility at the Coyote mine site when required. There will be no storage of explosives or associated equipment on site.

There will be no requirement for bulk storage of any other dangerous goods or hazardous substances.

8.13.5 Management and Mitigation Measures

Tanami Gold will implement management measures to minimise the risk of contamination of soil, surface water and groundwater and harm to employees at the site:

- A register of all hazardous materials on site will be developed and maintained. This will document the hazardous material name, location, approximate volume, storage method and where applicable, disposal method for the substance and containers;
- Fuel storage areas and workshops will be bunded in accordance with the DoIR and DEC requirements;
- Any areas where chemicals are to be used, stored or handled are to have suitable spill kits on hand to enable rapid response to spills that may occur;
- Hydrocarbon spills will be cleaned up immediately with contaminated soil being contained in plastic bags. These will be removed and transported to the bioremediation area at Coyote mine site regularly for treatment;
- Hazardous wastes generated by the operation are to be stored in an appropriately bunded facility before being transported off site for recycling or disposal by a suitable service provider. This is likely to include waste oil, grease and heavy equipment fuel and oil filters;
- Hazardous materials will be brought to the site in bulk packaging wherever possible. This practice will minimise the number of containers and reduce the risk of spillage;
- All mobile equipment and light vehicle servicing activities including wash down will be conducted on impermeable surfaces;
- A Licence to Store Dangerous Goods will be obtained for the storage of all hazardous materials on site;
- Spillages of hazardous materials will require incident reporting according to company policy and procedures;
- Explosives will be transported from the magazine facility at the coyote mine site when required; and
- All explosives will be transported by road in accordance with the Mines Safety and Inspection Act 1994, Mines Safety and Inspection Regulations 1995 and Explosives and Dangerous Goods Act 1961.

8.13.6 Environmental Outcome

By implementing appropriate storage and handling measures in accordance with industry standards and practices, dangerous goods and hazardous substances used in the Stage 2 project mining operations will not present a hazard or cause environmental harm.

8.14 Other Environmental Management Strategies

Tanami has developed a number of strategies to minimise the impact of mining and exploration activity in the Coyote Project area. Environmental management measures include:

- **Environmental induction -** all employees and contractors are required to attend an environmental induction intended to educate mine personnel of the presence of native fauna within the Western Tanami region as well as environmental management.
- **Animal sighting reports -** site personnel are encouraged to report threatened fauna or any unusual animals sighted in the area. Reports are lodged verbally, via email or using a simple reporting form available on site. To date, this strategy has resulted in reported sightings of 5 Bilbies, 4 Bush Stone-curlews and a Woma within the Coyote mine site and camp. There have also been numerous requests for further information on unusual animals sighted in the area including the Black-headed Python, other reptiles and various birds.
- **Environmental handbook -** a handbook has been developed for the Coyote Project. The booklet provides pictures of threatened species known or potentially inhabiting the region, significant plants such as the Desert Walnut and several weeds, as well as basic environmental management procedures for spill response and waste disposal. The handbook will be revised to include Stage 2 of the Project.
- **Animal road toll survey -** site personnel are asked to report road kills within and surrounding the Project area. Reports to date have been predominately reptiles, with no threatened species recorded.
- **Biological surveys -** flora and fauna surveys of the Project areas and surrounding region will be carried out at intervals for the life of the mining project. The information collected during these surveys will assist in development of management strategies for threatened species, weeds and other environmental issues.

9 Social Issues and Management

9.1 Surrounding Land Use

9.1.1 Potential Issues

The closest community is Balgo, located approximately 90 km west of the Stage 2 project. The area is not subject to grazing or other formal land uses although there are locations of high Aboriginal significance in the vicinity. Some of these sites are occasionally visited by the Traditional Owners. None of these will be impacted by the mining operation and access to these locations will not be restricted.

There will be no detrimental impact to Balgo community, or to any areas of Aboriginal significance as a result of the Stage 2 mining operation.

9.1.2 Management and Mitigation Measures

All employees will be made aware of the value of parts of the surrounding landscape to the Traditional Owners.

Exclusion zones defined by the local Aboriginal people and the requirement to remain within the confines of the mining area and access roads will be clearly communicated to all personnel.

On completion of mining activity an abandonment bund will be installed around the site to prevent vehicle access to the pits.

Progressive rehabilitation of the waste dump and tracks will be carried out during the project, with all other disturbance to be rehabilitated on completion of mining activity.

9.1.3 Outcome

There are no perceived issues relating to surrounding land use in the Stage 2 project area.

9.2 Aboriginal Heritage

9.2.1 EPA Objectives

To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.

9.2.2 Relevant Standards and Legislation

- National Environment Protection Council (Western Australia) Act 1996.
- Aboriginal Heritage Act 1972.
- Heritage of Western Australia Act 1990.
- EPA Guidance Statement No. 41, Assessment of Aboriginal Heritage.

9.2.3 Potential Issues

Development and operation of the Stage 2 project and haul road has potential to adversely impact on sites of archaeological or cultural significance to Aboriginal people.

9.2.4 Impact Assessment

The Coyote Project is located on the traditional land of the Tjurabalan People and a number of sites of traditional Aboriginal significance are located within the surrounding region.

9.2.5 Management and Mitigation Measures

Heritage surveys were conducted in 2002 utilising qualified consultants and elders from a number of the local communities. Areas of significance were identified during that time and Tanami has agreed not to access these locations. These processes were formalised in Native Title and Heritage Protection Agreements signed in April 2003.

All infrastructure will be located well away from these culturally significant areas, none of which will be impacted by Stage 2 activity.

9.2.6 Environmental Outcome

The heritage values of the Stage 2 project area and region have been identified through appropriate survey and consultation, which will be ongoing during the project. The proposed project has been designed with cultural and heritage sensitivities in mind, and is expected to have no impact on any sites of Aboriginal significance.

9.2.7 Benefits to Local Communities

The Coyote Project provides an opportunity for the Tjurabalan people to increase their skill base and share in the mutual benefits derived from the development of this project.

A number of local community members are now employed by Tanami through the mining contractor and are completing training in the operation of a range of earthmoving equipment. In addition to the traineeships a number of unskilled labouring roles have been filled by local community members. Future contracting and employment opportunities are anticipated.

As discussed in Section 9.1.2 there is potential for benefits to local communities in the future associated with the post-mining pits.

Tanami intends to undertake cultural awareness training of its workforce with the close involvement of the local communities and the KLC.

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11 Consultation

Consultation has been undertaken with the following people in preparation of this document.

Name	Position/Organisation
Professor Louis Evans (Pit lakes)	Executive Director, Centre of Excellence for Sustainable Mine Lakes, Curtin University.
Dr Tamra Chapman (Wildlife management)	Zoologist, Department of Environment and Conservation.
Dr Pip Masters (Mulgara)	Zoologist, Kangaroo Island Natural Resources Management Board
Mirjana Jambrecina (Mulgara)	Natural Cultural Resource Manager, Uluru-Kata Tjuta National Park
Dr David Pearson (Mulgara)	Research Scientist, Department of Environment and Conservation
Dr Bill Low (Post-mining pits)	Ecologist, Low Ecological Services Pty Ltd, Alice Springs.
Maria Mann, Jacqui Remond, Pat Lowe	Environs Kimberley.
Tim Nicol	Minerals Liaison Officer, Conservation Council of Western Australia.
Tim Gentle	Program Coordinator, EPA Service Unit, Department of Environment and Conservation.
Justin Robins	Environmental Officer, Department of Industry and Resources.
Vern Wilson (Post mining pit water)	Principal Hydrogeologist, Parsons Brinckerhoff

Appendices

Appendix 1
Letter regarding abandoned open pits

WA Low Ecological Services
Grouped with Low Ecological Services P/L
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PO Box 3130, Alice Springs, NT 0871, Australia
Phone: (08) 89 555 222 Fax: (08) 89 555 722
Email: LowEcol@LowEcol.com.au Web: www..LowEcol.com.au

May 19, 2007

Mr. Jeremy Shepherd,
jshepherdson@tanami.com.au

Dear Jeremy,

Fauna activity related to ground water in open cut voids in Tanami Desert.

I have been associated with open cut mining operations centered around Tanami Well and the Granites frequently since 1990 doing flora fauna surveys and rehabilitation monitoring.

During this time I have had many opportunities to observe the open cut pits at all stages of being dry and having water in them. The natural water table tends to be quite deep with water filling to perhaps 50m below ground level in pits which are 60 to 80m or more deep. Water quality is variable, depending on the location of the pit, but the tendency is for the water to be saline.

In all my association with the pits with water, I have never seen concentrations of fauna around the pits. This may be due to the depth below ground level and the difficult flight pattern for larger water birds to get down to the water and to take off in usually still conditions and fly in a spiral patter up to the ground surface level.

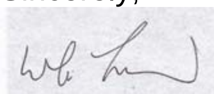
We have seen a few Grey teal rearing ducklings on the pit lakes, but I have no knowledge of whether they successfully fledged or not. Numbers of duckling families has been very few and then only in the fresher lakes. One problem the ducklings face is the relatively sterile water in ponds which have steep shores and little in the way of invertebrate life.

Other water birds seen on or adjacent to the water at the bottom of open cut pits include a few White faced Heron, terns, Dotterels and several other small waders. At Tanami Mine when swans and ducks were landing on tailings dams, they were not going down to the water in the pits. When one pit was used to collect fresh runoff water from a diversion drain it filled to about 20 or 30 m below ground level. A few more waterfowl used the pit under those circumstances, but the numbers of birds was never more than a few pair.

Camels are relatively common in the region and I have never seen camels or tracks going down to the water in the bottom of the pits. In one recent instance, camels did walk several hundred meters down a pit ramp to a seepage where fresh water was draining from the pit wall at about 20m below ground level. Red kangaroos and Euros are also present in the region in small numbers but there was never any indication of numbers increasing in proximity to the open cut pits. Smaller mammals such as Bilbies were occasionally present around the waste dumps, but there was never sign of them at the pits.

A pair of Peregrine Falcons established a nest in one large pit and over about 8 years brought off one or two chicks each year. Peregrines do not normally occur in the Tanami Desert due to lack of cliff face nesting sites. Here is a case of landscape rejuvenation.

Sincerely,



Bill Low,

Appendix 2
Pit Water Balance Modelling

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NCSI Certified Quality System ISO 9001

Our reference: 2142190A:LT_18302.doc

19th June 2007

Jeremy Shepherdson
Environmental Advisor
Tanami Gold NL
PO Box 1892
West Perth WA 6872

Dear Jeremy

Sandpiper & Kookaburra Pit Water Balance Model

The Coyote Project is located approximately 280 km southeast of Halls Creek, approximately 30 km west of the Western Australia-Northern Territory border. Stage 2 of the Tanami Gold NL (Tanami) Coyote Project focuses on the Sandpiper and Kookaburra gold deposits, located approximately 35 km north of the existing mine site. Open cut mining methods will be used to remove gold ore from these two pits. The pits will be mined in two phases. The first phase will involve removal of ore to the depth of the water table (20m) and is expected to take 6-8 weeks. The second phase will involve extraction of the remainder of the ore to approximately 70 m, taking an additional 6 months.

After pit closure and remediation groundwater abstraction will cease, therefore saline groundwater will start to inflow into the Sandpiper and Kookaburra pits, until it reaches the level of the groundwater table. There is concern that a layer of fresh water will develop on top of the saline groundwater and lead to environmental problems.

Groundwater inflow

Aquifers in the project area predominantly occur in zones of fractured or structurally deformed weathered bedrock. These features primarily control local groundwater occurrence and flow. The aquifers are typically inhomogeneous, anisotropic and irregular in their dimensions and form. The groundwater TDS (gravimetric) ranges from 23,000 mg/L to 26,000 mg/L with EC ranging from 36,000 µS/cm to 41,000 µS/cm. Field measurements of groundwater samples from two site bores at the time of construction have values of pH 7.7 to pH 7.9. The aquifer has a low hydraulic conductivity and a low hydraulic gradient. This means that saline groundwater inflow into the pit will be very slow and there will not be substantial groundwater through-flow to and from the pits, once full.

Fresh water inflow

There are two possible sources of fresh water addition to the pit; surface water runoff and direct rainfall. The Sandpiper and Kookaburra deposits are located on a slight lateritic rise with runoff generally moving in a south-easterly direction. A fall of less than 2m is evident from the north to the south of the Stage 2 project area. The Sandpiper and Kookaburra pits will also be bunded to prevent surface runoff into the pits. Therefore it is envisaged that surface runoff will not be a source of fresh water in the pits, and the only fresh water input will be from direct seasonal rainfall.

Climate data

The area around Sandpiper and Kookaburra pits has a tropical semi-arid climate with very hot summers and warm dry winters. There are two distinct seasons; the wet season generally from December to March, characterised by high temperatures and infrequent rainfall, and the dry season for the rest of the year. Over 80% of the average annual rainfall occurs between December and March and is associated with thunderstorms and tropical lows or cyclones.

Table 1 shows the average rainfall and temperature for Balgo Hills, the nearest weather station to the Sandpiper and Kookaburra pits. From October to January maximum temperatures average over 37°C. Winters are mild to warm with the July average maximum and minimum temperatures being 26.3°C and 12.5°C respectively. The average relative humidity varies from 22% to 50% at 9 am and from 17% to 35% at 3 pm with the higher values occurring in the wetter December to March period.

Table 1: Average rainfall – Balgo Hills

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	Years
Rainfall (mm)	71	85.8	44.3	18.3	15.3	9.8	8.1	2.5	2.8	11	21	55.7	345.6	1940-2007
Avg. Max Temp (°C)	38.5	37.2	36.7	34.2	29.3	26.2	26.3	28.8	33.7	37.1	38.7	38.7		1950-2007
Avg. Min Temp (°C)	25.2	24.2	23.2	20.4	15.6	12.5	11.9	14	18.4	22.3	24.3	25.1		1950-2007

In order to assess the potential accumulation of fresh water in the pit, a simple water balance model was calculated for the pits based on average rainfall data from Balgo Hills and average evaporation data for the region.

Fresh water accumulation

The total average rainfall is 345.6 mm and the average annual evaporation is approximately 3,000 mm per year (average 6 mm to 10 mm per day). The evaporation is much greater than the rainfall; this means that even in years of exceptionally heavy rainfall the fresh water that accumulates in the pit would not reside due to evaporation. It is anticipated that a fresh water layer of up to 1 m in thickness may accumulate in the pit during the wet season but that this fresh water layer will be depleted over the following dry season due to evaporation.

Therefore it is concluded that fresh water in the Sandpiper and Kookaburra pits may accumulate over the short periods of high rainfall, however it will not dwell over several months due to a greater net evaporation than net rainfall. Thus animals will not seek either pit to provide a reliable source of drinking water.

Yours sincerely,

Aine Patterson

Aine Patterson

Hydrogeologist
Parsons Brinckerhoff Australia Pty Limited

Appendix 3
Wildlife Management Plan

Coyote Project - Stage 2

Wildlife Management Plan

TANAMI
GOLD NL

Revised May 2007

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Date:	September 2006
Location:	Coyote Gold Project, Tanami Desert, Western Australia.

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Appendices

1 Executive Summary

1.1 Introduction

Tanami Gold NL proposes to develop Stage 2 of the Coyote Project in the Tanami Desert, Western Australia. Stage 2 will comprise a haul road running 35kms north from the existing Coyote mine site to the Sandpiper and Kookaburra prospects. The mining operation will involve development of two small open pits, a waste dump, ROM, evaporation dam and hardstand area. The entire operation will result in the disturbance of 112 ha, which includes the haul road.

A number of recognised environmental issues are associated with the development of this project, primarily relating to the presence of threatened fauna. This document discusses these issues and describes the methods to be employed to ensure any threats to wildlife are minimised.

1.2 Document Endorsement

This Wildlife Management Plan was submitted to the Department of Environment and Conservation in September 2006 for review and comment. A number of recommendations were made and the document was revised. In October 2006 it was re-submitted and received approval. Confirmation of approval of the document is included as Appendix 1.

1.3 Threats to Wildlife

An impact assessment for construction and operation of the haul road and Stage 2 mining operation has been carried out and a variety of environmental issues have been identified. These issues relate primarily to the potential for impact on fauna, in particular numerous threatened fauna species known to inhabit the area, and their habitats. Following is discussion of the recognised environmental threats that relate specifically to wildlife in the Stage 2 area.

1.3.1 Vegetation clearing

Stage 2 will result in total disturbance of 112 ha of native vegetation, which has potential to adversely impact on the flora and fauna of the area. The mining operation will require clearing of approximately 66.5 ha while the haul road will require clearing of approximately 23 ha.

Vegetation to be cleared is typical of the region, comprising predominately Acacia Shrubland and Hummock Grassland. No threatened flora or threatened ecological communities have been recorded in the area.

1.3.2 Habitat disturbance

The haul road passes through habitat known to support the Mulgara (*Dasycercus cristicauda*) and with potential to support the Bilby (*Macrotis lagotis*).

Approximately 2.8 ha of this habitat will be disturbed as the route passes through a series of small sand dunes approximately 25 km north of Coyote mine site. The largest of the sand dunes supports at least one population of Mulgaras.

The haul road will also pass through a small area of laterite rise, habitat potentially suitable for the Bilby. Less than 1 ha of this area will be disturbed and there have been no previous records of Bilby activity.

A number of Eucalypt trees will be removed to widen the existing track. There is some potential for nesting sites of the Major Mitchell's Cockatoo (*Cacatua leadbeateri*) to be lost as a result of this.

The mining area does not support vegetation or habitat specifically suited to any of the known threatened fauna, although several species may occupy the area on occasion.

1.3.3 Predators

Predators such as the dingo and cat are regularly observed along tracks in the area, including the existing access track to the Stage 2 area. It is believed that these animals use the roads as an easier means of movement, possibly resulting in expanded hunting areas and an increased threat to species such as the Bilby or Spectacled Hare-wallaby. Camels regularly use tracks in the area, which may also result in an expanded range.

With a track already in place and frequent sightings of dingoes, camels and cat tracks along the route, construction of the haul road is unlikely to result in any change to the current situation.

1.3.4 Increased motor vehicle activity

When the haul road is in operation the number of vehicles and frequency of vehicle activity in the area will increase. As a result, there is potential for an increase in fauna mortality.

1.3.5 Dust and noise

Dust and noise created by construction and use of the haul road may impact fringing vegetation or have a direct effect on wildlife inhabiting the immediate vicinity.

1.3.6 Use of saline water for dust suppression

The use of saline water for road construction and dust suppression has potential to result in adverse impact on vegetation and dependent fauna.

1.3.7 Dams, bunds and trenches

During construction and operation of the haul road and mine site there is potential for fauna to become trapped and die in dams, lined bunded areas or trenches.

1.3.8 Hydrocarbon and chemical spills

Fuel will be transported to the Stage 2 mine site and stored in a 50,000 litre tank. There is potential for spills to occur during construction and operation of the haul road and mine site and soil, surface or ground water contamination to occur as a result.

1.3.9 Fire

Frequent fires can alter the vegetation and subsequently affect the dependent fauna.

1.3.10 Surface and ground water disturbance

Drawdown of groundwater as a result of dewatering is not considered likely to impact vegetation in the area. Groundwater is saline and not suitable for plant use.

Disturbance of natural surface drainage by placement of infrastructure has potential for adverse downstream effects.

1.4 Receiving Environment

1.4.1 Landscape

The landscape traversed by the haul road is flat or gently sloping with a few hills apparent in the surrounding area. The mining area is gently sloping to the south with some exposed rocky outcrops. Hills and rocky outcrops become more frequent to the north.

Soils are sandy with underlying gravel that is exposed on higher ground.

Surface water movements are generally undefined and occur as broad sheet flows. Surface water movement for much of the area is directed toward a palaeo-drainage system that flows in a westerly direction.

1.4.2 Flora and vegetation

Vegetation in the area is generally low shrub or grassland. Over 140 species have been identified in the area as a result of flora surveys and monitoring.

There are three main vegetation types found along the haul road route and in the mine site area. Vegetation has been classified using the National Vegetation Information System framework, sourced from the Australian Natural Resources Atlas (http://audit.deh.gov.au/ANRA/atlas_home.cfm).

The main vegetation types present are:

Acacia Shrubland – found in the proposed mining area and at various locations along the haul road route. This typically consists of various Acacia species with scattered emergent Eucalypts (predominately *E. brevifolia* and *E. odontocarpa*) and occasional Grevilleas and Hakeas. The understorey is predominately *Triodia* (Spinifex) species.

Hummock Grassland – found in the proposed mining area and extensively along the haul road route. This vegetation type is dominated by *Triodia* species (predominately *T. pungens*). On laterite rises the Spinifex is interspersed with (predominately) *Acacia hilliana*. According to the Australian Natural Resource Atlas, Hummock Grassland accounts for 89% of vegetation in the Tanami region.

"Sand Dune" – found at several points along the haul road route. This vegetation type is essentially Acacia Shrubland growing on a sandy ridge with dominant understorey species including various Triodia species, *Chamaecrista symonii*, and *Jacksonia aculeta*. Typically these areas do not support Eucalypts.

In addition dense stands of *Grevillea wickhamii* can be found throughout the Acacia Shrubland vegetation.

Section 3 provides more detail of the vegetation present.

1.4.3 Fauna

229 species of vertebrate fauna are expected to occur in the Tanami Region. Over 130 species have been identified as a result of survey and monitoring work conducted to date. Twelve species of conservation significance are known to inhabit, or potentially inhabit the region. Surveys have confirmed the presence of seven of the twelve identified species. Table 1.1 lists these species. Section 4 provides more detail.

Species	WA Conservation Level	IUCN Conservation Ranking	EPBC Ranking	Recorded in the Project Area
Mulgara *Dasycercus cristicauda*	Schedule 1	VU	VU	**Yes**
Bilby *Macrotis lagotis*	Schedule 1	VU	VU	**Yes**
Southern and Northern Marsupial Mole *Notoryctes typhlops* and *N. caurinus*	Schedule 1	EN	EN	No
Giant Desert Skink *Egernia kintorei*	Schedule 1	VU	VU	No
Peregrine Falcon *Falco peregrinus*	Schedule 4	-	-	No
Major Mitchell's Cockatoo *Cacatua leadbeateri*	Schedule 4	-	-	**Yes**
Woma *Aspidites ramsayi*	Schedule 4	EN	-	**Yes**
Gravel Dragon *Cryptagama aurita*	Priority 1	-	-	No
Ctenotus uber johnstonei	Priority 2	-	-	No
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	Priority 3	LR	-	No
Bush Stone-curlew *Burhinus grallarius*	Priority 4	NT	-	**Yes**

Australian Bustard *Ardeotis australis*	Priority 4	NT	-	**Yes**

Table 1.1 Threatened fauna known to inhabit, or potentially inhabiting the Tanami Region.

1.5 Potential Impacts

1.5.1 Vegetation clearing and habitat disturbance

Clearing of vegetation has potential to impact on several of the threatened species known to inhabit the area.

Removal of trees along the route could impact on nesting sites for the Major Mitchell's Cockatoo that favour hollow limbs in Eucalypt trees. None of the trees to be removed are particularly large and no nesting activity has been observed over the previous 12 months. The number of trees to be removed will amount to a very small proportion of suitable nesting sites for bird species in the area. It is not expected to have an impact on local populations of any bird species.

No Bilby activity has been observed along the haul road route prior to or since commencement of mining activity at Coyote, although the species is likely to be present in the area on occasion. Minor disturbance of an area of laterite rise will occur at the southern end of the haul road, however is not considered likely to have any impact on the species.

Mulgara are known to be present in an area of sand dune habitat approximately 25km from Coyote mine site. This habitat extends for several kilometres in an east-west direction in the four locations where it is found along the route. Investigation of these areas has found that animal activity generally increases with distance from the existing track. Mulgara activity has been recorded in a number of locations within this habitat. There is potential for the species to be impacted by construction of the haul road, however all activity recorded to date is some distance either side of the proposed route.

Due to the relatively small scale of impact resulting from widening the existing track is not expected to significantly affect food or habitat availability for fauna species present in the area.

1.5.2 Dust and noise

Uncontrolled dust is likely to impact on vegetation immediately adjacent to the road, which in turn has potential to result in habitat loss.

Short duration vehicle noise is not anticipated to be detrimental to wildlife. The noise generated by the mining operation may result in fauna movement away from the area, however observations at the existing Coyote mine indicate that many species become accustomed and adapt to the increased noise levels.

1.5.3 Predators

The haul road will utilise existing disturbance and, although continuing to provide a suitable passage for the movement of these predators, will not extend the range currently available.

1.5.4 Increased motor vehicle activity

Increased motor vehicle activity along the haul road route is expected to be associated with an increase in animal road deaths, in particular the Bush Turkey (*Ardeotis australis*), which is commonly seen on roads and tracks in the later part of the year.

The potential for Mulgara to be affected by road traffic is recognised, particularly during the mating season when the range of males increases as they search for females.

Woma and Black-headed pythons have been observed sunning themselves on roads in the existing mining area, particularly in the cooler months of the year (May-August) and are active at night during the wet season (December-March). There is potential for an increase in road mortality of these and other snakes.

Opportunistic feeding on animal carcasses resulting from road kills may increase the potential for further road deaths. Species most at risk as a result of this will be birds of prey.

1.5.5 Use of saline water

The use of saline water has potential for adverse impact on roadside vegetation, which may in turn affect wildlife. Ground water to be used has a TDS of between 1600 mg/L (Coyote) and 26,000 mg/L (Sandpiper/Kookaburra). Over time, there is potential for the accumulation of salts along the road verge, which could then be transferred to the surrounding environment via rainfall runoff. Any accumulated salt will be considerably diluted following rainfall.

1.5.6 Fire

Altered fire regimes are thought to impact on a number of species in the Tanami Region, including the Bilby. Frequent fires can result in changes to the composition and diversity of vegetation and therefore impact species that are dependent on particular plant species.

1.6 Wildlife management objectives and targets

To enable effective monitoring of the impacts of the mining and haulage operation objectives and targets must be set as a basis for measurement. Table 1.2 provides the wildlife management objectives and targets for Stage 2 of the operation.

Objective	Target
Minimise the impact on fauna.	No threatened fauna deaths. Maintain diversity of species present.
Minimise disturbance to vegetation and habitat.	Clear only what is required for the operation. Leave large trees where possible and safe to do so.
Hydrocarbon contaminated soils are to be treated to achieve a level acceptable for Class 1 landfill.	Remediate hydrocarbon-contaminated soils to achieve: C_6-C_{15} petroleum hydrocarbons - 2800mg/kg. C_{16}-C_{35} petroleum hydrocarbons (aromatics) - 450mg/kg. C_{16}->C_{35} petroleum hydrocarbons (aliphatics) - 28,000mg/kg.
Minimise fire risk.	Fire prevention mechanisms in place i.e. fire breaks. Fire fighting equipment available and appropriate. Prevent fires resulting from mining or haulage activities.
Avoid significant alteration of surface water drainage.	Surface water runoff diverted around the mine site will continue in the natural flow direction.
Avoid contamination of surface and ground water.	Groundwater quality to be equivalent to baseline analysis. TPH to be 0mg/L Surface waters to be free of contaminants.
Avoid spills of hydrocarbon products and other chemicals. Hydrocarbon and chemical stored in bunded areas. Remove hydrocarbon waste from site regularly for appropriate disposal via Coyote mine site.	Minimise the frequency and size of hydrocarbon spills. All hydrocarbons and other chemicals appropriately stored. Hydrocarbon waste removed from site at least weekly.
Rapid cleanup and impact minimisation following spills of hydrocarbons and other chemicals.	Hydrocarbon spills are reported. Clean up is rapid and effective.
Prevent introduction of new weeds and feral animals. Minimise the opportunities for proliferation of feral animals. Prevent the spread of weeds.	No new species of introduced flora or fauna resulting from Stage 2 activities. Populations of cats, camels and mice do not increase. Existing weeds are controlled to prevent spread.
Appropriate waste handling and disposal.	Waste is appropriately contained on site. Only domestic and inert waste is disposed of in the landfill. The landfill is covered weekly as a minimum. Hydrocarbon and other potentially toxic waste is transported to Coyote mine site regularly for appropriate disposal.
Rehabilitate disturbed areas as soon as possible.	Achieve soil stability. Disturbed areas to be revegetated to achieve similar species diversity and assemblage to what naturally exists in the area.

Table 1.2 Coyote Project Stage 2 wildlife management objectives and targets.

1.7 Performance indicators

To enable monitoring of progress of wildlife management objectives and targets, performance indicators have been developed for the key environmental aspects of Stage 2 of the Coyote Project.

Environmental aspect	Performance indicators
Groundwater	Groundwater quality on completion of the project will be of similar quality to baseline analysis results. Groundwater will be analysed for the presence of hydrocarbons on a 3 monthly basis. Total petroleum hydrocarbons (TPH) will be 0mg/L.
Surface water	Visual assessments will be conducted following rainfall events to determine the impact of the mining operation on natural surface water movements in the area. Monitoring will be conducted at fixed points to assess the health of vegetation prior to, during and following the operation.
Threatened fauna	Inspections of the sand dune habitat will be conducted daily during ore haulage campaigns to record Mulgara activity. The location and frequency of activity will be used in comparison to previously collected information to assess the impact of haul road activity. Sightings of threatened fauna will be recorded and inspections of the haul road will be conducted periodically for signs of threatened fauna activity. Frequency of sightings over time will be used in assessing the impact of the haul road.
Fauna diversity	Fauna monitoring will continue using the pitfall traps installed in 2006. Data collected will be used as a comparison to the information collected prior to construction and operation of the haul road to assess the impact on small fauna in the area. Road kills will be recorded to provide an indication of the impact of haul road operations. Periodic surveys of the area will be undertaken to determine the fauna present. The data collected can be compared to that collected prior to the operation to assist in determining impacts.
Flora diversity and vegetation health	Photographic vegetation monitoring sites will be established in undisturbed vegetation along the haul road route and around the mine site. Data will be collected prior to commencement of operations and then at 6 monthly intervals. An assessment of the health of the vegetation will be made at these times and compared to the data originally collected. Monitoring sites will be established in selected rehabilitated areas on completion of the operation. Data collected from the original sites will be used as a method of assessing the success of rehabilitation.
Weeds	The haul road and mine site will be inspected regularly for the presence of weeds with the location of any being recorded. Weed eradication will be carried out as required and follow up inspections will be conducted to determine success.

Table 1.3 Coyote Project Stage 2 Performance indicators for wildlife management.

1.8 Implementation programme

To ensure success of the Wildlife Management Plan the following strategies will be implemented. Key responsibilities are also indicated.

Factor	Strategies to be implemented	Responsibility
Awareness of environmental issues.	Environmental induction for all personnel. Environmental handbook provided to all personnel.	Mine Manager.
Fauna monitoring.	Sightings of threatened or unusual animals to be reported and recorded. Road kills to be reported and recorded.	All personnel / Environmental Advisor.
	Daily inspection of haul road for presence of threatened fauna activity during haulage operations. Pitfall trapping in sand dune habitat. Periodic fauna surveys of the surrounding area.	Environmental Consultant.
Vegetation monitoring.	Establish photographic monitoring sites and collect data periodically.	Environmental Consultant.
Water sampling and analysis.	Water samples collected at 3 monthly intervals.	Pit Technician / Environmental Consultant.
	Analysis results interpreted and corrective action implemented if necessary.	Environmental Advisor.
Weeds.	Regular inspections of the haul road verges and disturbance within the mining area. Weed spraying conducted if required.	Environmental Consultant.
Feral animal species.	Site personnel will be required to report sightings of feral animals along the haul road route and within the mining area. Sightings will be recorded in a register.	All personnel. Environmental Advisor.
	Trapping of cats will be undertaken periodically.	Environmental Consultant / Pest Control Contractor(?).
Vehicle speed limits.	Vehicle drivers will be required to observe a speed limit of 40km/hr while passing through sand dune habitat. Signage will be placed at either end of this point to alert drivers.	Mine Manager / All personnel.
Dust suppression.	The haul road will be watered twice daily while ore haulage is in progress and as required at other times.	Mine Manager.

Table 1.4 Wildlife management strategies and responsibilities.

1.9 Monitoring

1.9.1 Fauna

Sand dune fauna

Baseline monitoring of small-medium sized vertebrate fauna has been conducted in sand dune habitat on the proposed haul road route since July 2006. Results to May 2006 are included as Appendix 4. This information will form the baseline for comparison of future monitoring that will be conducted during and after the haulage operation.

Mulgara activity

Several locations of Mulgara activity have been identified near the proposed haul road route. Inspection of these areas will be conducted during and after the haulage operation to determine the effects on Mulgara activity.

Inspections of the haul road intersection with the known Mulgara habitat will be conducted on a daily basis (early morning) during haulage periods. The nature, location and extent of Mulgara activity will be recorded.

1.9.2 Vegetation and flora

Photographic monitoring sites will be established in undisturbed vegetation at points along the haul road and around the mining area prior to commencement of operations. The information collected will provide baseline information to assess the impacts of the operation on fringing or surrounding vegetation. Data will be collected from the monitoring sites in March and September during the operation.

Photographic monitoring sites will be established in selected rehabilitated areas to enable monitoring of revegetation. Baseline information will be used as a comparison for assessment of success of rehabilitation techniques.

1.9.3 Groundwater

Groundwater monitoring will be conducted at 3-monthly intervals during the operation. Two bores at the Sandpiper and Kookaburra pits will be used for this purpose. Parameters to be monitored will include pH, TDS (total dissolved solids), EC (electrical conductivity) and TPH (total petroleum hydrocarbons).

1.10 Stakeholder consultation

Consultation with various stakeholders has been undertaken in preparation of this document.

Stakeholder	Date	Comments
DEC - Species and Communities Branch	5th September 2006	The first draft of the Wildlife Management Plan (WMP) was submitted for review.
	18th September 2006	Comments received and amendment of the WMP commenced.
	16th October 2006	Revised WMP submitted for review.
	18th October 2006	WMP deemed satisfactory.
DEC - EPA Service Unit	19th February 2007	WMP submitted as appendix with Environmental Protection Statement (EPS)
	15th March 2007	Comments received - remove reference to fauna fencing.
	4th April 2007	Revised WMP submitted as appendix with EPS
	1st May 2007	Comments received - extensive changes to the format of the WMP required.

Table 1.5 Stakeholder consultation.

1.11 Review and revision

The Wildlife Management Plan will be reviewed on at least an annual basis to ensure relevance is maintained and that the objectives and targets set are being achieved.

The review will be undertaken by Tanami management with the purpose of determining if targets have been met, and therefore whether or not the management strategies implemented have been effective.

Any changes to the document or the management strategies will be communicated to all concerned.

1.12 Reporting

Details of monitoring results will be reported to the DEC and DoIR in the Annual Environmental Report (AER), which is prepared in February each year. This report includes details of environmental compliance and performance.

1.13 Key management actions

Wildlife management action	Documentation to be provided	Reporting method	Status
Conduct baseline fauna surveys.	Survey reports.	Survey reports available on request.	Completed 2004 and 2005.
Establish sand dune habitat fauna monitoring programme and collect baseline results.	Monitoring reports.	Included in AER.	Commenced July 2006.
Establish photographic monitoring sites and collect baseline data prior to commencement of operations.	Monitoring site data sheets.	Included in AER.	Not commenced.
Construct bores and obtain baseline analysis.	Laboratory report.	Included in AER.	Not commenced.
Conduct groundwater sampling at 3-monthly intervals.	Laboratory report.	Included in AER.	Not commenced.
Haul road users and site personnel to report sightings of threatened fauna.	Email to Environmental Advisor. Register of sightings.	Included in AER.	Incidental sightings recorded since July 2006.
During haulage operations daily inspections of haul road to be undertaken in areas of known Mulgara activity.	Records of inspections.	Report to DEC as required. Included in AER.	Not commenced.

Table 1.6 Key actions for ensuring effective wildlife management during Stage 2 of the Coyote Project.

2 Introduction

2.1 Coyote Project

In 2006 Tanami Gold NL (Tanami) commenced development of Stage 1 of the Coyote Gold Project, an open pit and underground mining operation. The Coyote mine site now consists of two open pits, a processing plant and supporting infrastructure.

Tanami proposes to commence Stage 2 of the Project by developing the Sandpiper and Kookaburra open pits located approximately 35km north of the existing mine site. The construction of a haul road will be required for transportation of the ore from the Stage 2 mining area to the processing plant. Tanami proposes to upgrade an existing track for this purpose. The finished haul road will be used during the dry season only.

Potential environmental issues associated with development of Stage 2 of the Coyote Project are related primarily to the construction of the haul road, which will pass through habitat potentially supporting Mulgara (*Dasycercus cristicauda*), Bilby (*Macrotis lagotis*) and other fauna species of conservation significance.

2.2 Wildlife Management Plan

The Wildlife Management Plan (WMP) for Stage 2 of the Coyote Project details the following information:

- Details of threatened, priority and other fauna of significance known or potentially inhabiting the area;
- Perceived risks to wildlife associated with operation of the haul road; and
- Programs and strategies in place or planned by Tanami to manage and minimise the risks to wildlife associated with this development.

3 Flora and Vegetation

3.1 Vegetation

There are three main vegetation types found along the haul road route. Vegetation has been classified using the National Vegetation Information System framework, sourced from the Australian Natural Resources Atlas (http://audit.deh.gov.au/ANRA/atlas_home.cfm).

The vegetation types along the length of the proposed haul road comprise:

- Acacia Shrubland – found in the proposed mining area and at various locations along the haul road route. This typically consists of various Acacia species with scattered emergent Eucalypts (predominately *E. brevifolia* and *E. odontocarpa*) and occasional Grevilleas and Hakeas. The understorey is predominately *Triodia* species (Photograph 3.1).
- Hummock Grassland – found in the proposed mining area and extensively along the haul road route. This vegetation type is dominated by *Triodia* (Spinifex) species (predominately *T. pungens*). On laterite rises the Spinifex is interspersed with (predominately) *Acacia hilliana* (Photograph 3.2 and 3.3).
- "Sand Dune" – found at several points along the haul road route. This vegetation type is essentially Acacia and Grevillea Shrubland growing on a sandy ridge with understorey species including *Chamaecrista symonii*, *Jacksonia aculeta* and various *Triodia* species. Typically these areas do not support Eucalypts (Photograph 3.4).

Photograph 3.1 Typical Acacia Shrubland vegetation.

Photograph 3.2 Typical Hummock Grassland vegetation along the proposed haul road route.

Photograph 3.3 Typical Hummock Grassland vegetation on a laterite rise with interspersing *Acacia hilliana*.

Photograph 3.3 Typical Sand Dune vegetation and Mulgara habitat.

3.2 Flora

A combined total of 145 flora species from 41 families have been recorded during surveys in the Stage 2 area and surrounding region. The most common families are Poaceae (26 species), Mimosaceae (12 species) and Myrtaceae (11 species). The most commonly recorded genera are *Acacia* (12 species).

The Bilby is reported to have a preference for laterite rises and feeding habits of the animal may be associated with certain Acacia species that grow in these areas (i.e. *Acacia hilliana*).

With the exception of the Major Mitchell's Cockatoo with a preference for nesting in Eucalypts, there are no other recognised associations between threatened fauna present in the area and any particular species of flora.

4 Fauna of Conservation Significance

4.1 Fauna Surveys

In 2004 Tanami commissioned Biota Environmental Services (Biota) to conduct fauna habitat and assemblage surveys of the Coyote Project, including the northern deposits and the area proposed for the haul road (Appendix 1). Ecotec (WA) Pty Ltd (Ecotec) now provides on site environmental management for the Coyote Project, which includes ongoing flora and fauna surveys of the surrounding region. The combined survey work of Biota and Ecotec has recorded the presence of seven of the twelve species of conservation significance known to inhabit, or potentially inhabiting the region (Table 4.1).

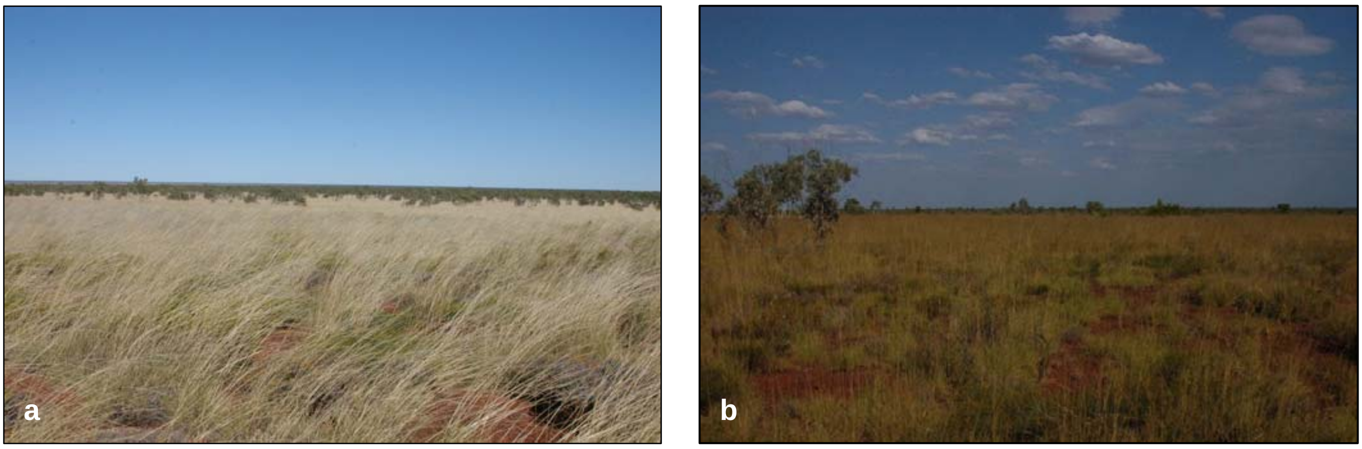
Species	WA Conservation Level	IUCN Conservation Ranking	Recorded During Surveys
Mulgara *Dasycercus cristicauda*	Schedule 1	VU	**Yes**
Bilby *Macrotis lagotis*	Schedule 1	VU	**Yes**
Southern and Northern Marsupial Mole *Notoryctes typhlops* and *N. caurinus*	Schedule 1	EN	No
Giant Desert Skink *Egernia kintorei*	Schedule 1	VU	No
Peregrine Falcon *Falco peregrinus*	Schedule 4	LC	No
Major Mitchell's Cockatoo *Cacatua leadbeateri*	Schedule 4	LC	**Yes**
Woma *Aspidites ramsayi*	Schedule 4	EN	**Yes**
Gravel Dragon *Cryptagama aurita*	Priority 1	-	No
Ctenotus uber johnstonei	Priority 2	-	No
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	Priority 3	LR	**Yes**
Bush Stone-curlew *Burhinus grallarius*	Priority 4	NT	**Yes**
Australian Bustard *Ardeotis australis*	Priority 4	NT	**Yes**

Table 4.1 Fauna species with conservation significance recorded or potentially inhabiting the Coyote Project area.

4.2 Bilby (*Macrotis lagotis*)

Fauna surveys carried out by Ecotec (2006) and Southgate (2005) have indicated *Macrotis lagotis* preferentially select for sandy habitats that border laterite areas, including areas that have been previously disturbed by fire or clearance (Appendix 2 & 3).

An area of habitat potentially suitable for the Bilby is located approximately 2km to the west of the Kookaburra deposit (Photo 4.1 a). Another area of potential habitat is located at the southern end of the proposed haul road, approximately 3km north of the Coyote mine site (Photograph 4.1, b). There has been no evidence of Bilby activity found in either of these areas to date. The probability of Bilby activity is expected to increase if the area is burnt (Southgate 2005, Ecotec 2006).



Photograph 4.1 Potential Bilby habitat: a) west of the proposed Kookaburra deposit; b) at the southern end of the proposed haul road.

The area near the Kookaburra deposit will not be affected by mining activity. The area at the southern end of the haul road (near the existing mine site) will have minor disturbance as a result of widening the existing track to construct the haul road. The impact on the total area of potentially suitable habitat caused by this disturbance will be insignificant. Figure 4.1 shows the areas of potential Bilby habitat in the region surrounding the Coyote Project. The distribution is based on the geology of the area, specifically the presence of laterite soils.

4.3 Mulgara (*Dasycercus cristicauda*)

Recent findings have indicated the Mulgara in the Tanami Desert is widespread (Masters *et al*. 2003, Cole and Woinarski 2002). Reports have indicated the species preferably occupies areas of laterite, sandplain and sand dunes that occur along palaeodrainage systems where spinifex (*Triodia* spp.) grows in distinct hummocks. In the Tanami Desert, Masters *et al*. (1993) estimated that Mulgara occupied an area of 18,000 km^2 and were more wide-spread than previously thought.

Fauna assemblage and habitat surveys carried out by Biota (in 2004) recorded potential Mulgara activity (predominately burrows) on sand dunes and sandy rises located between the Coyote mine site and the Stage 2 deposits. A Mulgara tracking survey was conducted by Ecotec within three sand dune habitats along the haul road of the Tanami Project during August 2006. Each survey consisted of a foot traverse within each area documenting signs of Mulgara activity including tracks, scats, diggings and burrows.

Biota captured one live animal in 2004. Ecotec used Elliot trapping to successfully capture two male Mulgara in December 2006. Trapping was conducted after a fire had passed through the area and targeted an area of unburnt vegetation where considerable activity had been observed (Photograph 4.2). The two male Mulgara were captured in two days (11^{th} and 12^{th} December) using standard peanut butter and rolled oats bait. Trapping was conducted in the area again in April and May 2007, however no Mulgara were caught. Mulgara tracks and potential burrows have been continually observed on both sides of the proposed route. It is believed that two populations of Mulgara exist on the largest sand dune, both being located some distance from the existing track.

Figure 4.2 shows the location of observed Mulgara activity in the sand dune habitat to December 2006.

Photograph 4.2 Mulgara refuge following bush fire, December 2006.

4.4 Southern and Northern Marsupial Mole (*Notoryctes typhlops and N. caurinus*)

Suitable habitat is believed to be large sand dunes and dry sandy river beds, neither of which is found within the proposed area for development. The Marsupial Mole has not been recorded in the area and the series of small sand dunes along the proposed haul road route are considered unlikely to support this species. The potential for the proposed mining activity and the construction of the haul road to impact on the Marsupial Mole is very low.

4.5 Giant Desert Skink (*Egernia kintorei*)

The Giant Desert Skink is known to inhabit sandplains vegetated with Spinifex (*Triodia*) species and, as such, has potential to exist in the area. This species has not been recorded during fauna surveys of the Coyote Project area is considered unlikely to be adversely impacted by mining or construction and operation of the haul road.

4.6 Peregrine Falcon (*Falco peregrinus*)

The Peregrine Falcon occurs in a wide range of habitats including forest, woodlands, wetlands and open country. Although not recorded during any fauna assemblage surveys within the region it is possible that the species would be found in the area. Given the high mobility of this species and the limited number of potential nesting sites that will be impacted, the proposed development is not considered likely to adversely impact the species.

4.7 Major Mitchell's Cockatoo (*Cacatua leadbeateri*)

Major Mitchell's Cockatoo inhabits lightly or sparsely wooded country near water and is dependent on large trees, particularly Eucalypts, for nesting. The species is commonly sighted in the Coyote Project area. Construction of the haul road will require removal of some trees to enable the existing road to be widened. These trees represent a very small proportion of large trees in the area and little or no impact on the Major Mitchell's Cockatoo population is expected.

4.8 Woma (*Aspidites ramsayi*)

The Woma or Ramsay's Python occurs in the arid zones of Western Australia, favouring open myrtaceous heath on sandplains, and dune fields dominated by Spinifex (*Triodia* spp.). There are very few recent records of the Woma within the southern parts of its range. Loss of habitat is one of the key threats to this species. Cats and foxes may also have a significant impact.

One large individual has been sighted along the route of the proposed haul road during a fauna survey carried out by Ecotec in July 2006. There have been no sightings by mine site or exploration personnel since that time. As these reptiles are so rarely encountered, development of the haul road is considered unlikely to impact on the local population.

4.9 Gravel Dragon (*Cryptagama aurita*)

Little is known of the ecology of the Gravel Dragon other than that it occurs on lateritic soils supporting *Triodia* (Spinifex) species, which are found throughout the region. It is possible that this reptile is present however it has never been recorded in the area. The haul road will not disturb significant areas of lateritic soil and is considered unlikely to impact on the conservation status of this species.

4.10 Ctenotus uber johnstonei

Ctenotus uber johnstonei is a skink known only from the Balgo Hills area of Western Australia. Preferred habitat appears to be areas of Chenopod shrub land, which is not found in the Project area. Stage 2 of the Coyote Project is considered very unlikely to impact on the species.

4.11 Spectacled Hare-wallaby (*Lagorchestes conspicillatus leichardti*)

The Spectacled Hare-wallaby is known in the region from a road kill near Balgo many years ago. Preferred habitat is believed to be sand plain with Spinifex and other grasses, which is common throughout the region. Tracks potentially belonging to this species have been found during survey work to the north of the Stage 2 area by Biota in 2004. There are also reports from Tanami Exploration employees of sightings of animals fitting this description, again to the north of the Project area. Medium sized tracks potentially belonging to this animal were also found by Ecotec during a survey to the south of the mine site.

Should the species be present in the area surrounding the haul road route, the potential for road-related deaths will increase, however there have been no sightings in this area. Increased vehicle activity is expected to result in avoidance of the area, however the potential for road mortalities is recognised. However given the small scale and short duration of the operation impact on the conservation status of the species is not expected. Survey work, including spot lighting, will continue throughout the life of mining.

4.12 Bush Stone-curlew (*Burhinus grallarius*)

The Bush Stone-curlew has been sighted at the Coyote mine site since commencement of the mining operation where they have been observed feeding on insects attracted to the lights around the site. There have been no sightings of this species during fauna assemblage surveys within the Stage 2 area although it is likely to be present. Although operation of the haul road has potential to result in road deaths, adverse impact on the local population of this species is considered unlikely.

4.13 Australian Bustard (*Ardeotis australis*)

The Australian Bustard (or Bush Turkey) is commonly sighted in the area, particularly alongside the existing tracks. The species may utilise these areas for mating displays (personal observation, J Shepherdson 2006). Increased road traffic may result in an increased mortality rate, however the relatively small scale of the operation, the large population and the mobility of the bird make the likelihood of adversely impacting the species very low.

5 Threatening Processes

5.1 Vegetation clearing

Stage 2 will result in total disturbance of 112 ha of native vegetation, which has potential to adversely impact on the flora and fauna of the area. The mining operation will require clearing of approximately 66.5 ha, which includes 12 ha of existing exploration disturbance. The haul road will require clearing of approximately 23 ha of vegetation to upgrade an existing track. The existing track was cleared several years ago and occupies an area of 22.5 ha.

To construct the haul road the existing track will be widened by approximately 8m. A number of Eucalypt trees will require removal along the route to allow the road to be widened. None of the trees are particularly large and no nesting activity has been observed. Removal of trees along the route will amount to a reduction of a very small proportion of suitable nesting sites for bird species in the area, and is not expected to have an impact on local populations.

Less than 1 hectare of potentially suitable Bilby habitat will require clearing. No Bilby activity has been observed along the haul road route prior to or since commencement of mining activity.

Less than 1 hectare of sand dune habitat will also require clearing. Sand dune habitat extends for several kilometres in an east-west direction in the four locations where it is found along the route. Investigation of these areas has found that animal activity, including that likely to belong to the Mulgara, increases with distance from the existing track.

Due to the relatively small scale of impact resulting from widening the existing track is not expected to significantly affect food or habitat availability for fauna species present in the area.

5.2 Predator movement

Predators such as the dingo and cat are regularly observed along tracks in the Project area, including the existing access route to the Stage 2 area. It is believed that these animals use the roads as an easier means of movement, possibly resulting in expanded hunting areas and an increased threat to threatened species such as the Bilby or Spectacled Hare-wallaby. The haul road will continue to provide a suitable passage for the movement of these predators, but is not expected to result in any change to the current predator-prey relationships.

5.3 Increased motor vehicle activity

The increased motor vehicle activity along the haul road route is expected to be associated with an increase in animal road deaths, in particular the Bush Turkey (*Ardeotis australis*), which is commonly seen on roads and tracks. It is also likely that an increase in road kills by motor vehicles will be associated with wildlife opportunistically feeding on animal carcasses. Species most at risk include the variety of birds of prey found within the region. Management strategies have been proposed to assist in minimising the risk.

5.4 Dust and noise

Disturbances such as dust and noise created by construction and use of the haul road may have an effect on wildlife in the immediate vicinity. Uncontrolled dust is likely to impact on vegetation immediately adjacent to the road, which in turn has potential to result in habitat loss. Increased noise may deter some animals from original home ranges close to the haul road.

5.5 Use of saline water for dust suppression

The use of saline water for road construction and dust suppression has potential to result in adverse impact on vegetation and dependent fauna.

Water will be sourced from groundwater bores at the existing Coyote mine site and at the Stage 2 site. Groundwater in the Coyote area has a very low salinity and is not detrimental to vegetation or fauna, however groundwater in the Stage 2 area is generally moderately saline and may be detrimental to vegetation.

5.6 Dams, bunds and trenches

Lined structures such as bunded areas as well as dams and trenches can become traps for animals that enter them. Such structures will include the bunded area for the fuel tank, the evaporation dam, trenches for installation of underground services and the landfill.

6 Management Strategies

To ensure minimisation of impact on wildlife during construction and operation of the proposed haul road, Tanami will incorporate the following management strategies into the development of Stage 2 of the Coyote Project.

6.1 Environmental induction

The environmental induction of all mine personnel will be continued throughout the life of mining to educate employees and contractors with regard to the native fauna and flora species of the area, with particular focus on threatened species. An environmental handbook accompanies the induction to assist personnel in identification of significant species and provide basic environmental procedures for the operation. Information in the handbook includes:

- Photographs and descriptions of threatened fauna;
- Reporting requirements for sightings of threatened fauna;
- Information relating to common snakes of the area;
- Information relating to introduced animals;
- Details of significant vegetation; and
- Basic spill procedures.

6.2 Vegetation clearing

Areas to be cleared will be clearly marked using survey pegs and high visibility flagging tape. Machinery operators are to be made aware of the boundaries of the area to be cleared. A Clearing Permit system and procedure is in place at the existing Coyote mine site and will be extended to include the Stage 2 area. Under the existing system an inspection of each area to be cleared is to be undertaken for the presence of threatened fauna. The Environmental Advisor holds a licence to relocate any threatened fauna found in areas approved for clearing.

Rehabilitation work will commence as soon as practical after completion of activity in an area to re-establish vegetation. Rehabilitation work will include restoration of habitat suitable for threatened fauna where appropriate.

6.3 Cat control

Trapping of feral cats within the region is planned to commence in late 2006. Once captured cats will be humanely euthanized using carbon dioxide. This program will aid in reducing the population of cats and assist in the conservation of threatened species in the region.

6.4 Fauna road toll survey

Mine personnel will be required to record and report the occurrence of road kills along the haul road. Reporting forms will be available to all personnel. Information including the name of the species or its distinguishing features (*i.e*. colour, shape, size etc.), time and date of the accident and the location of where the accident occurred will be reported. This will aid in monitoring the presence and distribution of different species within the region and highlight further management areas.

In addition, the road will be inspected daily by the environmental consultant during haulage operations. Road kills will be recorded and carcasses removed from the road.

6.5 Management of injured wildlife

All mine personnel are made aware of the potential for injured wildlife as a result of collisions with vehicles. The following information is extracted from a Tanami Gold Guideline and is displayed in poster format around the Coyote mine site and camp, as well as being reinforced during the induction.

If you hit an animal please follow this procedure:

1. ***Always check to see if the animal is still alive. Don't assume it will be dead.***
2. ***If the animal is dead remove it from the road so that the carcass doesn't attract other animals onto the road.***
3. ***If the animal is alive it may be possible to rehabilitate it. Contact Kiely Sullivan or Jeremy Shepherdson on Ch 21 or 9168 8305.***
4. ***If you need to move the animal, wrap it firmly in a towel, jacket or something similar and cover its head. Keep it in a warm and quiet place. If you're not sure what to do, get some help.***
5. ***If help is not available, or the animal is obviously beyond help, you may need to put it down. A hard blow to the back of the neck with an axe, shovel, tire iron or something similar should be enough. If you can't do it, get someone who can.***

Never leave an animal to die slowly!

Tanami has established contact with wildlife carer groups in Alice Springs and Darwin. Animals that can potentially be rehabilitated will be transported to these centres via regular charter flights. Jeremy Shepherdson (regularly on site) has considerable experience in wildlife rescue and rehabilitation. In addition, there are a number of other personnel on site with similar experience. Tanami will ensure adequate resources exist on site at all times to enable effective and humane care to be given to injured wildlife.

6.6 Speed limits

A speed limit of 40km/h will be required through the sand dune areas, with appropriate signage positioned accordingly. This may assist in minimising road kills and will reinforce the requirement to report native fauna species.

The speed limit for the remainder of the road will be 80km/hr.

Signage will be posted at each end of the haul road alerting drivers to the presence of wildlife of conservation significance.

6.7 Dust suppression

The haul road will be watered regularly in order to suppress the level of atmospheric dust and reduce the impact on surrounding vegetation and habitat types.

6.8 Saline water management

Water used for dust suppression will be treated as detrimental to vegetation regardless of where it is obtained from. Water cart operators are required to keep water spray within the road way and to avoid overspray of the surrounding vegetation.

Refilling areas will be constructed with a method of capturing spilled water, such as a drain directing spillage to a sump.

6.9 Dams, bunds and trenches

A lined earthen bund will be constructed for the bulk fuel storage tank. The walls of this bund will be less than 1 metre high and sloped, so most fauna will be capable of escaping. An evaporation dam will be required for disposal of excess water produced during dewatering. The main structure will not be lined however a corner of the dam will be constructed as a clean water dam and will be lined with HDPE. Any trenches required for installation of services will be temporary and backfilled immediately on completion of work. The rubbish tip will have a slope at one end to enable animals egress.

6.10 Hydrocarbon and chemical spills

Tanami has procedures for dealing with hydrocarbon and chemical spills in place at the Coyote mine site. These will also apply to the Stage 2 operations.

Appropriate spill containment and cleanup equipment will be available on site and personnel will be trained in its use.

6.11 Fire management

To prevent the spread of fire caused by mining activities fire fighting equipment will be available on site and personnel will be trained in its use. A fire break will be installed around the laydown area to prevent spread of fire to the surrounding vegetation, and also to prevent bush fires entering the mine operation.

6.12 Surface and groundwater management

Surface water diversion will be required to prevent flooding of the pits and erosion of roads and hardstand areas. Diverted surface water flows will be directed to settlement ponds to allow settling of sediment. Water will then continue on its natural course.

Groundwater will be abstracted for dewatering of the pits and used for dust suppression and construction. The remainder will be disposed of in an evaporation dam. The groundwater is saline and the natural water table is at approximately 20m below surface level. The aquifer from which water will be drawn is isolated so no impact on surrounding groundwater systems is expected. There has been no stygofauna found in the area and vegetation is unlikely to be affected by drawdown of the water.

7 Wildlife Monitoring

7.1 Baseline Monitoring

Sixteen pit fall traps have been permanently installed on the largest of the sand dunes intersected by the proposed haul road. The pitfalls have been placed in groups of four arranged in a zig-zag pattern to maximise coverage of the habitat. Drift fencing and shade shelters are installed when the traps are open (Photograph 6.1). Traps are left open for a 5-7 day period and checked at sunrise and mid-afternoon each day. When not in use each pit fall trap is capped with a plastic lid.

“Elliot” traps baited with rolled oats and peanut butter are placed with each group of pit fall traps when they are opened.

Baseline monitoring commenced in July 2006 and has been conducted at approximately monthly intervals to provide an indication of the species present in the area prior to construction of the haul road. A list of species captured to date is included as Appendix 4.

7.2 Mulgara

Inspection of suitable habitat adjacent to the proposed haul road route has been conducted for Mulgara activity. The surveys commenced in June 2006 and will continue at regular intervals throughout construction and operation of the haul road. These surveys intend to determine the presence and distribution of Mulgara in proximity to the haul road.

Elliot trapping is conducted on a regular basis and generally targets areas of high potential Mulgara activity. The original intention of trapping Mulgara had been to establish population size. The two animals captured in December were considerably stressed by the ordeal of having been trapped and, given the low success rate of the trapping, it was decided not to permanently mark the animals. The trapping programme will instead be used to confirm Mulgara presence.

Over a period of time it may be possible to determine whether there have been adverse effects on the distribution of the population and whether or not haul road activity has affected the distribution of the population(s). Data collected will also help to assess management options for the conservation of D. cristicauda.

Distribution of activity observed to December 2006 is illustrated in Figure 4.2 and details of survey findings will be reported to DEC on an annual basis.

7.3 Bilby

Bilbies are known to inhabit the Coyote Project area and several sightings have been recorded since commencement of mining. An area of high activity was located south of the mine site during survey work conducted in July 2006 (Figure 3.1). This area will be periodically monitored for continued activity throughout the life of the mining project.

Surveys of a number of areas of suitable habitat will be conducted on a quarterly basis, including around the site airstrip, at the southern end of the proposed haul road, west of the Kookaburra deposit and a recently burnt area northwest of the mine site. The surveys will be conducted primarily to locate evidence of Bilby activity (tracks, scats and burrows). The location of any activity will be recorded and reported to the DEC on an annual basis.

7.4 Incidental Sightings

A broadly based wildlife monitoring program has been established to monitor wildlife species of conservation significance outlined in Table 3.1. Animals opportunistically sighted along the haul road will be reported by mine site personnel and during regular visual surveys (day and night) to be conducted by Ecotec. Reported sightings are recorded in a spreadsheet that details location, date and time. This information can be used to determine variations in species abundance throughout operation of the haul road. Details of significant findings will be reported to DEC on an annual basis.

8 References

Biota Environmental Sciences Pty Ltd (2005). Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project. Report prepared for Tanami Gold NL, September 2005.

Brendan DT, Goldingay R. (2003). Cutting the carnage: Wildlife usage of road culverts in north-eastern New South Wales. *Wildlife Research* **30**(5) 529 - 537

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Masters P. (2003). Movement patterns and spatial organisation of the Mulgara, *Dasycercus cristicauda* (Marsupialia: Dasyuridae), in Central Australia. *Wildlife Research* **30**, 339-334.

Menkhorst, P., Knight, F. (2001). A field guide to the mammals of Australia. Oxford University Press. South Melbourne, Australia.

Southgate R. (2005). The results from animal track sampling in the Western Desert Tanami Project (Coyote and Larranganni Deposits). Sub consultancy report for Biota Environmental Services October 2005.

Appendix 1

DEC Endorsement of the Wildlife Management Plan

Appendix 2

Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project

From: Chapman, Tamra [mailto:Tamra.Chapman@dec.wa.gov.au]
Sent: Wednesday, 18 October 2006 3:37 PM
To: Jeremy Shepherdson
Subject: Tanami Gold Wildlife Management Plan
Importance: High

Hello Jeremy,

Thank you for forwarding the Wildlife Management Plan for Stage 2 of the Coyote Project (September 2006).

The plan is now satisfactory from DEC's point of view because it details the threatened fauna in the area, identifies the risks associated with the haul road and sets out strategies to minimise the risks.

I would hope that in the future, you can incorporate more of the recommendations outlined by Southgate (2005), particularly in regard to predator control.

I look forward to reading the outcomes of your monitoring programs.

Regards,

Dr Tamra Chapman, Zoologist
Species and Communities Branch
Department of Environment and Conservation
Locked Bag 104, Bentley Delivery Centre WA 6983
☎08 9334 0455 🖷08 9334 0278 Tamra.Chapman@dec.wa.gov.au

-----Original Message-----
From: Jeremy Shepherdson [mailto:jeremys@ecotecwa.com.au]
Sent: Monday, 16 October 2006 10:51 AM
To: Chapman, Tamra
Subject: Tanami Gold Wildlife Management Plan

Tamra,

Please find attached the revised Wildlife Management Plan for the proposed haul road for Stage 2 of Tanami Gold's Coyote Project. The revisions have been made in accordance with your previous feedback received via email 18th Sept and during our phone conversation. Due to the size of the document I will send Appendices 1 and 3 as separate emails.

I look forward to receiving your feedback.

Regards,

Jeremy Shepherdson

Appendix 3

The results from animal track sampling in the Western Desert Tanami Project

Appendix 4

Vegetation and Fauna Assessment - Ranges of the Western Desert Proposed Nature Reserve

Appendix 5
Fauna Collected During 2006 Baseline Fauna Surveys

Appendix 4

Coyote Project Stage 2 Decommissioning and Closure Plan

DRAFT

Decommissioning and Closure Plan

Coyote Project Stage 2

May 2007

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Purpose of the Draft Decommissioning and Closure Plan

This Draft Decommissioning and Closure Plan has been prepared to demonstrate that Tanami has made provision for final closure of Stage 2 of the Coyote Project.

The objective of this plan is to provide a preliminary framework for closure planning of the mining operation and to identify issues that need to be addressed as the closure planning process continues. Tanami aims to achieve a standard that prevents adverse long-term environmental impacts and restores a land use that is acceptable to regulators, post-mining land users and other stakeholders.

As the project is still under application, this management plan must be considered a preliminary document. Amendments are expected and may reflect variations to the project, regulatory conditions, new scientific discoveries, modification of accepted practices or changes to legislation.

1.2 Definitions

In accordance with the Environmental Protection Authority's Guidance for the Assessment of Environmental Factors No. 6 - Rehabilitation of Terrestrial Ecosystems, decommissioning and closure are defined as follows:

Closure - A whole of life process which includes rehabilitation and decommissioning and culminates in tenement relinquishment.

Decommissioning - Occurs near or at the end of a project involving removal of unwanted infrastructure, construction of final landforms and rehabilitation.

1.3 Background

Tanami Gold NL (Tanami) owns and operates the Coyote Project, located approximately 300 km southeast of Halls Creek on the Tanami Highway. Balgo Hills community is the nearest settlement, located approximately 100 km by road to the west of the site.

The Coyote Project commenced in March 2006 with development of the Coyote mine site and an upgrade of the existing exploration camp. The Project currently consists of an open pit mining operation supported by a processing plant and associated infrastructure.

Tanami proposes to develop Stage 2 of the Coyote Project located 35km north of the existing site. Stage 2 will comprise two small open pits and basic mining support infrastructure linked to the Coyote site by a haul road. The proposed mining operation is located on M80/563 and the haul road will be within L80/45. These tenements are held by Tanami Exploration, a 100% subsidiary of Tanami Gold NL. Figure 1.1 shows an overview of these tenements in relation to the existing mining operation.

1.4 Tanami Policy and Standards

Tanami is committed to ensuring accountability and adequate resources for the implementation of this Decommissioning and Closure Plan and responsibilities for managing the technical and financial implementation have been allocated.

The requirements of the Plan will be integrated into the general operation of the Project to ensure rehabilitation is carried out progressively and that final closure of the site is achieved within the expected timeframe and budget.

Tanami is committed to achieving environmentally and socially acceptable closure of its operations. Closure objectives include prevention of adverse long-term environmental impact and re-creation of self-sustaining natural ecosystems acceptable to the local community and other stakeholders.

From the initial planning to final closure phases of the Coyote Project, Tanami will aim to:

- Consult with all stakeholders during decision making processes;
- Plan effectively so that closure occurs in a sequenced manner, within the estimated timeframes and allocated budget;
- Ensure there is accountability, responsibility and adequate resourcing to enable implementation of the closure plan;
- Establish and/or utilise set criteria and indicators, agreed with the responsible authority, to demonstrate the successful completion of each closure project; and
- Reach a point where agreed completion criteria are met to the satisfaction of the responsible authority, local community and other stakeholders, so that the area may be relinquished.

1.5 Legislation and Industry Standards

Key environmental legislation with relevance to mine closure in Western Australia includes:

- Environmental Protection Act 1986.
- Mining Act 1978.
- Mines Safety and Inspection Act 1994.

Other legislation relevant to mine closure includes:

- Aboriginal Heritage Act 1972.

- Agriculture and Related Resources Protection Act 1976.
- Bushfires Act 1954.
- Conservation and Land Management Act 1984.
- Contaminated Sites Act 2003.
- Dangerous Goods (Transport) Act 1998.
- Explosives and Dangerous Goods Act 1961.
- Land Administration Act 1997.
- Occupational Safety and Health Act 1984.
- Rights in Water and Irrigation Act 1914.
- Soil and Land Conservation Act 1945.
- Town Planning & Development Act 1928.
- Waterways Conservation Act 1976.
- Wildlife Conservation Act 1950.

1.6 Regulatory Authorities

The Department of Industry and Resource (DoIR) and Department of Environment and Conservation are likely to be the primary regulatory authority responsible for overseeing the closure of the Coyote site.

Other authorities with an interest in the Project may include:

- Department of Environment and Conservation (DEC);
- Department of Water (DoW);
- Environmental Protection Authority (EPA); and
- Shire of Halls Creek.

1.7 Regulation

Environmentally-related licences and permits required for the Coyote Project have been summarised in Table 6.1.

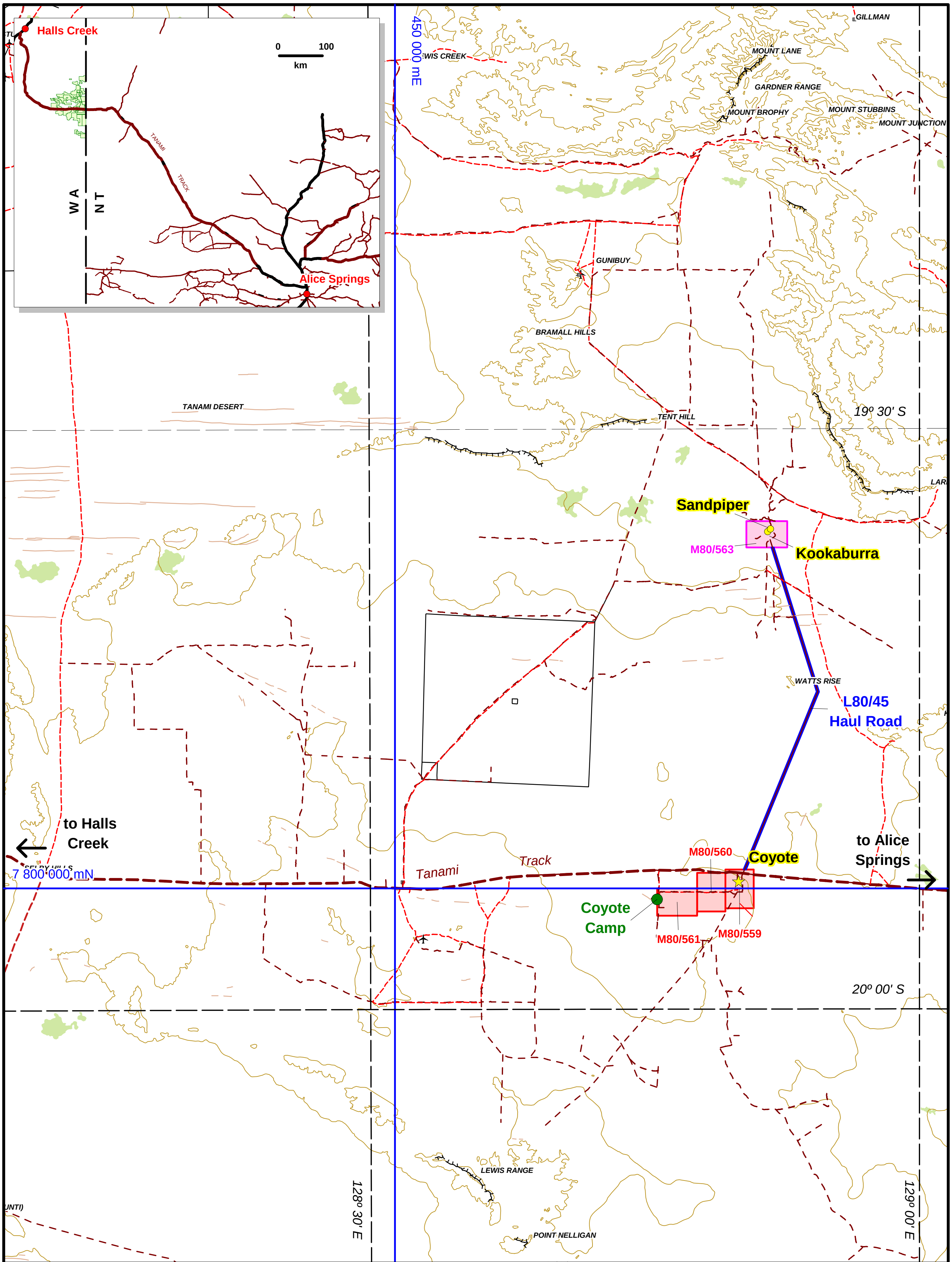
Agency	Licence, Permit, Approval
EPA	Acceptance of Environmental Protection Statement
DoIR	Mining Proposal approval
DoW	5C License to Take Groundwater

Table 1.1 Approvals and Permits Required for the Coyote Project

Numerous Government and Industry Guidelines for mine closure exist. Those pertinent to Stage 2 of the Coyote Project include:

Guideline	Purpose
Australian Minerals Industry (AMI) Code for Environmental Management (MCA, 2000).	Framework including consultation, progressive rehabilitation and reporting.
Strategic Framework for Mine Closure (ANZMEC/MCA, 2000) (a joint government and industry guideline).	Framework including upfront planning for closure, consultation, progressive rehabilitation and reporting.
Guideline Safety Bund Walls Around Abandoned Open Pit Mines. Department of Minerals and Energy of Western Australia (1997).	Design of abandonment bunds around open pits to prevent vehicular access.
Mine Closure Guideline for Mineral Operations in Western Australia (Chamber of Minerals and Energy WA Inc. 2000).	Framework including consultation, progressive rehabilitation and reporting.
Assessment Levels for Soil, Sediment and Water (DoE, V3 Nov 2003).	Threshold levels for contaminated soils.
The Commonwealth Environmental Protection Agency series 'Best Practice Environmental Management in Mining'.	Industry examples of mining practices.
Guidance for the Assessment of Environmental Factors: Rehabilitation of Terrestrial Ecosystems. Draft No. 6 (EPA 2006)	Closure strategy and description of objectives, targets and review during mine operation.

Table 1.2 Guidance documents applicable to decommissioning and closure of Stage 2 of the Coyote Project.



TANAMI GOLD NL

WESTERN TANAMI

COYOTE PROJECT STAGE 2 LOCATION PLAN

ORIGINATOR:	DATE:	DRAWN:
J. Shepherdson	Aug 2006	A. Weston

PLAN No: WTP_1_0_019

1 : 500,000

0 10 20 30

MGA Zone 52 (GDA94) kilometres

FIGURE 1.1

2 Project Description

Stage 2 of the Coyote Project is a small-scale open pit mining operation intended to provide ore for blending with ore from underground mining at the existing operation.

The Sandpiper pit is expected to produce 89,000 tonnes of ore at an average grade of 3.6 g/t. The Kookaburra pit is expected to produce 328,000 tonnes of ore at an average grade of 3.0 g/t. An estimated 42,000 ounces of gold will be produced from the mining operation.

Site infrastructure will be minimal with ore being periodically transported to the Coyote mine site for processing. No crushing or processing will be conducted on site.

Minimal infrastructure will be required for this operation as the facilities of the existing mine site will be utilised for processing of the ore and accommodation of the workforce. Stage 2 site infrastructure will comprise:

- two small open pits;
- a single waste dump for disposal of waste rock;
- a ROM pad for ore stockpiling;
- a hardstand area for laydown, workshop and site office;
- an evaporation pond for storage and disposal of groundwater;
- site access roads; and
- a haul route from Stage 2 to the Coyote processing plant.

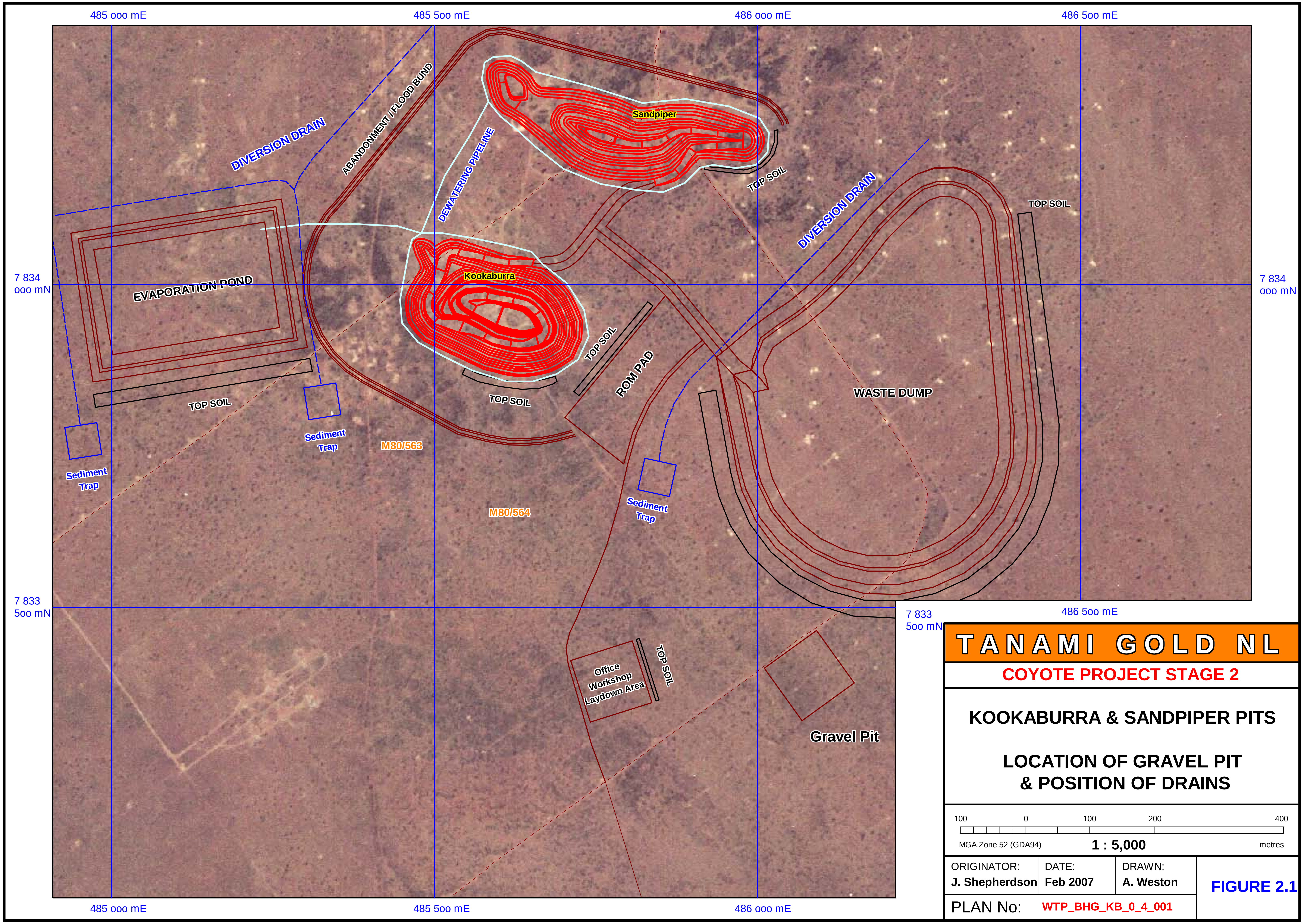
The site layout is intended to produce the minimum disturbance possible and allows direct access to the haul road. Figure 2.1 shows the proposed site layout. Tables 2.1 and 2.2 provide a breakdown of the proposed areas of disturbance.

Tenement Number: M80/563	
Description of Mining Disturbance	**Area (ha)**
Sandpiper open pit and surrounds	5
Kookaburra open pit and surrounds	5
Waste dump	25
ROM pad	2.5
Evaporation pond	8
Haul and access roads	2
Office, workshop, laydown area	2
Gravel pit	1
Topsoil storage	4
Existing exploration disturbance	12
Total Disturbance	**66.5**
Undisturbed Land	908.5
Disturbed + Undisturbed	975
M80/563 Tenement Area	975

Table 2.1 Proposed disturbance areas for M80/563.

Tenement Number: L80/45	
Description of Mining Disturbance	**Area (ha)**
Haul road *(includes existing exploration disturbance of 22.5 ha)**	45.5
Total Disturbance	**45.5**
Undisturbed Land	609.5
Disturbed + Undisturbed	655
L80/45 Tenement Area	655
** This disturbance will be utilised in construction of the haul road.*	

Table 2.2 Proposed disturbance area for L80/45.



TANAMI GOLD NL

COYOTE PROJECT STAGE 2

KOOKABURRA & SANDPIPER PITS

LOCATION OF GRAVEL PIT & POSITION OF DRAINS

100 0 100 200 400

MGA Zone 52 (GDA94) 1 : 5,000 metres

ORIGINATOR:	DATE:	DRAWN:	
J. Shepherdson	Feb 2007	A. Weston	FIGURE 2.1

PLAN No: WTP_BHG_KB_0_4_001

3 Existing Environment

3.1 Climate

The Project area is semi arid and has an average rainfall of 336 mm (Balgo Hills). Most of the rain falls from December to March but the amount varies greatly, both seasonally and annually. The area is occasionally subject to extreme rainfall events as a result cyclonic activity.

Mean annual maximum temperature is 34^{o}C and mean annual minimum 20^{o}C. Daily maxima above 40^{o}C are usual from October to March. Evaporation is high with an average daily rate of 8.9 mm. The annual evaporation rate is 3,250 mm.

The climatic conditions are recognised as challenging, particularly with respect to rehabilitation.

3.2 Landform and Vegetation Associations

The Stage 2 project area comprises a number of distinct landforms and vegetation associations. The mining area comprises sandplains and occasional rocky outcrops, while the haul road route traverses laterite rise, palaeo-drainage channel and sand dune landforms. Vegetation types are predominately Acacia Shrubland and Hummock Grassland. Thickets of *Grevillea wickhamii* are also located along the haul road route. Photographs 3.1 to 3.6 show the main landforms and vegetation types. Photograph 3.7 shows a typical hill in the region.

Photograph 3.1 Acacia Shrubland vegetation over sandplain landform at Sandpiper.

Photograph 3.2 Hummock Grassland surrounding a rocky outcrop at Kookaburra.

Photograph 3.3 Sand dune landform with Acacia Shrubland vegetation.

Photograph 3.4 Laterite rise landform with Hummock Grassland vegetation.

Photograph 3.5 The palaeo-drainage landform with Hummock Grassland vegetation.

Photograph 3.6 A Grevillea thicket along the haul road route

Photograph 3.7 Hills in the region are typically rocky with sparse spinifex cover.

3.3 Hydrology

The Sandpiper and Kookaburra deposits are located on a slight lateritic rise with runoff generally moving in a south-easterly direction. A fall of less than 2m is apparent from the northern to the southern extent of the Stage 2 project area. Figure 3.2 provides a surface water flow diagram based on the contours of the area.

Aquifers in the project area predominantly occur in zones of fractured or structurally deformed and largely unweathered bedrock. These features primarily control local groundwater occurrence and flow. The aquifers are typically inhomogeneous, anisotropic and irregular in their dimensions and form. The static groundwater level is approximately 20m below ground surface.

The groundwater in the project area is saline. TDS (gravimetric) ranges from 23,000 to 26,000 mg/L with EC ranging from 36,000 to 41,000 µS/cm.

3.4 Vegetation and Flora

Vegetation and flora studies were undertaken of the proposed mine sites and surrounding areas prior to commencement of mining activity and further incidental collection of flora species has been carried out since that time.

A total of 145 flora species from 41 families have been recorded during surveys of the Project area and surrounding region. The most common families are Poaceae (26 species) Mimosaceae (12 species) and Myrtaceae (11 species). The most commonly recorded genus is *Acacia* (12 species).

A list of the flora species recorded between August 2004 and August 2006 is included as Appendix 1.

There has been no Declared Rare Flora (DRF) or Priority flora species recorded in the Project area. No Threatened Ecological Communities (TEC) occur in the region, however Proposed Nature Reserves exist to the north and south of the site.

A number of weed species are known to exist in the Project area. Gallon's Curse (*Cenchrus biflorus*) and Buffel Grass (*Cenchrus ciliaris*) have been found in the camp, along the Tanami Road and in isolated patches throughout the surrounding area. To date neither of these weeds has been recorded within the proposed mine area. Weeds identified in the area are indicated in the flora species list in Appendix 1.

3.5 Fauna

Survey work around the project area has recorded 132 vertebrate species of an expected 229 in the Tanami Region. Observations so far include 65 species of bird, 18 native mammals, 3 introduced mammals, 43 reptiles and 4 species of frog.

Twelve fauna species with conservation significance are known to inhabit, or are potential inhabitants of the Tanami Region. Six of these have been recorded in the project area since commencement of activity.

Although mining activity on a relatively small scale is considered unlikely to have a significant impact on the status of any of these species, Tanami recognises the importance of conserving the habitats on which they depend. Rehabilitation will include habitat reconstruction where appropriate and closure of the site will include ongoing monitoring to assess the success of faunal recolonisation.

4 Potential Impacts

4.1 Rehabilitation limitations

Trials currently being conducted at the Coyote mine site have not identified issues associated with rehabilitation of disturbed areas at this stage. There has been limited rehabilitation work carried out on the waste dump, however this is planned to commence before Stage 2 of the project gets underway. Successful techniques will be used at the Stage 2 operations.

Grazing animals can be detrimental to rehabilitation (i.e. goats in the Goldfields). Camels are the only large grazing animal thought likely to be a threat to rehabilitation. Information from other mining operations in the Tanami Region indicates no evidence of camels having caused problems.

Topsoil management is one of the key factors in successful rehabilitation. Topsoil will be stripped and stockpiled as described in Section 8. Topsoil will not be watered for dust suppression.

4.2 Landform stability and erosion

The waste material generated from the Kookaburra and Sandpiper pits is not expected to be highly erosive material. Water management features such as bunding, back-sloped berms and contour ripping will be employed on sloped areas. Vegetation has been observed to re-establish very quickly in disturbed areas, therefore minimising erosion and promoting further plant growth.

4.3 Weeds

Several weed species are known to exist in the area. There is potential for weeds to become established in disturbed areas, particularly along road verges where water accumulates. Seeds are spread by vehicles as well as by many of the native animals. Regular inspections of disturbed areas will be undertaken and weed control implemented as appropriate.

4.4 Contamination of soil or groundwater

A number of substances will be used at the Stage 2 mining area that have potential to cause contamination if not managed correctly. Tanami will ensure that appropriate containment measures are installed and that handling techniques are such that the potential for soil or water contamination is minimised. Prior to leaving the site any identified soil contamination will be removed for onsite treatment, or shipped off site for appropriate treatment elsewhere. Groundwater monitoring will be conducted on a regular basis for the duration of the project to enable identification of contamination. Should contamination be identified, appropriate measures will be implemented to treat the groundwater to achieve accepted levels.

4.4.1 Hydrocarbons

Potential Locations:	Fuel farm, workshop, generators.

Relatively small hydrocarbon spills are expected as a result of refuelling and servicing of vehicles and machinery. Over the life of the mining operation this could result in localised areas of soil contamination at the locations listed above.

Contaminated soil is to be periodically removed for treatment in a purpose-built bioremediation area at the Coyote mine site. The facility is a clay-lined area surrounded by a bund to prevent runoff of contaminants. Treatment of hydrocarbon contaminated soil will involve addition of an organic absorbent (Global Peat) and a hydrocarbon utilising bacterial solution.

Treatment will continue until hydrocarbon levels meeting acceptance criteria for Class 1 landfill facilities are achieved (DEP, 2002). Average levels to be achieved are:

- C_6-C_{15} petroleum hydrocarbons – 2800mg/kg;
- C_{16}-C_{35} petroleum hydrocarbons (aromatics) - 450mg/kg; and
- C_{16}->C_{35} petroleum hydrocarbons (aliphatics) – 28,000mg/kg.

4.4.2 Naturally occurring contaminants

Potential Locations:	Ore body, ROM, waste dump.

Arsenic (As) is present in the Kookaburra and Sandpiper ore bodies at relatively high levels, but will not pose a threat unless it becomes mobile, which will require a pH of 3.7 or less. These conditions are highly unlikely to occur in the waste or ore material obtained from the pits.

Sulphides are present in trace amounts as pyrite and arsenopyrite. The levels are too low for acid rock drainage to be considered an issue. Should quantities of high concentration sulphide material be produced from either of the pits as waste it will be encapsulated within inert material in the waste dump. Small volumes of sulphide ore will be treated at the Coyote processing plant. The volume of tailings generated from the treatment of this material is not expected to be significant and will be combined with the much larger volume of tailings generated from the treatment of oxide material which has slightly alkaline pH, thereby neutralising acidic material.

4.4.3 Salt

Potential Locations:	Evaporation dam, haul road.

Saline water will be discharged to the evaporation dam where it is likely to result in deposition of saline sediment. This material will be removed prior to rehabilitation of the dam and deposited in the pit.

Saline water will be used for dust suppression, however is not anticipated to result in contamination of the soils due to the short term nature of the operation and the diluting effect of rains during the wet season. Site procedures ensure that groundwater is managed to minimise the potential for adverse impacts on vegetation.

5 Closure Objectives and Targets

Tanami's closure objectives have been developed specifically for the Project area. The following table outlines these objectives.

Aspect	Objective	Target
Final land use	Return the site, as near as possible, to the pre-mining condition to allow safe and unimpeded use of the surrounding area by the Traditional Owners.	TO's satisfied with work carried out.
Public safety	Leave the site in a condition where the risk of adverse effects to people, fauna and the environment in general, has been reduced to a level acceptable to all stakeholders.	Site meets accepted standards for public safety.
Final landform	Develop final landforms that are compatible with the natural surroundings.	Final landforms have a natural appearance.
Stability	Achieve soil stability in all post-mining landforms and disturbed areas.	Disturbed areas remain stable with minimal erosion.
Vegetation	Revegetate disturbed areas and post-mining landforms to achieve self-sustaining populations of endemic vegetation that resembles that already present.	Vegetation present in rehabilitated areas displays diversity similar to the surrounding area.
Fauna	Rehabilitate post-mining landforms and disturbed areas to re-establish the former habitats (where possible) and promote recolonisation by native fauna.	Fauna recolonise the mine site area over time.
Groundwater and Soil Contamination	Ensure any contaminants remaining in the soil or groundwater are below agreed criteria. Minimise the potential for movement of contaminants away from the Project area.	No soil or groundwater contamination caused by the mining operation remains after site closure.
Socioeconomic	Enable all stakeholders to have their interests considered during the mine closure process.	Stakeholder requirements are considered and achieved where cost effective and practical.
Cost and timing	Ensure that the closure process occurs in an orderly, cost-effective and timely manner.	Provision of funding is adequate. Closure completed within an agreed time frame.

Table 5.1 Closure objectives for Stage 2 of the Coyote Project

6 Closure Criteria

The proposed completion criteria described below are based on regulatory requirements, Tanami's corporate objective for closure, industry standards and stakeholder requirements. The completion criteria will be periodically reviewed and modified to reflect improved scientific knowledge or technological advances, future commercial opportunities and changes to regulatory requirements or legislation.

Closure aspect	Completion criteria
Infrastructure.	All mining related infrastructure removed from site. Bores capped.
Post-mining landforms.	As close as possible to pre-mining condition or resembling similar natural landforms. Safe, stable and suitable for agreed use.
Vegetation and flora.	Self-sustaining and resilient. Diversity retained. Weeds controlled.
Fauna.	Diversity similar to pre-mining condition. Habitat recovery.
Hydrology.	Surface water flows re-established. No pollution.
Soils.	No contamination. Minimal erosion/long term stability achieved.

Table 6.1 Closure criteria for Stage 2 of the Coyote Project.

7 Implementation Programme

7.1 Rehabilitation Methods

7.1.1 Vegetation and Topsoil Stockpiling

Cleared vegetation and topsoil will be stockpiled at strategic locations around the mine site. Topsoil will be stripped to a depth of approximately 200mm. Long-term stockpiles will be approximately 1m in height and will be deep ripped to enable vegetation growth and continued biological activity (Photograph 7.1). Short-term topsoil stockpiles will be trucked dumped adjacent to the areas in which they will be used (Photograph 7.2).

The positioning of stockpiles will enable access for machinery and short haul distances during rehabilitation work. Long term stockpiles will be located away from active areas to avoid disturbance.

Photograph 7.1 A long term topsoil stockpile at the Coyote mine site.

Photograph 7.2 A short term topsoil stockpile on the Coyote waste dump.

7.1.2 Rehabilitation of flat areas

Rehabilitation of site disturbance will be progressive where possible. Rehabilitation of flat areas will involve replacement of topsoil using a grader or bulldozer and scarification of the area along the contour where possible. There has been no seeding undertaken in any of the areas rehabilitated at Coyote so far and observations have shown good plant diversity. As an example Photograph 7.3 and 7.4 show the airstrip gravel pit in May 2006 and April 2007 respectively. The techniques employed for rehabilitation of flat areas appear successful and will therefore continue.

7.1.3 Rehabilitation of slopes

By April 2007 the southern face of the waste dump had been battered to 15^0 but topsoil had not been applied. This will occur prior to the wet season of 2007/2008.

Rehabilitation techniques for sloped areas will include:

- battering of material to a maximum angle of 15^0;
- transfer and spreading of topsoil to achieve even coverage of approximately 150mm;
- contour ripping of slopes (guide line to be surveyed and pegged); and
- installation of water management features including bund around top surface and back-sloped berms.

Photograph 7.3 Airstrip gravel pit following completion of rehabilitation work in May 2006.

Photograph 7.4 Airstrip gravel pit in April 2007.

7.1.4 Pits

It is not planned to backfill the pits. On completion of mining each pit will be bunded in accordance with DoIR criteria for abandonment bunds. The bunds will also be utilised to prevent excessive surface water inflow. It is anticipated that water levels in the pits will return to the natural groundwater level within three years of completion of mining. The addition of rainfall and surface runoff is likely to result in an increase in the water level. However the relatively low rainfall and extremely high evaporation rate (+3m annually) will maintain the final water level at between 10 and 20 metres below surface level. Water quality will be variable but is expected to consist of a fresh to brackish surface layer over saline subsurface water. The pit ramps will be left in place to enable fauna access and egress.

7.1.5 Contamination

Should monitoring or inspection programmes discover contamination of soil or groundwater, appropriate treatment methods will be developed and implemented to remediate the area to an agreed standard.

Hydrocarbon contaminated soil will be removed from site and transferred to Coyote mine site where a purpose-built bioremediation area is in operation. Biological treatment of the material will be undertaken to achieve hydrocarbon levels equal to or less than those acceptable for Class 1 landfill.

Monitoring

Vegetation monitoring sites planned to be established prior to commencement of the mining operation will provide baseline information that will be used in determining the success of rehabilitation. Monitoring sites will be established in rehabilitated areas to enable comparison with baseline sites.

Monitoring of groundwater will be undertaken to test for the presence of contaminants resulting from mining.

Areas of known or suspected soil contamination will also be monitored to determine the success of remedial action.

7.2 Site Decommissioning

Decommissioning of Stage 2 of the Coyote Project will commence when mining is complete. At this stage the expected life of mining is approximately 12 months, however it is possible that this will be extended if the results of further exploration are favourable.

Final site decommissioning is expected to take approximately 3 months and will include:

- closure of abandonment bunds;
- removal of infrastructure and any underground services;
- rehabilitation of hardstand areas;
- rehabilitation of the evaporation pond; and
- rehabilitation of roads, tracks and other disturbance.

7.3 Specific Rehabilitation Requirements

The following section details the requirements for rehabilitation of each of the major components of the Stage 2 mining operation.

Much of the work required for rehabilitation and final closure will be undertaken progressively as part of the mining operation. Estimates of time are therefore based on what may be required at completion of mining and does not take into account work already expected to have been carried out.

7.3.1 Pits

	Work Required	Estimated Time	Indicative funding
Photo	• Close safety bund around pit crest (loader); • Close abandonment bund (bulldozer);	Safety bund - 2hrs Abandonment bund - 12 hours	$1,000

7.3.2 Waste Dump

	Work Required	Estimated Time	Indicative funding
Photo	• Batter to max 15^0 (dozer); • Back slope berms (dozer/grader); • Install bund around upper level (dozer) • Transport topsoil (dump trucks and excavator); • Spread topsoil (dozer); • Contour rip (dozer).	(25ha) Battering - 125hrs Back slope berms - 12hrs Install bund - 24hrs Transport topsoil - 60hrs Spread topsoil - 50hrs Contour ripping - 25hrs	$50,000 (note that much of this work will be completed during mining)

7.3.3 ROM

	Work Required	Estimated Time	Indicative funding
Photo	• Batter to max 15^0 (dozer); • Install bund around upper level (dozer) • Transport topsoil (dump trucks and excavator); • Spread topsoil (dozer); • Contour rip (dozer).	(5ha) Battering - 25hrs Install bund - 12hrs Transport topsoil - 12hrs Spread topsoil - 10hrs Contour ripping - 5hrs	$10,000 (note that much of this work will be completed during mining)

7.3.4 Fuel Farm

	Work Required	Estimated Time	Indicative funding
Photo	• Drain tanks to suitable storage; • Remove pipework and other infrastructure (crane); • Remove tanks (crane); • Remove contaminated material for treatment (loader); • Remove and bury liner (dozer/loader); • Spread topsoil, deep rip area (included in 7.4.13)	Remove pipework etc - 12hrs Remove tanks - 12hrs Remove contaminated material - TBA Remove and bury liner - 3hrs	$2,500

7.3.5 Workshop

	Work Required	Estimated Time	Indicative funding
Photo	• Remove shed and other infrastructure (crane); • Remove underground services if applicable (dozer); • Spread topsoil, deep rip area (included in 7.4.13)	Remove shed and other infrastructure - 36hrs Remove underground services - 1hr	$5,000

7.3.6 Site Offices and Ablutions

	Work Required	Estimated Time	Indicative funding
Photo	• Remove approx dongas (crane and trucks); • Remove other infrastructure i.e. antennas, satellite dishes, concrete footings (crane, loader); • Remove underground services i.e. septics, electrical (loader, grader); • Spread topsoil, deep rip area (included in 7.4.13).	Dongas - 24hrs Remove other infrastructure - 24hrs Remove underground services - 2hrs	$5,000

7.3.7 Evaporation Dam

	Work Required	Estimated Time	Indicative funding
Photo	• Remove accumulated sediment and dispose in pit; • Remove liner from clean water dam; • Push walls in to centre; • Apply topsoil; • Scarify.	(8ha) Remove sediment - 12hrs Push walls - 20hrs Cart topsoil - 24hrs Spread topsoil and scarify - 24hrs	$10,000

7.3.8 Hardstand areas and internal roads

	Work Required	Estimated Time	Indicative funding
Photo	• Remove infrastructure and materials; • Apply top soil (side tipper); • Push out bunds and windrows (grader/dozer); • Spread topsoil (grader); • Deep rip (dozer).	(2ha) Transport topsoil - 4hrs Spread bunds, windrows and topsoil - 2hrs Ripping - 2hrs	$2,000

7.3.9 Gravel pit

	Work Required	Estimated Time	Indicative funding
Photo	• Return overburden to gravel pit (dozer); • Push out bunds and windrows (grader/dozer); • Spread topsoil (grader); • Scarify (grader).	(1ha) Push overburden - 4hrs Spread topsoil - 2hrs Scarify - 2hrs	$2,000

7.3.10 Haul road

	Work Required	Estimated Time	Indicative funding
Photo	***A single vehicle track will remain.*** • Pull windrows onto road (grader); • Spread topsoil (grader); • Deep rip (grader/dozer).	(23ha) Spread windrows - 20hrs Ripping - 20 hrs	$3,000

7.4 Responsibility for implementation

Tanami will ensure responsibilities for achieving decommissioning and closure objectives are assigned and clearly communicated. An indication of the likely responsibilities for the various aspects of mine closure

Factor	Strategies to be implemented	Responsibility
Vegetation monitoring.	Establish photographic monitoring sites and collect data periodically.	Environmental Consultant.
Weeds.	Regular inspections of the rehabilitated areas of the haul road and mining area. Weed spraying conducted if required.	Environmental Consultant.
Decommissioning.	Mining area to be made safe. Infrastructure to be removed from site.	Mine Manager.
Rehabilitation.	To be undertaken progressively where practical. To be completed in a timely fashion on completion of mining activity	Mine Manager
	To be conducted in a manner that meets or exceeds accepted standards.	Mine Manager Environmental Consultant.
Contamination.	Contaminated soil will be removed from site for appropriate treatment. Monitoring of groundwater and areas of suspected contamination will be undertaken as specified.	Mine Manager Environmental Consultant.

Table 7.1 Responsibilities for implementation of key components of decommissioning and closure.

8 Monitoring Programme

A range of monitoring activities will be undertaken to assist in achieving site closure objectives. Table 8.1 summarises the planned monitoring programme for the Stage 2 operation and that planned for implementation as rehabilitation work progresses. Results of monitoring will be reported in the Coyote Project Annual Environmental Report.

Type of Monitoring	Objective	Monitoring Parameters / *Frequency*	Planned Commencement
Undisturbed vegetation	• Photographic monitoring sites will be established in undisturbed areas around the mine site and along the haul road to determine whether there is detriment to native vegetation as a result of the mining operation.	Abundance and diversity of flora. Health of vegetation. *6 monthly*	Prior to disturbance.
Rehabilitation	• Photographic monitoring sites will be established in rehabilitated areas to monitor the success and diversity of revegetation.	Abundance and diversity of flora. Vegetative cover. Soil stability. *Annually*	On completion of rehab.
Weeds	• Road verges, drains and other selected areas will be periodically monitored for the presence of weeds.	Presence of weeds. Success of weed eradication programmes. *3 monthly*	Following start up.
Erosion	• Rehabilitated areas will be monitored for signs of erosion as a result of rainfall runoff or wind.	Soil stability. *Annually*	On completion of rehab.
Fauna	• Rehabilitated areas will be monitored for the presence of fauna and indications of recolonisation.	Presence and diversity of fauna species. *Annually*	On completion of rehab.
	• Site personnel will be requested to report sightings of threatened fauna.	*Daily*	Following start up.
	• The Project area will be monitored for the presence of feral species with all personnel asked to report sightings of cats, camels or other introduced species.	*Daily*	Following start up.
	• A fauna survey involving monthly trapping will be conducted to provide a baseline inventory of small to medium ground-dwelling vertebrates found in the Project area.	*3 monthly*	Commenced July 2006.
Groundwater	• Groundwater will be monitored for the presence of contaminants resulting from mining activity. • Remedial action will be taken if required.	pH, EC, TDS, TPH, As. *3 monthly*	On completion of bores.

Soil	• Areas of potential or suspected soil contamination will be monitored to determine effectiveness of treatment methods.		

Table 8.1 Summary of monitoring to be undertaken.

9 Stakeholder Consultation

9.1 Key Stakeholders

Stakeholders are defined as individuals, government agencies, community groups or others who have the potential to be affected by or have an interest in mine closure. Tanami recognises that stakeholder consultation is a critical component of the closure planning process as the interests held by stakeholders in an area often precede an operation and remain long after its closure. Tanami will undertake regular consultation with the various stakeholders of Stage 2 of the Coyote Project and meetings will be held periodically.

Stakeholder	Interest
TNTLAC/Balgo Community.	Traditional landowners and Native Title holders.
Environs Kimberly Conservation Council of WA.	Conservation of the natural environment.
Department of Industry and Resources.	Regulation of the mining operation.
Department of Environment and Conservation.	Flora and fauna of the region.
Environmental Protection Authority.	Protection of the natural environment.

Table 10.1 Stakeholders of Stage 2 of the Coyote Project.

Stakeholder comments to date have related to the potential for post mining pits to have detrimental effects on the surrounding environment. Table 10.2 summarises the comments and responses.

Stakeholder	Date	Actions/Comments
Environs Kimberley Conservation Council of WA	1st March 2007	Site visit.
	14th March 2007	Comments received from CCWA. Concerns raised regarding closure and completion criteria.
	28th March 2007	Comments received from EK. Concerns raised regarding post-mining pits and funding for mine closure.
	30th March 2007	Tanami response to concerns raised sent via emailed letter.
DEC - EPA Service Unit	19th February 2007	Tanami submitted the Draft Environmental Protection Statement (EPS) including Draft Decommissioning and Closure Plan (DCP).
	15th March 2007	Concerns raised regarding post mining pits and the potential for impact on the natural ecosystem.
	4th April 2007	Tanami submitted a revised EPS.
	1st May 2007	Comments received - extensive changes to the format of the DCP required. Further concerns regarding post mining pit voids.

Table 10.2 Stakeholder comments and responses relating to decommissioning and closure of Stage 2.

10 Review and Revision

This documented is intended as a draft. As such the Decommissioning and Closure Plan will be reviewed soon after commencement of operations, and then at least annually thereafter to ensure relevance is maintained and that the objectives and targets set are being achieved.

The review will be undertaken by Tanami management with the purpose of determining if targets have been met, and therefore whether or not the management strategies implemented have been effective.

Any changes to the document or the management strategies will be communicated to all concerned.

11 Reporting

Progress of decommissioning and closure activities, including progressive rehabilitation and monitoring, will be reported annually in the Coyote Project Annual Environmental Report, prepared in February each year. On completion of site closure a Closure Report will be prepared and submitted to the various stakeholders of the project.

12 Key Management Actions

Decommissioning and closure management action	Documentation to be provided	Reporting method	Status
Establish photographic monitoring sites and collect baseline data prior to commencement of operations.	Monitoring site data sheets.	Included in AER.	Not commenced.
Establish photographic monitoring sites in rehabilitated areas to monitor the success and diversity of revegetation.	Monitoring site data sheets.	Included in AER.	Not commenced.
Regular inspection of disturbed areas for weeds.	Eradication plan to be developed if weeds found.	Details included in AER.	Not commenced.
Monitor rehabilitated areas for signs of erosion.	Monitoring site data sheets.	Included in AER.	Not commenced.
Baseline fauna information to be collected.	Survey reports.	Reports available on request.	Commenced 2004.
Fauna diversity and indications of recolonisation to be monitored periodically.	Monitoring reports.	Details included in AER.	Not commenced.
Groundwater will be monitored for the presence of contaminants resulting from mining activity.	Analysis reports.	Included in AER.	Not commenced.
Remediation of contaminated areas to be undertaken if required.	Completion report.	Details in AER. Reports available on request.	Not commenced.

Table 13.1 Key actions for ensuring effective decommissioning and closure of Stage 2 of the Coyote Project.

13 References

Biota Environmental Sciences Pty Ltd 2005. Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project. Report prepared for Tanami Gold NL, September 2005.

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Appendix 5

Environmental Induction and Handbook

Coyote Project
Environmental Induction

Introduction

Gaining environmental approval for the Coyote Project has been a difficult process.

As a result:

- Very high level of environmental regulation by various government agencies;
- Interest from environmental groups;
- Strict environmental conditions set for the Project;
- A breach of environmental conditions could result in the operation being shut down.

Environmental procedures must be followed.

NO EXCUSES!

Threatened Animals

There are a number of threatened animals known to inhabit the Tanami Region. We must make sure that this operation does not impact on these animals.

Threatened animals in this area are:

- Considered rare or likely to become extinct (Schedule 1);
- In need of special protection (Schedule 4);
- Poorly understood, under surveyed or inhabit threatened land (Priority 1-4).

Meet our neighbours….

The Bilby (*Macrotis lagotis*)

• Rabbit size.

• Once occupied more than 70% of Australia.

• Have been impacted by predation from cats and foxes, competition with rabbits and grazing animals and loss of habitat.

• Now restricted only to central areas of Australia.

• Preferred habitat seems to be gravel rises (i.e. the airstrip).

• We conduct surveys to monitor the impact of mining on the local Bilby population.

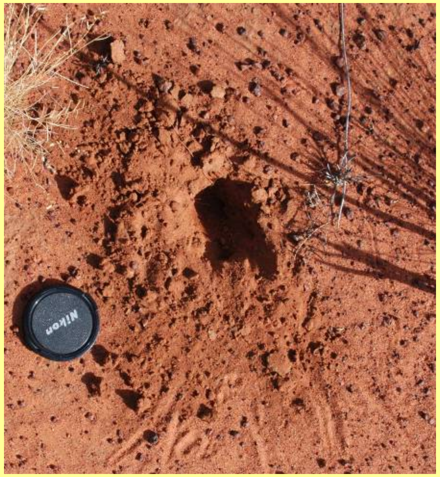
Rare or likely to become extinct (Schedule 1)

The Bilby (*Macrotis lagotis*)

Burrow

Tracks

Droppings



Scratchings

The Mulgara (*Dasycercus cristicauda*)

• Rat size

• Have been impacted by predation from cats and foxes.

• Preferred habitat is sandy soil with mature spinifex (70% of Tanami Desert).

• Build burrows under spinifex.

• Usually found in colonies.

• Have been located to the northof the mine site.

• Further survey work will be carried out to locate more colonies and monitor the impact of mining activity.

• *Appear to be more abundant than previously thought.*

Rare or likely to become extinct (Schedule 1)

The Giant Desert Skink (*Egernia kintorei*)

- Preferred habitat is sandplain with spinifex vegetation cover.
- Only recorded in the NT portion of the Tanami Desert but expected to be throughout the region.
- Possibly impacted by cats and dingoes.
- Further survey work is being carried out to see if they live in this area.

Rare or likely to become extinct (Schedule 1)

Northern and Southern Marsupial Mole

(*Notoryctes typhlops & N. caurinus*)

- Rat size
- Only known to exist in the central desert region of Australia.
- Preferred habitat appears to be sand hills and sandy creek beds.
- Spend most of their time below ground, only emerging after rain.
- Very little is known about the life cycle of these animals.
- Unlikely to be found in the Coyote area but possibly in the sand dune country to the north.

Rare or likely to become extinct (Schedule 1)

Major Mitchell’s Cockatoo

(*Cacatua leadbeateri)*

- Common in the Coyote area and throughout much of inland Australia.
- If you see a cockatoo out here, it will be one of these.
- Impacted by loss of habitat in the agricultural regions.
- Need large trees for nesting**.**

Specially protected (Schedule 4)

The Peregrine Falcon (*Falco peregrinus)*

• Uncommon but likely to be found in the Tanami region.

• Impacted by loss of habitat in the agricultural regions.

• Occupy a wide range of habitats.

• Need large trees for nesting**.**

• Similar looking birds in the area:

Brown Falcon

Nankeen Kestral

Specially protected (Schedule 4)

The Woma *(Aspidites ramsayi)*

• Uncommon but have been found near the mine site.

• Impacted by loss of habitat in the agricultural regions resulting in the Southern population being listed as a Threatened Species.

• Also threatened by predation from cats and dingoes

• Occupy a wide range of habitats across northern Australia, including Spinifex Grassland and Acacia Shrubland.

• The Woma is a traditional food item of significant value to desert Aboriginal people.

Specially protected (Schedule 4)

The Gravel Dragon *(Cryptogama aurita)*

- Very little is known about this lizard.
- Have not been recorded in the Coyote area.
- Appears to prefer gravelly soils with spinifex cover.
- Further survey work is being carried out to see if they live in this area.

Priority One Fauna

The Spectacled Hare-Wallaby

(*Lagorchestes conspiculatus)*

• Once quite common, now restricted to isolated parts of central Australia.

• Impacted by loss of habitat, competition with grazing animals and predation by cats and foxes.

• One confirmed sighting (road kill) near Balgo and a number of unconfirmed sightings in the Bald Hill area.

• Further survey work is being carried out.

Priority Three Fauna

The Bush Stone Curlew *(Burhinnus grallarius)*

- Shy, nocturnal bird.
- Commonly seen on the road at night.
- Often run rather than fly.
- Occupy a wide range of habitat, usually preferring thick cover**.**

Priority Four Fauna

Australian Bustard / Bush Turkey

(*Ardeotis australis)*

Priority Four Fauna

- Very common along the Tanami Road.
- Impacted by loss of habitat, predation and hunting.
- They are heavy birds and take a long time to get into the air – *slow down and give them time to get out of the way**!***

Other animals to look out for…

Pebble Mound Mouse (*Pseudomys johnsoni*)

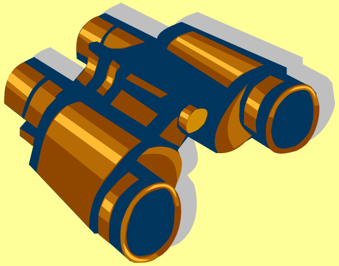
- There is one known colony of *P. johnsoni* in the Bald Hill area, however this animal is quite common further north in the Gardiner Range.
- Preferred habitat is gravelly slopes with spinifex.
- Distinctive pile of pebbles around the entrance to burrows.

Other animals to look out for…

Rufus Hare Wallaby / Mala *(Lagorchestes hirsutus)*

- Once common throughout inland Australia.
- Now believed to be extinct on mainland Australia.
- Impacted by loss of habitat and predation by cats and foxes.
- The last recorded sighting on mainland Australia was in 1995 in the Tanami Desert (NT).
- Now only found on two islands off the WA coast.

Animal Sightings



- Information on any of these animals will be very useful.
- Please report all sightings (even dead animals).
- Also report sightings of any unusual animals or things you don't recognise.
- Include the following information if possible:

  - Date and time;
  - Location;
  - Activity of the animal (i.e. running away, sitting in shade, dead etc);
  - Take photos of the animal, its tracks, burrow etc if possible.

Give your information to the Tanami admin girls and they will pass it on.

Snakes

There are many different types of snakes in the Tanami Region. Some are dangerous, some are harmless, **but many look very similar**.

Snakes

ALL snakes should be treated in the same manner - **assume they are dangerous!**

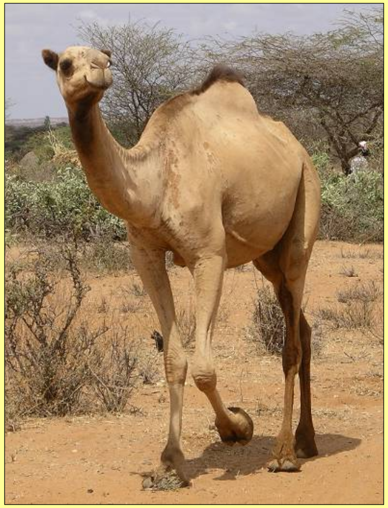
In most cases snakes will move away from noise and activity.

DO NOT ATTEMPT TO CATCH OR KILL SNAKES

Introduced Animals

Australia has about 25 species of introduced mammals that have become established in the wild. In the Tanami this includes cats, camels, wild dogs, donkeys, horses and rabbits.

Cats have contributed to the extinction of more than 20 native animals.



Camels destroy vegetation and compete with native animals for water and food.

Dingoes and wild dogs are responsible for the decline of native animals.

- Do not feed or encourage animals.
- Do not bring pets to site.
- Dispose of your rubbish correctly.

Legislation

There are Commonwealth and WA State laws relating to environmental management of the Coyote Project. Some of these include:

Commonwealth

- Environment Protection and Biodiversity Conservation Act 1999
  - Environmental Protection and Biodiversity Conservation Regulations 2000
- Native Title Act 1973

State

- Environmental Protection Act 1986
  - Environmental Protection (Clearing of Native Vegetation) Regulations 2004
  - Environmental Protection (Unauthorised Discharge) Regulations 2004
  - Environmental Protection (NEPM - NPI) Regulations 1998
- Conservation and Land Management Act 1984
- Wildlife Conservation Act 1950
- Contaminated Sites Act 2004
- Soil and Land Conservation Act 1945
- Rights in Water and Irrigation Act 1914

Environmental Policy

Tanami's commitment to the environment is outlined in the Environmental Policy. Our commitment to the environment includes:

• *Incorporating environmental management into our day-to-day activities;*

• *Preventing pollution;*

• *Training our people;*

• *Regular auditing;*

• *Continual improvement;*

• *Conserving our resources;*

• *Communicating openly with employees, contractors, the community and regulatory authorities.*

Employees and contractors have the shared responsibility to:

• *Work in compliance with environmental procedures*

• *Communicate all environmental incidents*

Through realisation of these commitments and responsibilities the impact of our operations on the environment will be minimised.

Clearing vegetation

- Tanami aims to minimise clearing of vegetation.
- The area to be cleared has been stipulated by the Department of Environment.
- The total area to be cleared on each lease **cannot** be exceeded.
- We are now at the limit of our clearing allowance.
- No clearing is to be undertaken until a **Clearing Permit** has been issued.
- Trees are to be left standing wherever possible and safe to do so.
- Disturbed areas will be rehabilitated as soon as possible after completion of activity.

Significant vegetation

The Desert Walnut has special significance to the Traditional Owners of this area.

We are not permitted to remove or damage this tree.

Minimising our impact

- Use designated roads.
- Don't make or take short-cuts.
- No clearing without approval.
- No fires!
- Put all rubbish in a bin. If there are no bins, bag your rubbish and put it in the bin when you get back to site/camp.
- Clean up oil, fuel and chemical spills immediately.
- Stay off rehabilitated areas.
- Avoid weed areas.

Your rubbish can kill wildlife. Take it with you.

Spills

Many substances are harmful to the environment when spilled. These include:

- Fuel;
- Oil;
- Chemicals; and
- Saline water (most ground water).

Prevent spills by….

…storing fuels, oils and chemicals in bunded areas.

…having the right spill kits available and easily accessible.

…training everyone to use them.

…being prepared!

Make sure you know where to find a spill kit and that you know how to use it.

YOUR SPILL IS YOUR RESPONSIBILITY!

CLEAN UP YOUR OWN MESS!

Fuel and Oil Spill Cleanup

Spills must be cleaned up immediately to minimise damage to the environment.

<u>Basic procedure:</u>

1. Control the spill - stop the spill at the source if possible.

2. Contain the spill - stop it spreading.

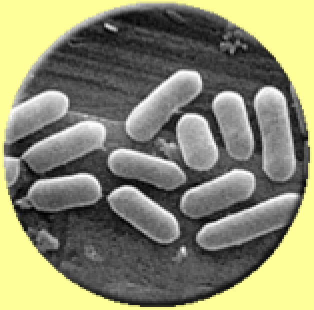
3. Clean up the spill:

   - use peat or absorbent pads to cover spilled oil or fuel.

   - remove and bag all soil and absorbent affected by the spill.

   - take the bagged material to a designated storage area or to the land farm.

Bioremediation



- All soils and organic absorbents contaminated by hydrocarbons (oils and fuels) will be treated using a technique called “bioremediation”.
- A designated bioremediation area - a “Land Farm” - is used for this purpose.
- Naturally occurring bacteria are used to break down hydrocarbons into harmless materials.
- Bacteria are added to contaminated material in liquid form and are also present in the peat absorbent used on site.

Chemical Spill Cleanup

Chemical spills can be dangerous to people as well as the environment. There are specific emergency response procedures for the chemicals stored on site.

<u>Basic procedure:</u>

1. Consider safety first.
2. Raise the alarm.
3. Use appropriate protective equipment.
4. Control the spill - stop the spill at the source if possible.
5. Contain the spill - stop it spreading.
6. Clean up the spill.

Chemicals will require different absorbent materials and different handling techniques - refer to the emergency response procedures.

Using saline water

- Ground water in the Coyote area is highly saline (very salty) and will kill plants.
- It will be used for dust suppression around the site.
- Avoid over-spray and contact with vegetation.
- All pipes are to be laid in a V drain.
- Report leaks immediately.

Spill Reporting

- **<u>All spills</u>** are to be reported using the Spill Reporting Form.
- Spills over 100 litres may require an incident report and investigation to be completed.
- Spills over 100 litres must be reported to the Mine Manager immediately (verbal notification followed by written).
- All other spills are to be reported by the end of the shift.

Waste Management

- Tanami's goal is to re-use or recycle as much waste produced on site as possible.
- Our long-term goal is to eliminate disposal of non-biodegradable waste on site.
- Please assist by taking the time to separate your rubbish into the bins provided.
- Rubbish must be securely contained to keep scavengers out.
- The rubbish tip must be covered with dirt weekly as a minimum.
- Rubbish must not be burnt.

Recycling

- As much waste as possible will be recycled.
- Recyclable materials include:
  - metals (aluminium, steel, copper etc);
  - paper and cardboard;
  - plastics;
  - waste oils;
  - batteries;
  - glass (expensive to transport).
- Tanami supports Ruggies Recycling by donating 50% of the proceeds or recycled materials. These funds go to Princess Margaret Hospital for Children.

In summary….

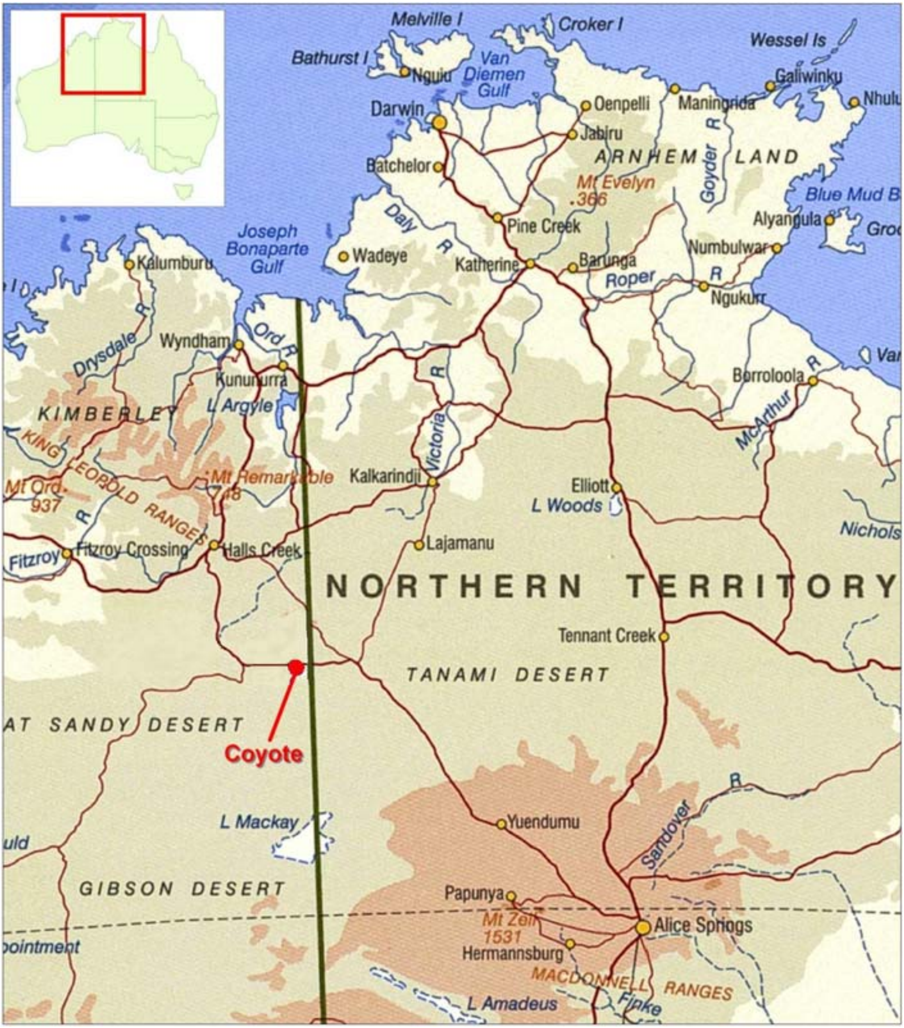
- Keep an eye out for rare or unusual animals;
- Don’t disturb any vegetation unless a permit has been issued;
- Dispose of your rubbish thoughtfully;
- Report spills and other incidents;
- Minimise YOUR impact on the surrounding environment;
- If in doubt….ASK!

TANAMI GOLD NL

Coyote Project

Environmental Handbook

WELCOME TO THE COYOTE PROJECT



The Coyote Project is located in the Tanami Desert, one of the most remote parts of Western Australia.

Although it may not look like it, there is a huge range of plant and animal life in this area. Many of the plants and animals are only found in this part of Australia.

A number of animals classified as **Rare, Threatened** or **Priority Species** are known, or thought likely, to live in the area. Effective environmental management of this Project is extremely important.

Activities such as clearing vegetation, waste disposal, spills and the use of saline water for dust suppression must be carefully managed to minimise the impact on the surrounding environment.

Your assistance is vital!

Please help us to manage our environment by following procedures and guidelines, reporting environmental incidents and disposing of your waste thoughtfully.

This handbook provides basic information to help employees, contractors and visitors to Coyote minimise their impact on the environment.

Threatened Animals

There are 12 different types of animal in the Tanami region considered to be rare, endangered or under threat. Pages 14 and 15 provide definitions of the status classifications

NAME:
Bilby

STATUS:
Schedule 1 Rare

DESCRIPTION: Bilbies are nocturnal animals that once occupied more than 70% of Australia. They are now restricted to northern-central Australia, which includes the Tanami region. Cats, foxes and loss of habitat are their main threats.

The Bilby's preferred habitat appears to be laterite rises, such as the airstrip. They also seem to be attracted to areas that have been recently burnt.

There have been several sightings in the area since the mining operation started. Active areas have been found to the south and the east of the mine site.

Bilbies are about the size of a rabbit.

Bilby activity:

Burrow

Tracks

Droppings

Scratching

NAME:
Mulgara

STATUS:
Schedule 1 Rare

DESCRIPTION: These small carnivorous marsupials are found in sandy soils with Spinifex cover. They burrow and live in colonies. Several colonies have been located to the north of Coyote mine. They are primarily threatened by cats and foxes. Mulgaras are approximately the size of a rat.

Mulgara activity:

Typical signs of Mulgara activity include burrows up to about 15cm in diameter and numerous tracks throughout the surrounding area.

NAME:
Marsupial Mole

STATUS:
Schedule 1 Rare

DESCRIPTION: A burrowing animal that generally only appears on the surface after rain. Their preferred habitat seems to be sand dunes or sandy creek beds. Very little is known of the life cycle of these animals. The Marsupial Mole is about the size of a large rat.

NAME:
Giant Desert Skink

STATUS:
Schedule 1 Rare

DESCRIPTION: These skinks have been found on sand plain with spinifex cover. They have not been found in the Coyote area. Possibly threatened by cats, but little is known about these animals. These skinks are similar in size to the common Blue Tongue skink.

NAME: **Major Mitchell's Cockatoo**

STATUS: **Schedule 4**

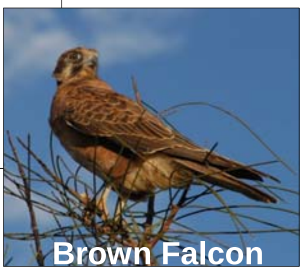
DESCRIPTION: Major Mitchell's are common in the Tanami, but were once widespread throughout most of WA. They are threatened by loss of habitat, mainly in agricultural areas. These birds need large trees for nesting.
Most cockatoos seen around the mine site are Major Mitchells.

NAME: **Peregrine Falcon**

STATUS: **Schedule 4**

DESCRIPTION: Peregrine Falcons are found worldwide but are threatened by loss of habitat. They have not been recorded in this area.

There are similar looking birds found around the mine site:



Brown Falcon

Nankeen Kestral

NAME: **Woma or Ramsay's Python**

STATUS: **Schedule 4**

DESCRIPTION: The Woma is a medium sized python usually around 1.5m long, but has been recorded at almost 3m. They have a rounded head, making them appear more like a venomous snake than a typical python.
Preferred habitat is usually sandplain but they are found across much of northern Australia. The Woma has traditionally been a prized food item for desert Aborigines. They are threatened by habitat loss and possibly predation by cats, foxes and dingoes.

NAME:
Gravel Dragon

STATUS:
Priority One

DESCRIPTION: Very little is known about this lizard. It is believed to live on gravely hills but has not been recorded in the Coyote or Bald Hill areas. The only known sighting in the region was near Balgo.

NAME:
Ctenotus uber johnstoni

STATUS:
Priority Two

DESCRIPTION: This skink is known only from the Balgo Hills area Preferred habitat appears to be areas of chenopod shrubland, of which there is very little in the Coyote Project area. It is thought unlikely to be found in the Project area however there is potential in the surrounding region.

NAME:
Spectacled Hare Wallaby

STATUS:
Priority Three

DESCRIPTION: This wallaby inhabits spinifex grassland with sparse tree and shrub cover. It is solitary, nocturnal and spends days in dense vegetation. It has potentially been sighted north of Bald Hill and tracks that may belong to this animal have been found to the south of the mine site.

NAME:
Bush Turkey or Australian Bustard

STATUS:
Priority Four

DESCRIPTION: Bush Turkeys are commonly seen along roads and tracks in the Tanami region. They are large, heavy birds and generally need a good run up to get off the ground. When driving, slow down and give them time to get away.

NAME:
Bush Stone-curlew

STATUS:
Priority Four

DESCRIPTION: A nocturnal bird with long legs and large eyes. This bird will often run rather than fly and is quite common in the Coyote area during the wet season. They live in a wide range of habitats and have been seen at the mine site around lighting towers eating insects attracted to the light.

Other animals to look out for

NAME: Pebble Mound Mouse (*P. johnsoni*)

STATUS: Not threatened

DESCRIPTION: Pebble Mound Mice live on stony hills and build mounds of pebbles over the entrance to their burrows. One colony is known in the Bald Hill area. Look for a small mound of similar sized rocks, usually at the base of spinifex.

NAME: Rufus Hare-Wallaby or Mala

STATUS: Schedule 2 Thought to be extinct in the Tanami Region

DESCRIPTION: The Mala is solitary and nocturnal. They shelter in a short burrow beneath spinifex grass. When disturbed it races from cover in a rapid "zig zag" motion. The last known sighting in the Tanami Desert was in 1995.

Reporting animal sightings

Please report sightings or activity of any of the animals shown on the previous pages (except the Bush Turkey and Major Mitchell's Cockatoo - these are very common). Also report sightings of any unusual animals you see in the area.

Deaths of any of these animals MUST be reported.

Provide as much of the following information as you can:

- Date and time
- Location
- Activity of the animal(s)
- Photographs (animal, tracks, burrow, droppings)

Pass this information on to Coyote Admin, or email directly to **jshepherdson@tanami.com.au**.

This information will be recorded and then reported to the Department of Environment and Conservation in the Project's Annual Environment Report.

Classification of Threatened Fauna

Classification of rare and endangered fauna under the Wildlife Conservation (Specially Protected Fauna) Notice 2006 recognises four distinct schedules of taxa:	
Schedule 1	Fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection.
Schedule 2	Fauna which are presumed to be extinct and are declared to be fauna in need of special protection.
Schedule 3	Birds which are subject to an agreement between the governments of Australia, Japan and China relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection.
Schedule 4	Fauna that are in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 and 3.

In addition to the above classification, fauna are also classified under five different Priority codes:	
Priority One (P1)	Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two (P2)	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Three (P3)	Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four (P4)	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
Priority Five (P5)	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Snakes

There are many different types of snakes in the Tanami Region. Some are dangerous, some are harmless, **but many look very similar**.

Woma Python - not harmful.

Black Headed Python - not harmful.

Legless Lizard - not a snake!

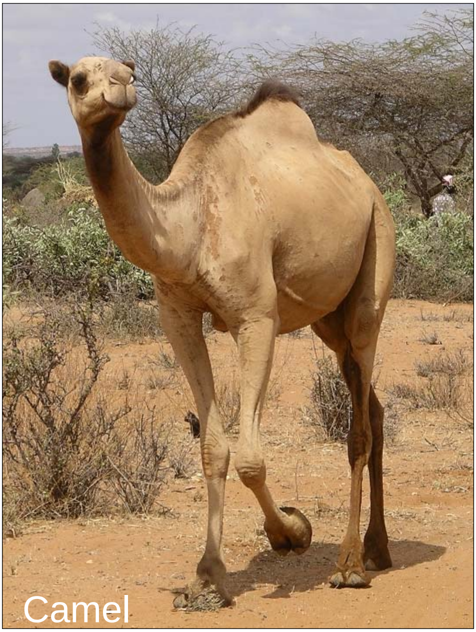
ALL snakes should be treated in the same manner:
ASSUME THEY ARE ALL DANGEROUS

DO NOT ATTEMPT TO CATCH OR KILL SNAKES - IT'S A LONG WAY TO HOSPITAL FROM HERE!

Introduced Animals

Numerous introduced species can be found in the area. These include cats, camels and wild dogs. Donkeys, horses and rabbits may also be found.

These animals destroy vegetation, compete with native animals for water and food and are directly responsible for the decline of many Australian native animals.



Do not feed or encourage animals.

Do not bring pets to site.

Dispose of your rubbish correctly.

Significant vegetation

The **Desert Walnut** has special significance to the traditional owners of this area.

We are not permitted to remove or damage this tree.

Tanami intends to minimise clearing of vegetation.

No clearing is to be undertaken until a clearing permit has been issued.

Do not enter rehabilitated areas.

Spills

Many substances are harmful to the environment when spilled. These include:

- Fuel
- Oil
- Chemicals
- Saline water (Ground water)

Prevent spills by storing fuels, oils and chemicals in bunded areas.

Report leaking pipework to your supervisor

Spills are to be reported using the Common Notification Form.

Fuel and oil spill cleanup

Your spill is your responsibility. Clean up your own mess!

Procedure

1. Control the spill
Stop the spill at the source if possible.

2. Contain the spill
Use absorbent materials or sand to prevent the spill spreading.

3. Clean up the spill
Use peat or an absorbent pad to cover the spill.

Remove and bag all soil and absorbent affected by the spill.

Take the bagged material to the bioremediation area.

Chemical spill cleanup

Chemical spills can be dangerous to people as well as the environment. There are specific emergency response procedures for the chemical spills on site.

Procedure

1. Consider safety first.
2. Raise the alarm.
3. Use appropriate protective equipment.
4. Control the spill
5. Contain the spill

Chemicals will require different absorbent materials and different handling techniques. Refer to the emergency response procedures.

Recycling

Recyclable materials include;

- Metals (aluminium, steel, copper etc)
- Paper and cardboard
- Plastics
- Waste oil
- Batteries
- Glass

The recycling program is not yet operating on this site, however labeled bins are positioned around the camp and mine site.

Tanami will be supporting Ruggies Recycling by donating 50% of their proceeds from recycled material to Princess Margaret Hospital for Children.

Environmental Policy
(Summarised)

Tanami's commitment to the environment is outlined in the Environmental Policy. Our commitment to the environment includes:

- *Incorporating environmental management into our day-to-day activities;*
- *Preventing pollution;*
- *Training our people;*
- *Regular auditing;*
- *Continual improvement;*
- *Conserving our resources; and*
- *Communicating openly with employees, contractors, the community and regulatory authorities.*

Employees and contractors have the shared responsibility to:

- *Work in compliance with environmental procedures; and*
- *Communicate all environmental incidents.*

Through realisation of these commitments and responsibilities the impact of our operations on the environment will be minimised.

Produced by:

Appendix 6

Dewatering Feasiblity Investigations (URS)

REPORT

Dewatering Feasibility Investigations, Coyote and Larranganni Deposits

Prepared for

Tanami Gold NL

P.O. Box 1892,
WEST PERTH. W.A. 6872

6 October 2004

53850-002-562/555-F6560.1

URS

Project Manager ………………………………. Vernon Wilson, Associate Hydrogeologist

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Date: **6th October 2004**
Reference: 53850-002-562/555-F6560.1
Status: Final

List of Tables, Figures & Appendices

Tables

Figures

Appendices

Introduction

Tanami Gold NL are conducting mining feasibility studies at their Coyote and Larranganni Gold Deposits, located approximately 220 km southeast of Hall's Creek and within the Kimberley Goldfields (Figure 1). The Coyote Deposit is located approximately 1.5 km south of the Tanami Highway and 20 km west of the W.A.-N.T. border, and within granted Exploration Leases E80/1483 and E80/1679. The Larranganni Deposit is located approximately 40 km north of Coyote and 16 km southwest of Larranganni Bluff, within granted Exploration Lease E80/1905. The Larranganni Deposit will be mined from two adjacent pits, Kookaburra and Sandpiper.

The open-pit mining of these deposits will extend considerably below the water table. The Coyote Deposit will also be mined underground upon completion of open-pit mining. Consequently dewatering of the local aquifer systems will need to accompany mine development. During May and June 2004 a program of investigation drilling, bore construction and test-pumping was undertaken to evaluate the local aquifers, and to identify the key dewatering issues associated with the deposits. The findings from this work have been used to develop a conceptual hydrogeological model and to define the requirements for mine dewatering. A groundwater flow model has been formulated for each deposit to assist in the design of appropriate dewatering infrastructure.

Findings from the mine dewatering investigations are contained within this report and are based on:

- review and interpretation of available geological and hydrogeological data;
- construction of one test-production bore and two monitoring bores at Coyote and one test-production bore and one monitoring bore at Larranganni to broadly define and characterise the local aquifer systems within each deposit;
- development of a conceptual hydrogeological model of the deposits, based on known geology and the results of the drilling program;
- determination of dewatering requirements through aquifer test analysis and groundwater flow modelling;
- design of a dewatering bore system to suite mine dewatering as well as provide a groundwater supply for processing and dust suppression;
- use of evaporation ponds to take surplus groundwater from dewatering; and
- design of groundwater monitoring and management programs associated with the dewatering of the mines.

The report also discusses the provision of a potable water supply to both Coyote and Larranganni.

The scope of work for this project was aimed at developing an understanding of the groundwater resources of the Coyote and Larranganni deposits and applying this understanding to quantify the requirements for mine dewatering. The project comprised the following stages:

- Initial site visit and review of the geological, geophysical and geotechnical database to develop a conceptual hydrogeological model of the deposits and local aquifer systems.
- Drilling and construction of one test-production bore (CYPB1) and two monitoring bores (CYMB1 and CYMB2) at Coyote, and one test-production bore (LPB1) and one monitoring bore (LMB1) at Larranganni, and aquifer testing to define the local aquifer zones, obtain quantitative data on hydraulic parameters and determine the groundwater chemistry. The groundwater exploration bores were located to intercept interpreted aquifers and for compatibility with the May 2004 pit designs, see Figures 2, 3, 4 and 5.
- Design of the mine dewatering system, based on:
  - the collation and interpretation of data from the groundwater drilling and aquifer testing programs;
  - mine layout plans and schedules for the mining of the pits and underground developments; and
  - results of predictive groundwater flow modelling based on the conceptual hydrogeological model; and
  - water supply requirements of ore processing and dust suppression.
- Reporting of the design dewatering system. This report or relevant parts thereof will be submitted to the Waters and Rivers Commission in support of an application for a Groundwater Well Licence (Abstraction).

The planned layout of the Coyote Pit, based on May 2004 resource optimisation, is shown on Figure 2. The planned layouts of the Larranganni Pits, named Kookaburra and Sandpiper, are shown on Figure 3. The currently proposed mining schedule and associated dewatering requirements for the Coyote Pit are outlined in Table 1 and for the Coyote Underground Mine in Table 2. The currently proposed mining schedules and associated dewatering requirements for the Larranganni Deposit are outlined in Table 3.

Table 1 Coyote Pit Development Schedule and Drawdown Requirements

Period	Deepest Mining Elevation (RL m)		Drawdown Required (m)	
	Coyote Pit 1	**Coyote Pit 3**	**Coyote Pit 1**	**Coyote Pit 3**
January 2005	410	410	2	2
February 2005	405	400	7	12
March 2005	400	400	12	12
April 2005	395	390	17	22
May 2005	390	390	22	22
June 2005	385	380	27	32
July 2005	380		32	
August 2005	375		37	
September 2005	370		42	
October 2005	365		47	
November 2005	360		52	
December 2005	355		57	
January 2006	350		62	

Note: Calculated drawdowns assume a natural water table elevation of 402 mRL and include a design allowance for groundwater levels being held at least 10 m below the pit floor.

Table 2 Coyote Underground Mine Development Schedule and Drawdown Requirements

Period	Deepest Mining Elevation (RL m)	Drawdown Required (m)
January 2006	300	112
February 2006	300	112
March 2006	290	122
April 2006	290	122
May 2006	280	132
June 2006	280	132
July 2006	280	132
August 2006	270	142
September 2006	270	142
October 2006	270	142
November 2006	270	142
December 2006	270	142
January 2007	260	152
February 2007	260	152
March 2007	250	162
April 2007	250	162
May 2007	250	162
June 2007	250	162
July 2007	240	172
August 2007	240	172
September 2007	240	172
October 2007	240	172
November 2007	230	182
December 2007	230	182
January 2008	220	192
February 2008	220	192
March 2008	220	192

Note: Calculated drawdowns assume a natural water table elevation of 402 mRL and include a design allowance for groundwater levels being held at least 10 m below the mine floor.

Table 3 Larranganni Pits Development Schedule and Drawdown Requirements.

Period	Deepest Mining Elevation (RL m)		Drawdown Required (m)	
	Kookaburra Pit	**Sandpiper Pit**	**Kookaburra Pit**	**Sandpiper Pit**
November 2005	380	370		
December 2005	380	360	nil	9
January 2006	360	360	9	9
February 2006	360	360	9	9
March 2006	360	360	9	9
April 2006	360	350	9	19
May 2006	360	350	9	19
June 2006	350	350	19	19
July 2006	350	340	19	29
August 2006	350	320	19	49
September 2006	350	320	19	49
October 2006	340		29	
November 2006	330		39	
December 2006	330		39	
January 2006	310		59	
February 2006	290		79	

Note: Calculated drawdown assumes a natural water table elevation of 359 mRL and includes a design allowance for groundwater levels being held at least 10 m below the pit floor.

4.1 Regional Geology

The Coyote and Larranganni project areas lie toward the western end of The Granites - Tanami Inlier, which is a highly deformed and metamorphosed Palaeoproterozoic block, approximately 250 km long and 100 km wide.

Basement is rarely exposed and is composed of Archaean granites and gneisses. The basement was subjected to the Barramundi Orogeny prior to the deposition of the overlying sediments. Post-Barramundi rifting led to deposition of mafic volcanics, volcaniclastics and clastics and calc-silicates of the McFarlane Peak Group. This was succeeded by the deposition of the Tanami Group in a passive marine environment. These rocks include carbonaceous siltstone, minor banded ironstone and calc-silicates of the Dead Bullock Formation, which is conformably overlain by several thousand metres of turbiditic sandstones of the Killi-Killi Formation.

The sedimentary pile was later intruded by doleritic sills, prior to and during the subsequent deformation of the Tanami Orogenic Event, a period of regional deformation and metamorphism across the Tanami Inlier. The Pargee Sandstone, comprising interbedded conglomerates, sands and minor silts, was deposited unconformably on the Tanami Group in a sub-basin created during the Tanami Orogenic Event.

Local intracontinental rifting led to subaqueous and subaerial sedimentation and felsic to mafic volcanism forming the Mount Charles Formation, Mount Winnecke Group and the Nanny Goat Volcanics.

Three overlapping periods of granitic plutonism occurred at this time. The basement was then eroded and covered by Birrindudu Group sediments comprising the Gardner Sandstone, Talbot Well Formation and Coomarie Sandstone.

The region has been cut by large west-northwesterly trending faults. These structures manifest themselves as large prominent quartz ridges or as drainages.

Gold mineralisation in the Tanami is extensive. Locally some deposits favour certain lithologies, however it is clear that gold mineralisation is lithologically indiscriminate and occurs in almost all rock types across the Tanami region.

4.2 Coyote Deposit

The Coyote Deposit is hosted within folded turbidite clastic sediments of the Lower Proterozoic Killi Killi Beds. These sediments consist of dominantly well-sorted, coarse to very coarse greywackes, sandstones and siltstones, with variable but generally very weak carbonaceous content. A sub-marine fan setting, proximal to the sediment source has been proposed, with sandstone thought to be deposited within sub-marine canyons eroding the clastic fan.

Structurally the Killi Killi beds have been folded into an east-west trending westerly plunging (20° - 30°) overturned anticline. The southern limb is overturned and dips 70° - 90° whilst the northern limb dips between 30° and 50°.

Bedding - parallel thrust faults that ramp through bedding, such as the Gonzalez Thrust Zone, occur on both the south and north limbs but are more common on the south limb. Thicker (10-30 cm) bedding - parallel quartz veins form as a result of dilation associated with this thrusting. These veins are best developed between thick siltstone and greywacke/sandstone units.

There are a number of sub-parallel thrusts on the south limb, each with differing amounts of displacement.

The Coyote antiform is cut and block faulted by north - northwest trending faults and lesser northeast faults that offset the stratigraphy and axial plane. Quartz veining is often associated with the faulting and shearing.

Details of the occurrence of groundwater are limited. A contour plan had previously been prepared showing the depth at which wet samples were collected during reverse circulation (RC) drilling. The depths recorded were from angled (-60°) drill holes and ranged from less than 100 metres to greater than 150 metres.

There is one known previously constructed water supply bore within the Coyote Pit. Anglogold using a mineral exploration RC rig drilled water bore CYRC090 (Coyote Bore) to a total depth of 100 m. The aquifers intersected, bore construction and groundwater quality details are unknown. This bore was unable to be tested in this program as initially planned, as a bend in the casing prevented the setting of the test-pump.

Diamond drill core from holes within and outside the planned Coyote Pit were examined during this current program. Potential aquifer zones identified included shear zones and quartz veins. These were often represented by poor core recovery, and by numerous fractures and joints with iron staining on the joint surfaces.

South of Coyote there is an east-west trending palaeodrainage containing calcrete and silcrete. Tertiary and Quaternary alluvial sediments overlie most of the project area to a depth of between 2 m and 20 m.

The bedrock is deeply weathered in the top 80 - 100 m with associated partial depletion and supergene enrichment of gold within this zone. At greater depths the lower saprolite becomes more consistent before grading into weathered bedrock at an average of 180 m depth and then fresh rock, generally at 200 m. However traces of oxidation are recorded as deep as 300 m below surface along shear zones and in fractured ground.

4.3 Larranganni Deposit

No records were found of any previous hydrogeological investigations within the Larranganni Deposit. However there is a previously constructed bore located within the proposed Kookaburra Pit. This bore is referred to as Kookaburra Bore (KB). The bore has provided small groundwater supplies to past exploration drilling campaigns. The bore casing was bent, restricting the depth that the pump inlet could be set. The bore was tested at a low yield because of the limited available drawdown.

Aquifers in the project area predominantly occur in zones of fractured or structurally deformed and largely unweathered bedrock. These features primarily control local groundwater occurrence and flow. The aquifers are typically inhomogeneous, anisotropic and irregular in their dimensions and form.

Within the Larranganni Deposit previous resource and geotechnical drilling had indicated a variable transmissivity regime throughout. There has been some recorded difficulty with water inflows during the mineral exploration RC drilling programs.

The rock cores from previous diamond drilling by Anglogold are old and in generally poor condition. They are considered by TG site geologists to be unreliable for determining open fractures and lost core.

A bore located approximately 8 km north of the Larranganni Camp provides a potential source of potable groundwater.

4.3.1 Kookaburra Pit

The Kookaburra Deposit is hosted within the Bald Hill sequence, comprising mainly mafic rocks with lesser beds of siltstone, graphitic shale and cherts from 2 m to 20 m width. The Bald Hill sequence occurs within inter-bedded coarse quartz sandstones and pelitic siltstones. The stratigraphic sequence has been deformed by at least three phases of deformation, the most notable being large-scale tight chevron like folds trending 125^0 to 135^0 and plunging 40^0-50^0 to the east. The sediment units have been altered to sericitic, biotite, carbonate schists with minor to moderate amounts of quartz veining.

Cross cutting the stratigraphy at 130^0 is a vertical shear zone and quartz vein of 5-15 m true width and strike length of 450 m (Kookaburra Quartz Vein). Adjacent to the quartz veins the mafics have been altered and deformed to biotite schists. Elsewhere the mafics comprising dolerites and basalts are relatively undeformed and altered. They have been weathered to green nontronitic clays with a sharp interface to fresh rock at approximately 90 m vertical depth.

Fifty metres to the northeast of the Kookaburra Quartz Vein is a parallel dextral slip fault. Displacement has not been accurately established from the drilling results but is considered likely to be of an order of 250 m northeast of the fault are sericitic fine-grained sediments and coarse quartz sandstones. These sediments are probably the fault displaced basal sandstone unit.

Arsenopyrite is very closely associated with the gold mineralisation and both occur within the quartz veining. Disseminated pyrite is also present.

4.3.2 Sandpiper Pit

The Sandpiper Pit is located on the southern limb of an overturned southeast plunging anticline within the Bald Hill Formation, which comprises mafics, wackes, siltstones and cherts. Overlying the Bald Hill Formation are course quartz sandstones, siltstones and wackes of the Killi Killi Beds. Underlying the Bald Hill Formation are course quartz sandstones and wackes.

In the immediate vicinity of Sandpiper, the Bald Hill Formation is dominated by medium grained mafics with varied alteration (silica, carbonate, chlorite) and deformation. Petrology suggests that they are dolerites. Minor narrow (<5 m wide) chert like units occur within these mafics.

Weathering typically produces nontronic green clays in the case of the massive unaltered mafics or ferruginous chloritic clays in the case of the altered mafics, and varies in depth from 60 m to 95 m.

All gold mineralisation at Sandpiper is contained within a wide geological/mineralisation envelope characterised by intense foliation, alteration of the mafics along with sulphide mineralisation (arsenopyrite) and quartz veining. Fresh samples are identified as chloritic schist, with weathered samples forming very platey, fissile chips. Quartz veining appears as massive veins up to 3 m wide and as stockworks.

5.1 Bore Construction

A program of groundwater exploration drilling, followed by test-production and monitoring bore construction and aquifer testing, was completed at the Coyote and Larranganni Deposits during May and June 2004. Gorey and Cole Drillers Pty Ltd (G & C) carried out the drilling program with an Ingersoll Rand rig utilising air-hammer techniques. G & C also carried out the test pumping of the bores.

For the groundwater exploration program, five potential drill-sites were selected based on a study of data on site. All sites were selected to intersect geological formations and structural features interpreted as possible aquifers. Regional magnetic geophysical images, data from previous mineral exploration and geotechnical drilling and the resultant interpreted geology of the deposits were used in drill site selection. Sites for test-production bores were located outside the May 2004 pit perimeters so that installed bores could be used for dewatering during mining.

Investigation holes were commenced with a 254 mm diameter hole drilled to a depth of approximately 4 metres for the installation of a 200 mm steel surface collar. Drilling continued at 152 mm diameter to the total depth. Drill cuttings were sampled every metre and logged, and groundwater yields were measured during airlifting after rod changes.

Monitoring bores were constructed with 50 mm diameter class 18 uPVC, fitted with an end cap at the base, placed within the investigation hole and the annulus was gravel packed with 3.2 - 6.4 mm washed and graded gravel.

Test-production bores were constructed at sites providing an adequate airlift yield by cementing in place 6 m of 254 mm steel surface casing, and then reaming the investigation hole to 254 mm diameter to total depth. The production casing was 155 mm diameter uPVC casing, slotted beneath the groundwater table and fitted with an end cap at the base. The annulus was packed with 3.2 - 6.4 mm washed and graded gravel. The bores were developed to stabilise and sort the gravel pack.

Table 4 Summary of Dewatering Bore Construction Details

Bore	Coordinates mN (m)	Coordinates mE (m)	Ground Elevation (mRL)	Total Depth Drilled (m)	Observed Aquifer Zones (m)	Airlift Yield (kL/day)	Casing Details (mbgl)	Slotted Interval (mbgl)	SWL (mbtoc) (Date)
Production Bores									
CYPB01	7799567	481886	-	124	40-60, 78-84, 90-102, 108-120	600	+0.43 –5.57 m, 254 mm steel casing + 0.48 - 123.6 m, 155 mm uPVC casing	15.6 - 123.6	12.50 (5/6/04)
CYRC0090 (Coyote Bore)	7799644	482400	-	100	-	-	+0.05 - ? m, 203 mm steel casing +0.24 - ?, 150 mm uPVC casing	-	13.92 (5/6/04)
LPB01	7834140	485514		123	34-38, 84 -96, 102 - 114	260	+0.15 - 5.85 m, 254 mm steel casing + 0.36 - 122.3 m, 155 mm uPVC casing	14.3 - 122.3	21.46 (2/6/04)
Kookaburra Bore	7833801	485448	-	150	-	-	-	-	
Monitoring Bores									
CYMB01	7799642	482358	-	117	42-54, 60 - 66, 78 - 96, 108 - 114	600	+0.14 - 5.86 m, 155 mm steel casing +0.30 - 116.9 m, 50 mm Class 18 uPVC	36 - 107	13.85 (5/6/04)
CYMB02	7799565	481936	-	122	36-48, 60-84, 102-108	600	+ 0.31 - 5.69 m, 155 mm steel casing +0.42 - 121.5 m, 50 mm Class 18 uPVC	28 - 106	12.58 (5/6/04)
LMB01	7834115	485535	-	118	75-82, 102-114	170	+0.32 - 6.18 m, 152 mm steel casing +0.46 - 51.1 m, 50 mm Class 18 uPVC	0 - 51.1	21.11 (2/6/04)

NB. ?: unknown

5.1.1 Coyote

Test - production bore CYPB01 drilled through transported silts and clays to 13 m where it intersected saprolite clays and weathered siltstone, containing at times a large amount of fractured grey and clear quartz. Samples were moist from 37 m and a continuous airlift yield of 0.4 L/s was established at 42 m. The flow rate increased gradually to 7 L/s at 120 m. The larger incremental increases in airlift yield occurred between 48 - 60 m and 108 - 114 m. Groundwater conductivity and pH were measured whilst airlifting at a depth of 120 m., providing values of 11,100 µS/cm and 8.1 respectively.

Monitoring bore CYMB02, adjacent to CYPB1, drilled through transported silts and clays to 14 m where it intersected saprolite clays and weathered siltstone and minor sandstone, containing at times a large amount of fractured grey and clear quartz. Samples were moist from 28 m and a continuous airlift yield of 2.2 L/s was established at 48 m. The flow rate increased gradually to 7 L/s at 108 m. The larger incremental increases in airlift yield occurred between 42 - 54 m, 60 - 84 m and 102 - 108 m. Groundwater conductivity and pH were measured whilst airlifting. Electrical conductivity increased gradually from 1,680 µS/cm at 48 m; 3,400 µS/cm at 66 m; 6,600 µS/cm at 90 m; 10,000 µS/cm at 102 m to 13,400 µS/cm at 120 m. pH remained unchanged at 7.7.

Monitoring bore CYMB01 drilled through transported soils and clays to 9 m where it intersected saprolite clays and weathered siltstone, containing at times a large amount of fractured grey and clear quartz. Samples were moist at 31 m and a continuous airlift yield of 0.8 L/s was established at 42 m. The flow rate increased gradually to 7 L/s at 117 m. The larger incremental increases in airlift yield occurred between 42 - 66 m, 78 - 96 m and 108 - 117 m. Electrical conductivity increased gradually from 4,300 µS/cm at 48 m; 10,000 µS/cm at 84 m; to 13,200 µS/cm at 114 m. pH remained unchanged at 8.1.

Construction logs of all bores are included in Appendix A.

5.1.2 Larranganni

Test - production bore LPB01 drilled through transported silts and clays to 4 m where it intersected saprolite clays and weathered dolerite and minor shale, containing a large amount of fractured grey and clear quartz within the depth intervals 33 - 47 m and 88 - 92 m. Samples were moist from 34 m and a continuous airlift yield of 0.7 L/s was established at 42 m. The flow rate increased gradually to 3 L/s at 120 m. The airlift yield increased from 0.7 L/s to 3 L/s between 90 - 114 m. Groundwater conductivity and pH were measured whilst airlifting, providing uniform values of 30,000 µS/cm and 7.7 respectively.

Monitoring bore LMB01 drilled through transported gravely silts to 3 m where it intersected saprolite clays and weathered siltstone and dolerite, containing only minor quartz. A continuous airlift yield of 0.4 L/s was established at 75 m. The flow rate increased gradually to 2 L/s at 118 m. The larger incremental increases in airlift yield occurred between 75 - 90 m, and 102 - 114 m. Groundwater conductivity and pH were measured whilst airlifting, providing uniform values of 29,000 µS/cm and 7.9 respectively.

The casing in LMB01 could not be lowered beneath 51 m depth due to the swelling clays of the formation. A second attempt was made to progress the casing beyond this depth.

Construction logs of all bores are included in Appendix A.

5.2 Aquifer Testing

5.2.1 General

The newly constructed production bores CYPB01 and LPB01, along with the Kookaburra Pit Bore (KB) were test pumped to determine the hydraulic parameters of the aquifers to arrive at sustainable dewatering rates. The testing comprised firstly a multi-rate test to assess the bore performance and to determine a suitable pumping rate for the constant rate test, and then the constant rate test.

G & C used an electric submersible pump to complete the pumping tests. Water flow rates were measured through an orifice weir. Electric contact meters were used to measure groundwater levels in both the pumped and the monitoring bores.

Groundwater from each test was pumped to a purpose built holding dam to protect the environment from the saline groundwater. Each dam was located away from the production bore to minimize the possibility of recharge.

5.2.2 Multi-Rate Tests

The multi-rate test consisted of 4 x 1 hour steps at incrementally increasing rates. Three one-hour steps were undertaken for LPB01. Analyses of these results were used to determine well and formation loss factors and to select a suitable rate for the constant rate test.

Groundwater level drawdown in a pumping bore has two components, formation loss and well loss. Formation loss is dependent on the hydraulic characteristics of the aquifer in the vicinity of the bore and is directly proportional to the pumping rate. Well loss is caused by turbulent flow and friction head loss through casing slots and around the pump, and thus depends on bore construction and development. It is generally considered proportional to the square of the pumping rate.

Therefore, drawdown in a pumping bore can be expressed by the formula:

$$S_w = BQ + CQ^2$$

where: S_w = groundwater level drawdown (m)

Q = pumping rate (m^3/day)

B = formation loss factor (day/m^2)

C = well loss factor (day^2/m^5)

$$\text{Well efficiency} = [BQ/(BQ + CQ^2)] \times 100$$

Field data are presented at Figures 8, 11, and 14.

The multi-rate test results have been analysed by the Bierschenk and Wilson method, whereby S_w/Q is plotted against Q, giving a line with y-intercept of B and slope C (Table 15).

Successful step-rate tests were completed in CYPB01, LPB01 and KB. The test was of three hours duration in LPB01 due to the large drawdown.

The final step during test in KB was only slightly higher than the third step as the pump could not be lower beyond 38 metres, due to a bend in the casing.

Table 5 Step-Rate Test Results

Bore	Pumping Rates (kL/day)	Drawdown (m) (after 60 min)	Static Water Level (m)	S_w/Q (day/m^2)	Formation Loss (BQ) (m)	Well Loss (CQ^2) (m)	Well Efficiency (%)
CYPB01	173	3.22	12.62	0.019	2.82	.03	90
	346	6.94		0.019	5.64	1.20	82
	518	12.11		0.022	8.44	2.68	76
	691	17.65		0.023	11.26	4.77	70
LPB01	86	9.12	20.21	0.106	5.70	2.98	63
	173	23.94		0.138	11.40	11.94	49
	259	48.64		0.181	17.11	26.87	39
KB	86	1.76	19.06	0.020	1.38	0.52	73
	173	5.03		0.029	2.76	2.09	57
	259	10.35		0.037	4.15	4.70	47
	302	11.16		0.033	4.84	6.40	43

Groundwater pumped during the step-rate test for KB was very silty and levels rose on a number of occasions. This has been attributed to the bore being developed by the test pumping.

It can be seen that well efficiency generally decreases as pumping rate increases, due to the higher proportion of well loss (CQ^2) contributing to total drawdown ($BQ + CQ^2$) in the well. At higher pumping rates, the higher velocities of groundwater entering the well causes a higher proportion of well loss resulting in lower bore efficiency. These low values of efficiency are typical of wells completed with slotted casing in fractured rocks.

5.2.3 Constant-Rate Tests

The constant-rate test in each bore was commenced following the multi-rate test and after groundwater levels had recovered to initial static levels. They ran for 24 hours. The constant-rate test results enabled the hydraulic characteristics of the aquifer in the vicinity of each production bore to be determined. These parameters describe the storage and transmission of groundwater in the aquifer. The groundwater storage characteristic of an aquifer (storativity) is defined as the amount of water released from the aquifer under a unit decline in hydraulic head. The term transmissivity describes the transmission of groundwater in an aquifer and is defined as the rate at which groundwater is transmitted through a unit width of aquifer under a unit hydraulic gradient.

The results of the constant-discharge tests and the calculated hydraulic parameters, are shown on Table 6 and discussed below. Field data are shown at Figures 9, 10, 12, 13, 15 and 16.

Table 6 Constant-Rate Test Results

Pumping Bore	Date of Test	Pumping Rate (m^3/day)	Final Drawdown (m)	Observation Bore			Transmissivity (m^2/day)		Storativity
				Bore	Distance (m)	Final Drawdown (m)	Theis Method	Jacob Method	
CYPB01	17/6/04	691	17.89				45	60	
				CYMB02	50	2.41	142	90	$2.3x10^{-3}$
CYPB01		Recovery						70	
LPB01	22/6/04	173	46.30				2.3	4.02	
				LMB01	37	11.83	5.4	4	$5.4x10^{-5}$
		Recovery						3.6	
KB		302	6.06				42.7	20	
KB		Recovery							

CPB01

Bore CPB01 was pumped during the multi-rate test at rates of 173, 346, 518 and 691 m^3/day, followed by a constant-rate test at 691 m^3/day. The water level declined rapidly for the first 15 minutes with the drawdown reaching 15 metres. Between 15 and 850 minutes the drawdown trend flattened after which the trend steepened and water level were variable. These fluctuations may be the result of minor variations in the pumping rate. At the end of the test the drawdown was 17.98 m.

Analysis of late time data indicated an aquifer transmissivity of 45 m^2/day (Theis) and 60 m^2/day (Jacob).

During the test, the groundwater level was measured in monitoring bore CYMB02, located about 50 metres to the east. The drawdown was 2.41 metres, with the drawdown trend similar to that of the pumped bore.

A storativity value of 2.3×10^{-7} was estimated from the observation bore data.

The water table within the Coyote Deposit occurs at approximately 402 mRL (13 m bgl). Regional groundwater throughflow is presumed to be towards the palaeochannel south of the deposit.

LPB01

The constant rate test for bore LPB01 was commenced at a pumping rate of 173 m^3/day, following the multi-rate test at rates of 86, 173 and 259 m^3/day.

The plot of drawdown in the pumped bore shows water levels drew down 15 metres in the first 30 minutes. The drawdown trend steepened between 30 and 60 minutes with the drawdown reaching 43.58 metres. Between 650 minutes and the end of the test (1,440 minutes) the trend flattened. The minor decrease in the water level (1.1 m) at the end of the test may be the result of a change in pumping rate.

The transmissivity of the aquifer was 4 m^2/day from Jacobs Method and 2.3 m^2/day from the Theis method.

The aquifer response to pumping was monitored in bore LMB01, located about 37 metres to the southeast. The drawdown trend was similar, but flatter, than in the pumped bore with a final drawdown of 11.83 metres. From the observation bore data a storativity value of 5.4×10^{-5} was estimated.

Kookaburra Pit Bore (KB)

The bore casing in the Kookaburra Pit Bore is bent and the pump could not be lowered beyond 39 metres due to the pump jamming at that depth. The static water level was 19.06 m with an available drawdown of less than 19 metres.

The steps for the multi-rate test were therefore limited to discharges of 86, 173, 259 and 302 m^3/day. During the test the groundwater was silty and water levels fluctuated during the third step. These fluctuations can be attributed to development in the bore during pumping.

The drawdown after the final step was 11.16 metres so the constant rate test was run at 302 m^3/day.

The drawdown plot shows a gradually steepening trend with a steepening of the drawdown trend after 540 minutes. The water level at the end of the test was 6.06 metres. The transmissivity of the aquifer from the late time data and the Jacobs method was 21 m^2/day and from the Theis analysis 43 m^2/day.

An adjacent diamond drill hole (LGD01) was cased with 50 mm PVC casing and groundwater levels were monitored during the test. The drill hole is angled (at 60°) and at a depth of about 90 metres, the hole is about 12 to 15 metres east of the pumping bore. Data from this monitoring bore was used, as the drawdown was only 0.61 metres in the bore. From Theis data the storativity value of 6×10^{-2} was estimated. The drawdown in the observation bore followed a similar trend to that of the test bore.

The water table within the Larranganni Deposit occurs at approximately 359 mRL (21 m bgl). Regional groundwater throughflow is presumed to be towards the west.

5.3 Groundwater Chemistry

Groundwater samples were taken from all bores drilled in the program. The results of all laboratory analyses conducted on these samples are presented in Appendix B.

A full chemical analysis was completed for all production bores at the completion of the constant-rate test. A full chemical analysis was completed on samples taken from all monitoring bores by airlifting at the completion of drilling.

A partial analysis was conducted on groundwater samples from production bores taken at the start of the constant-rate test. There was no significant difference in either the Ec or the pH results from samples taken at the start of the test compared with the results from samples taken at the end of testing.

A summary of results for all full analyses is presented in Table 7.

Table 7 Summary of Groundwater Chemistry

	Units	CYPB01	CYMB01	CYMB02	LPB01	LMB01	KB
pH	pH units	7.6	7.8	8.0	7.3	7.4	7.3
Ec @25^{0}C	µS/cm	9300	13000	11000	41000	41000	36000
TDS (calc. as Na CL)	mg/L	5900	7700	6500	26000	26000	23000
TDS (grav.) @ 180^{0}C	mg/L	6700	10000	8500	27000	27000	23000
Total Alkalinity as $CaCO_3$	mg/L	440	480	460	250	180	250
Iron, Fe (soluble)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Aluminium, Al	mg/L	<0.1	0.2	0.1	0.2	0.2	<0.1
Sodium, Na	mg/L	1700	2700	2300	5700	6000	5600
Potassium, K	mg/L	140	180	160	140	140	140
Calcium, Ca	mg/L	110	160	140	1000	1100	940
Magnesium, Mg	mg/L	250	370	330	1700	1600	1200
Chloride, Cl	mg/L	2400	3800	3100	12000	12000	13000

	Units	CYPB01	CYMB01	CYMB02	LPB01	LMB01	KB
Hydroxide, OH	mg/L	<1	<1	<1	<1	<1	<1
Carbonate, CO_3	mg/L	<1	<1	<1	<1	<1	<1
Bicarbonate, HCO_3	mg/L	540	590	560	310	210	300
Hardness (equivalent $CaCO_3$)	mg/L	1300	2300	1700	9500	9300	7300
Sulphate, SO_4	mg/L	1600	2400	2100	4900	4900	3200
Nitrate, NO_3	mg/L	9.9	8.5	9.3	4.7	5.8	8.7
Nitrite, NO_2	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese, Mn	mg/L	0.15	0.30	<0.05	<0.05	0.2	<0.05
Silica, SiO_2	mg/L	17	17	17	30	21	28
Sum of Ions (calc.)	mg/L	6843	10183	8684	25755	25956	24389
Cation/Anion balance	mg/L	-2.42	-1.60	-0.76	-0.49	0.79	-5.48

5.3.1 Coyote Deposit

The groundwater in the project area shows an increase in measured electrical conductivity with depth from airlift samples. At 48 m depth in CYMB2 the Ec is 1,680 µS/cm, at 84 m depth it is 5,100 µS /cm and at 120 m depth it is 13,400 µS /cm.

The groundwater from test pumping is saline and has a slightly alkaline pH. Salinity concentrations range from 6,700 to 10,000 mg/L TDS (gravimetric). The groundwater is a sodium chloride type. The laboratory pH values were in the range 7.6 to 8.0. As the laboratory analyses were completed well after the samples were taken it is expected that the pH of the groundwater would be slightly higher than those values recorded in the laboratory. Field measurements of groundwater samples from the three bores at the time of construction all gave a pH value of 8.1.

The disposal of the abstracted saline groundwater will need to be managed to avoid adverse effects on the environment.

5.3.2 Larranganni Deposit

The groundwater in the project area is highly saline and has a slightly alkaline pH. Salinity concentrations range from 23,000 to 27,000 mg/L TDS (gravimetric). The groundwater is a sodium chloride type. The laboratory pH values were in the range 7.3 to 7.4. As the laboratory analyses were completed well after the samples were taken it is expected that the pH of the groundwaters would be slightly higher than those measured. Field measurements of groundwater samples from the two bores at the time of construction all gave values within the range 7.7 - 7.9.

The disposal of the abstracted highly saline groundwater will need to be managed to avoid adverse effects to the environment.

6.1 Coyote Water Supply Requirements

The estimated water requirements at Coyote comprise

- 150 kL/day of potable water for both camp and mine facilities;
- 2,500 kL/day of water for ore processing; and
- 300 kL/day for dust suppression and road maintenance.

A total of approximately 3,000 kL/d of groundwater will be required to service these requirements.

6.1.1 Potable Water

Based on an estimated maximum of 150 persons on site at one time and an estimated requirement of 1 kL/day of potable water for each person, the total requirement is 150 kL/d.

A Reverse Osmosis plant would provide the potable water supply from groundwater obtained from the dewatering bores. A suitable unit is the Novatronics 150 kL/d RO plant. The estimated foot print size is 3.5 m long x 1.2 m wide x 1.8 m high. The pre-treatment skid has approximately the same dimensions.

The estimated cost of the RO plant is $170,000 for the RO plant and $30,000 for the Media-Filtration plant. Running costs are estimated at $0.80-$1.00 per 1,000 litres.

6.1.2 Process Water

A planned feed rate of 1,500 tpd of solids to the plant and an ore-processing requirement for the water to solids ratio to be 1.6:1 means that the plant would consume 2,500 kL/d of water. This supply would initially be provided from the dewatering bores. However it is possible that 2 additional bores, distant from the dewatering effect, may be required to supplement the process water supply as dewatering proceeds and as the yields from some dewatering bores diminish. It is considered that such an extension of the borefield away from the pit, possibly incorporating aquifers in the nearby palaeochannel, will provide an assured groundwater supply to the plant for the current 36-month planned lifetime of the mine. Should additional supply be required to the plant at commencement of processing (say 3,500 kL/d) then these bores could be installed at the time of installing the dewatering bores.

6.1.3 Dust Suppression and Road Maintenance

It is estimated that approximately 300 kL/d of groundwater obtained from dewatering will be required for dust suppression and road maintenance at Coyote.

6.2 Larranganni Groundwater Requirements

The estimated water requirements at Larranganni comprise

- 40 kL/day of potable water for both camp and mine facilities; and
- 300 kL/day for dust suppression and road maintenance.

Thus a total of approximately 340 kL/d would be required for the above purposes.

6.2.1 Potable Water

A potable groundwater supply would be provided from the site of the current water bore located 8 km from the Larranganni Camp. The electrical conductivity of the water was tested on site and found to be 1,270 μS/cm and within potable standards for Ec.

Based on an estimated maximum of 40 persons at Larranganni at one time and a requirement of 1 kL/day of potable water for each person, there is a total requirement of 40 kL/d. The water bore needs to be tested to ensure that it can provide this supply. A standby bore may be required to ensure supply.

A Reverse Osmosis plant would be used to treat the groundwater from the bore. A suitable unit is the Novatronics 40 kL/d RO plant. The estimated foot print size is 2.5 m long x 1.2 m wide x 1.8 m high. The pre-treatment skid is approximately 1.2 m long x 1.2 m wide x 2 m high.

The estimated cost of the RO plant is $40,000 for the RO plant and $15,000 for the Media-Filtration plant. Running costs are $0.60-$0.80 per 1,000 litres.

6.2.2 Dust Suppression and Road Maintenance

It is estimated that approximately 300 kL/d of groundwater obtained from dewatering will be required for dust suppression and road maintenance at Larranganni.

7.1 Conceptual Hydrogeological Model

The key aspects of the conceptual hydrogeological model for the Coyote and Larranganni Deposits are outlined below.

- Groundwater occurrence and flow within and adjacent to the deposit are controlled mainly by sub-vertical structures (faults, folds, shear zones) that form a fractured rock aquifer system. The general overview from the site investigations is that the ore deposits comprise permeable fractured rocks and adjacent areas comprise low permeability rocks.

- Aquifers are formed within near vertical zones of fractured weathered and fresh rock and are likely to principally occur above 155 m depth. Below this depth the transmissivity of these fracture zones is expected to decrease as the fracture frequency is reduced and the structures close.

- Production bores will need to be located in the areas of fractured rock in order to facilitate dewatering. Installed production bores should be slotted from the water table to total depth to optimise their yield potential on dewatering impacts.

- It is expected that pumping from sumps will be necessary to remove inflow from any isolated aquifers in the deeper, lower permability rocks that may not have been dewatered by the bores.

7.2 Groundwater Flow Modelling

The design approach to dewatering of the Coyote and Larranganni Deposits has involved the use of a conceptual hydrogeological model to develop a compatible groundwater flow model.

7.2.1 Coyote Model Construction, Layout and Calibration

A Visual MODFLOW groundwater flow model has been developed with a finite difference domain over the Coyote Deposit. The base of the model has been extended to include a total thickness of fresh bedrock of 100 m, about 140 m below the base of the pit and 20 m below the base of underground mining.

The model comprises five layers. Each layer comprises different material types, which provide lateral and vertical definition of the interpreted hydrogeological domains and in particular fractured rock aquifer systems. Each material type has different hydraulic properties, which reflect interpreted spatial variations in hydraulic conductivity and storage characteristics. Hydraulic parameter descriptions are provided in Table 8 and the model domain is shown on Figure 17.

Transmissive structures, incorporated into the model as the most significant aquifer systems, have been interpreted from geological cross sections adjacent to the pit area and from the results of mineral and groundwater exploration drilling programs. The lateral continuity of these structures away from the pit area is poorly defined. In the model, the structures have been extended for significant distances away from the pit to simulate lateral continuity of the fractured rock aquifer systems.

Other unknown and unidentified structures may also transect the pit and contribute to groundwater inflows during mining.

A cross section of the interpreted aquifer system model is shown at Figure 6.

Table 8 Coyote Modelled Hydraulic Parameters and Material Types

Domain	Layer Elevation (m RL)	Layer Thickness (m)	Hydraulic Parameters				
			Hydraulic Conductivity (m/day)			Specfic Storage (1/m)	Specific Yield (dimensionless)
			H_X	H_Y	H_Z		
Palaeochannel	405 – 392	13	4	4	1	0.0001	0.10.01
Transported Material (Clays)	405 – 380	25	0.005	0.005	0.004	5×10^{-5}	0.01
Aquifer (Faults, Shears, Fractured Rock)	380 – 200	180	2	1	0.5	1.75×10^{-6}	0.01
Saprolite (Structured Rock)	300 – 200	100	0.001	0.001	0.001	1×10^{-5}	0.001
Saprock (Non-structured Rock)	380 – 200	180	0.002	0.005	0.0001	1×10^{-6}	0.0001
Fresh Bedrock (Non-structured Rock)	200 – 100	100	0.001	0.001	0.001	1×10^{-6}	0.001

Note: 1 Hx-east west, Hy-north south and Hz-vertical, components of hydraulic conductivity.

2 The water table elevation in the model range is assumed constant across the domain at 402 mRL.

7.2.2 Coyote Predictive Dewatering Simulations

The simulated design dewatering system for the Coyote Deposit includes simulated bore sites shown at Table 9 and located on Figure 2. These bores comprise five pit-perimeter and two in-pit dewatering bores. The latter were required in the simulation to dewater the pit however they will be replaced by pit-perimeter bores if at all possible for ease of mining operations.

The simulated pumping schedule allows for;

- commissioning of production bores PB02, PB03, PB05 and PB08 at the commencement of open pit mining, and

- commissioning of production bores PB04, PB06 and PB07 a minimum 2 months prior to the commencement of underground mining.

The total pumping period is 43 months. Results from the predictive dewatering simulations in terms of forecast groundwater abstraction schedules are outlined in Table 9. Drawdown impacts of pumping are illustrated as contours on Figures 19a, 19b, 19c and 19d, and as sections through the pits on Figures 22a, 22b, 22c, 22d for periods of 12 months, 24 months, 36 months and 38 months. The locations of these sections are shown on Figure 21. Maximum drawdown is achieved after 38 months.

Table 9 Coyote Simulated Production Bores and Rates of Groundwater Abstraction

Simulated Production Bore Site	**Rates of Groundwater Abstraction (kL/day)**				
	0-300 days	**300-360 days**	**360-750 days**	**750-1140 days**	**1140-1290 days**
PB02	500	500	173	173	173
PB03	500	500	173	173	173
PB04	Nil	605	605	432	432
PB05	500	500	260	173	173
PB06	Nil	605	605	432	432
PB07	Nil	605	605	432	432
PB08	500	500	173	173	173
Totals	**2,000**	**3,815**	**2,593**	**1,988**	**1,988**

The results of the predictive simulations indicate that:

- After 12 months from the commencement of the above dewatering schedule, the groundwater level in the major water bearing structures, and in the vicinity of the open pit, will draw down between 320 and 340 mRL, see Figure 19a and Figure 22a.

- After 24 months from the commencement of the above dewatering schedule, groundwater levels in the water bearing structures will be at about 260 mRL to 310 mRL, see Figure 19b and Figure 22b.

- After 36 months from the commencement of the above dewatering schedule the groundwater levels in the major water bearing structures have reached between 320 and 240 mRL signifying only small additional drawdown from that after 24 months, see Figure 19c and Figure 22c.

- After 38 months from the commencement of the above dewatering schedule the groundwater levels in the major water bearing structures have reached 240 mRL, with a maximum drawdown of 173 m (229 mRL), see Figure 19d and Figure 22d.

Based on this model it is seen that the water level has drawn down to approximately 230 m RL within and adjacent to the major water bearing structures after 38 months of pumping.

The modelling results to date are broadly predictive and are based on one pumping test and a number of reasonable assumptions. In the next stage of dewatering bore construction all potential water bearing structures will be targeted to optimise the location of dewatering production bores outside the pit.

7.2.3 Larranganni Model Construction, Layout and Calibration

A Visual MODFLOW groundwater flow model has been developed with a finite difference domain centred over the Larranganni Deposits, including Kookaburra and Sandpiper ore deposits. The base of the model has been extended to include a total thickness of fresh bedrock of 20 m, about 70 m below the base of the Kookaburra pit.

The model comprises five layers. Each layer comprises different material types, which provide lateral and vertical definition of the interpreted hydrogeological domains and in particular fractured rock aquifer systems. Each material type has different hydraulic properties, which reflect interpreted spatial variations in hydraulic conductivity and storage characteristics. Hydraulic parameter descriptions are provided in Table 10 and the model domain is shown on Figure 18.

Transmissive structures, incorporated into the model as the most significant aquifer systems, have been interpreted from fault-associated features identified from geological cross sections adjacent to the pit area and from results of the mineral and groundwater exploration programs. The lateral continuity of these structures away from the pit area is poorly defined. In the model, the structures have been extended for significant distances away from the pit to simulate lateral continuity of the fractured rock aquifer systems.

Other unknown and unidentified structures may also transect the pit and contribute to groundwater inflows during mining. A cross section of the interpreted aquifer system model is shown at Figure 7.

Table 10 Larranganni Modelled Hydraulic Parameters and Material Types

Domain	Layer Elevation (m RL)	Layer Thickness (m)	Hydraulic Parameters				
			Hydraulic Conductivity (m/day)			Specfic Storage (1/m)	Specific Yield (dimensionless)
			H_X	H_Y	H_Z		
Saprolite (Structured Rock)	380 –310	70	0.005	0.005	0.004	5×10^{-5}	0.01
Aquifer (Faults, Shears, Fractured Rock)	380 –310	70	0.1	0.1	0.05	0.0005	0.1
Saprock Aquifer (Faults, Shears, Fractured Rock)	310 – 260	50	0.5	0.2	0.2	5×10^{-6}	0.0005
Saprock (Non-structured rock)	310 – 260	50	0.001	0.001	0.001	1×10^{-5}	0.001
Fresh Bedrock (Non-structured rock)	260 – 240	20	0.002	0.005	0.0001	1×10^{-6}	0.0001

Note: 1 Hx-east west, Hy-north south and Hz-vertical, components of hydraulic conductivity.

The water table elevation in the model range is assumed constant across the domain at 360 m RL.

7.2.4 Larranganni Predictive Dewatering Simulations

The simulated design dewatering system for the Larranganni Deposit includes simulated bore sites shown at Table 11 and located on Figure 3.

Sandpiper Deposit

These bores comprise two pit-perimeter bores.

The simulated pumping schedule allows for;

- commissioning of production bores PBS01 and PBS02 at the commencement of the open pit mining.

The total pumping period is 11 months. Results from the predictive dewatering simulations in terms of forecast groundwater abstraction schedules are outlined in Table 11. Drawdown impacts of the pumping are illustrated as contours on Figures 20a, 20b, 20c, 20d, 20e and 20f, and as sections across the pit on Figures 24a, 24b, 24c and 24d for periods of 3 months, 6 months, 9 months, 11 months, 12 months and 14 months. The locations of these sections are shown on Figure 23. Maximum drawdown, in the vicinity of the Sandpiper Pit is achieved after 11 months.

Table 11 Sandpiper Simulated Production Bores and Rates of Groundwater Abstraction

Simulated Production Bore Site	Rates of Groundwater Abstraction (kL/day)			
	0-210 days	**210-240 days**	**240-270 days**	**270-360 days**
PBS01	260	216	216	173
PBS02	260	216	173	173
Totals	**520**	**432**	**389**	**346**

The results of the predictive simulations indicate that:

- After 11 months from the commencement of the above dewatering schedule, the groundwater level in the major water bearing structures, and in the vicinity of the open pit, will draw down between 305 and 310 m AHD, see Figure 20d and 24d.

Based on this model it is seen that the water level has drawn down to approximately 303 m RL within and adjacent to the major water bearing structures after 11 months of pumping.

The modelling results are only broadly predictive and are based on only one pumping test and a number of reasonable assumptions.

Kookaburra Deposit

These bores comprise five pit-perimeter and two in-pit production bores. The latter were required in the simulation to dewater the pit. They will be replaced by pit-perimeter bores if at all possible for ease of mining operations.

The simulated pumping schedule allows for;

- commissioning of production bores PBK03, PBK04, PBK05 and PBK06 prior to the commencement of the open pit mining.

The total pumping period is 14 months. Results from the predictive dewatering simulations in terms of forecast groundwater abstraction schedules are outlined in Table 9. Drawdown impacts of the pumping are illustrated as contours on Figures 20a, 20b, 20c, 20d, 20e and 20f and as sections on Figures 25a, 25b, 25c, 25d and 25e for periods of 3 months, 6 months, 9 months, 11 months, 12 months and 14 months. The locations of the sections are shown on Figure 23. Maximum drawdown in the vicinity of the Kookaburra pit is achieved after 417 days (75.7 m drawdown).

Table 12 Kookaburra Simulated Production Bores and Rates of Groundwater Abstraction

Simulated Production Bore Site	Rates of Groundwater Abstraction (kL/day)	
	0-410 days	**410-415 days**
PBK03	260	173
PBK04	260	260
PBK05	260	260
PBK06	260	260
Totals	**1,040**	**953**

The results of the predictive simulations indicate that:

- After 14 months (417 days) from the commencement of the above dewatering schedule, the groundwater level in the major water bearing structures, and in the vicinity of the open pit, will draw down to between 285 and 290 m AHD.

Based on this model it is seen that the water level has drawn down to approximately 285 m RL within and adjacent to the major water bearing structures after 14 months of pumping.

The modelling results are only broadly predictive and are based on only one pumping test, undertaken in the Sandpiper deposit, and a number of reasonable assumptions.

7.3 General Dewatering Design Details

To achieve dry mining conditions, the primary aquifer zones within the pits and pit-perimeter areas need to be specifically targeted for dewatering. The key design considerations for the dewatering system for the pits are considered to be:

- An investigation drilling and bore construction program to install the additional production bores;
- Placement of additional permanent monitoring bores around the pit perimeters to provide monitoring records during the lifetime of the pits;
- In-mine sumps will be required to store groundwater that may enter the mine from individual aquifers encountered by mining that have not been dewatered by the bores. A sump pump (such as a high head Flyght pump capable of pumping up to 15 KL/s) will remove groundwater from “short term” flows.

The preferred design for all in-pit production bores is with 152 mm diameter mild steel casing, slotted beneath the water table. Mild steel is also recommended for pit perimeter production bores that could possibly end up within the pit during mining. Other pit perimeter production bores would be constructed with 155 mm uPVC casing. This design is suitable for meeting the predicted initial pumping schedules with electro-submersible pump-units.

Pit perimeter monitoring bores should be constructed with dual 50 mm uPVC tubes placed within 152 mm diameter bores. One tube, slotted against the shallow, clayey saprolite would provide the groundwater level in this material. The other casing would be slotted against the deeper formation beneath the clays.

Results from the predictive simulations have resulted in a designed dewatering system and show that the mine dewatering requirements for the Coyote and Larranganni Deposits are met by:

- the operation of dewatering bores pumping for the life of the mine;
- electro-submersible pumps installed in bores and associated headworks; operated by gensets;
- in-pit sump pumping to deal with isolated aquifers not dewatered by the bores;
- the commencement of dewatering activities at the commencement of mining.

The predictive simulations indicate that most of the dewatering requirements can be met by operating these dewatering bores, augmented with sump pumping. However, these simulations are constrained by assumptions, regarding the nature and extent of regional aquifer zones, which may influence the longer-term pit dewatering and the projected total pumping rate. The design details for the dewatering infrastructure required to facilitate the dewatering abstraction are outlined below.

7.3.1 Coyote Design Production Bore Locations

Design locations for possible production bores are shown in Table 13 and on Figure 2. Test-production bore CYPB01 and monitoring bores CYMB01 and CYMB02 have been constructed.

Production bores used in the computer simulation have been named PB02 - PB08. PB05 replaced CYPB01 in the computer simulation as it was found to be more effective, being closer to the pit perimeter.

Monitoring bore CYMB01 will be destroyed soon after mining commences as it is within the pit. CYMB02 will be used as a permanent monitoring bore.

Table 13 Coyote Design Production Bore Locations

Bore Site	AMG Co-ordinates		Ground Elevation (mRL)	Slotted Interval (mRL)
	mE	mN		
PB02	482423	7799640	415	402-215
PB03	482182	7799367	415	402-215
PB04	482019	7799508	415	340-200
PB05	481954	7799543	415	402-215
PB06	482194	7799533	415	340-200
PB07	481796	7799442	415	402-200
PB08	482171	7799733	415	402-215

7.3.2 Coyote Pumping Schedules

This schedule assumes that underground mining will commence upon the completion of open pit mining and that the total period of mining is 38 months when the deepest mining depth of 220 mRL is reached. The schedule allows for these bores to provide the plant 2,500 kL/d of groundwater as from four months after the commencement of mining, as well as 300 kL/d for dust suppression and road maintenance from the commencement of mining.

Table 14 however presents ‘start-up’ pumping rates for the simulated bores based on yields from groundwater modelling. Production and monitoring bores should be monitored very closely and pumping rates adjusted if required. It is expected that production bores will require some adjustment. Production bores will become unproductive once total dewatering (or mining) of the aquifer takes place.

Table 14 Coyote Design Dewatering Abstraction from Commencement of Mining

Simulated Production Bore Site	Rates of Groundwater Abstraction (kL/day)				
	0-120 days*	**120-300 days**	**300-360 days**	**360-750 days**	**750-1290 days**
PB02	500	500	500	170	170
PB03	500	500	500	170	170
PB04	Nil	500	400	610	440
PB05	500	500	500	260	170
PB06	Nil	500	400	610	440
PB07	Nil	Nil	600	610	440
PB08	500	500	500	170	170
Totals	**2,000**	**3,000**	**3,400**	**2,600**	**2,000**

Note: plant commences operation at 120 days.

7.3.3 Coyote Pump Specifications

Design pump-units specifications for the production bores are shown in Table 15.

Table 15 Coyote Design Pump Specifications

Bore	Bore Depth (m)	Casing Diameter (mm)	Pump Setting (m)	Design Pump-Units (with J tubes)
PB02-08	180-220	155 mm	Initial - 100 Final - 200	Grundfos SP30-25 Rated power: 22 KW Rated current: 50/48/47.5A Motor size: 6” Required yield: 610-170 kL/d

The pump type has been selected for pumping to a pond 1.5 km distant from the bore with a rise in topography of 10 m.

7.3.4 Larranganni Design Production Bore Locations

Design locations for possible production bores are shown in Table 16 and on Figure 3. Test-production bore LPB01 and monitoring bore LMB01 has been constructed.

Production bores used in the computer simulation have been named PBS01 and PBS02 for the Sandpiper Pit and PBK03-PBK06 (four bores) for the Kookaburra pit.

PBS01 has replaced test-production bore LPB01 in the computer simulation as it was found to be more effective, being closer to the pit perimeter.

Table 16 Larranganni Design Production Bore Locations

Bore Site	Local Co-ordinates		Ground Elevation (mRL)	Screen Interval (mRL)
	mE	MN		
PBS1	9911	10259	380	360-290
PBS2	10133	10474	380	360-290
PBK3	10087	10036	380	360-240
PBK4	10263	10111	380	360-240
PBK5	10220	9933	380	360-240
PBK6	10080	9959	380	360-240

7.3.5 Larranganni Pumping Schedules

Table 17 presents ‘start-up’ pumping rates for the simulated bores based on yields determined from groundwater modelling. Production and monitoring bores should be monitored very closely and pumping rates adjusted if required. It is expected that production bores will require some adjustment. Production bores will become unproductive once total dewatering (or mining) of the aquifer takes place.

It is estimated that approximately 300 kL/d of groundwater will be used for dust suppression and road maintenance.

Table 17 Kookaburra Design Production Bores and Rates of Groundwater Abstraction

Simulated Production Bore Site	Rates of Groundwater Abstraction (kL/day)	
	0-410 days	410-415 days
PBK03	260	175
PBK04	260	260
PBK05	260	260
PBK06	260	260
Totals	**1,040**	**955**

Table 18 Sandpiper Design Production Bores and Rates of Groundwater Abstraction from Commencement of Mining

Simulated Production Bore Site	Rates of Groundwater Abstraction (kL/day)			
	0-210 days	210-240 days	240-270 days	270-360 days
PBS01	260	215	215	175
PBS02	260	215	175	175
Totals	**520**	**430**	**390**	**350**

7.3.6 Larranganni Pump Specifications

Design pump-units specifications for the production bores are shown in Table 18.

Table 19 Larranganni Design Pump Specification

Bore	Bore Depth (m)	Casing Diameter (mm)	Pump Setting (m)	Design Pump-Units (with J tubes)
PBS01 & PBS02	90	155	85	Grundfos SP17-10 Rated power: 5.5 KW Motor size: 4” Rated current: 13/13/13.4 A Yield: 260-175 kL/d
PBK03, PBS04, PBK05, PBK06	140	155	135	Grundfos SP17-15 Rated power: 9.2 KW Motor size: 6” Rated current: 21.8/21.8/21.8 A Yield: 260-175 kL/d

The pump type has been selected for pumping to a pond 1.5 km distant from the bore with a rise in topography of 10 m.

7.3.7 Monitoring of Dewatering Progress

Three monitoring bores have been constructed, namely CYMB01 and CYMB02 (Coyote Pit) and LMB01 (Sandpiper Pit). However CYMB01 is located within the Coyote Pit and will be removed by mining. It is proposed that three additional monitoring bores be constructed at Coyote, two around the Sandpiper Pit perimeter and three around the Kookaburra Pit perimeter. These bores will allow for the monitoring of groundwater levels, and provide data for the assessment of the dewatering progress and the evaluation of groundwater heads behind the pit walls. These additional monitoring bores should be equipped with two tubes, one screened opposite the clayey saprolite and one screened opposite the deeper formation. In this way the water level behind the pit wall can be monitored as well as the regional water level.

For the first one to two months of pumping, groundwater levels should be measured more regularly than in later months (see program below). Assessments can then be based on the data as to the dewatering progress and the actions required (if any) for successful dewatering. Groundwater level monitoring will also ensure the production bores are being pumped at their optimum rates. Pumping in this period should be considered in a similar way to a controlled pumping test, and data should be collected and recorded accurately to aid in the assessment of dewatering.

There is no known local abstraction by other groundwater users from these aquifers because the saline groundwater in the area is not suitable for most stock. The nearest stock bores are some distance from the mining area and Tanami Gold NL will keep the landholders fully informed of mining plans.

A monitoring and management strategy has been formulated for the dewatering of the mines. The focus of the strategy is on defining the dewatering progress and local impacts of the dewatering abstraction and complying with probable licensing requirements.

The proposed monitoring/management program includes:

- Affixing of flow meters to each production bore and sump pump.
- Installation of an 'auto shut-off' system for each production bore to protect the pump if water levels approach the pump inlet.
- Measurement and recording of aggregate abstraction volumes from each production bore and sump pump every week.
- Installation of dipping tubes in each production bore so that pumping and/or standing groundwater levels can be measured.
- Measurement of groundwater levels in the production and monitoring bores as follows:
  - daily for the first two weeks;
  - twice a week for the next six weeks; and
  - weekly for the remaining pumping period.

  The measurements should be at a consistent stage in the pumping cycle – preferably at times the production bores are operating and have been pumping consistently for a day. If this is not possible, it must be noted if the bore is pumping or not when the measurement is taken.
- If two operating stock wells can be located within 10 km of the deposits, they should be included in the monitoring program (level and field conductivity) every quarter.
- Quarterly sampling of the production bore discharge, with subsequent analysis of TDS concentrations.
- A sample should be collected annually from each production bore and submitted to a NATA-registered laboratory for comprehensive chemical analyses.

7.3.8 Groundwater Disposal

- **Coyote**

  Groundwater abstracted from the Coyote mine will eventually be used for mineral processing and dust suppression. However mining will commence 2 months before the tailings dam will be able to receive water and 4 months before the plant commences operation. Thus an evaporation pond will need to be constructed to receive excess groundwater during the period of mining.

  Based on a maximum inflow of 120,000 kL of water during this 2-month period an evaporation pond would have a footprint of approximately 2.5 ha for a design depth of 6 m, 5.0 ha for a design depth of 4 m and 15 ha for a design depth of 2 m. The evaporation pond would be constructed at a location where the requirement to rehabilitate is minimised.

- **Larranganni**

  Groundwater abstracted from the Larranganni mines would be used for road maintenance and dust suppression. The excess groundwater would be pumped to an evaporation pond. At present it is planned to commence mining Sandpiper and Kookaburra at the same time. In this case the evaporation pond should be designed to have a footprint of approximately 6 ha for a design depth of 6 m, 10 ha for a design depth of 3 m and 15 ha for a design depth of 2 m.

  However should Kookaburra be mined after Sandpiper, the Sandpiper pit could be used to contain groundwater from Kookaburra. In this case the evaporation pond should be designed with a footprint of approximately 1 ha for a design depth of 6 m, 2 ha for a design depth of 3 m and 3.5 ha for a design depth of 2 m.

  The above footprint sizes would be optimised during the concept design. The evaporation pond would be constructed at a location where the requirement to rehabilitate is minimised.

7.4 Future Dewatering and Water Supply Cost Items

Cost items to be considered for the establishment of the dewatering system include the following:

- electro-submersible pumps with associated headworks and fittings;
- sump pumps;
- pipelines to direct dewatering discharge to required destinations;
- electrical reticulation;
- electrical power costs; and
- evaporation ponds.

Some of these items have been costed and included below in this report.

7.4.1 Drilling and Construction of Dewatering Bores

A summary of the items for the drilling and the construction of additional dewatering bores for the pits includes:

- Application to the Department of Environment for licences to explore for, and extract groundwater for dewatering, ore processing and dust suppression/road maintenance. Application should be made 2-3 months before the drilling program is due to commence.

- Test drilling, and construction of up to 13 additional production bores (7 bores at Coyote and 6 bores at Larranganni) and 8 monitoring bores (3 bores at Coyote and 5 bores at Larranganni). The site program would take 15 weeks to complete at a Contractor cost of $546,617 for Coyote and $323,038 for Larranganni.

- following the completion of individual bores, relevant data would be collated, plotted and interpreted;

- revision of the mine dewatering system and groundwater flow model based on the results from the exploratory drilling and increased geological knowledge; and

- reporting - this stage would involve the compiling of factual documents relevant to the installation of the mine dewatering systems. Submission of this report to the Water and Rivers Commission on the final installed dewatering systems would be required.

The cost estimate for URS to provide the technical support for the above programs is $105,380 for Coyote and $66,175 for Larranganni.

7.4.2 Groundwater Supply

The following bores would augment and safeguard the current and proposed dewatering bores to provide the required groundwater supplies to the operations.

- Additional Bores for Plant Water Supply

It is possible that bores additional to the planned dewatering bores at Coyote may be required to assure supply to the plant. An investigation program of the palaeochannel sediments, during the installation of the dewatering bores, the drilling of two investigation holes and the construction of two bores is estimated to cost $80,000.

- Larranganni Camp Supply

The estimated cost to construct a standby bore at the 8 km bore site is estimated to cost $50,000.

7.4.3 Evaporation Ponds

The estimated cost to prepare the concept design for evaporation ponds at Coyote and Larranganni is $60,000 for the two sites.

This estimate of cost includes the completion of:

- Site testing
- Laboratory Testing
- Hydrology, hydrogeology
- Design
- Environmental approvals

This estimate assumes that adequate topographic data of the areas are available.

7.5 Data Summary for BFS Report

7.5.1 Dewatering of Coyote and Larranganni Mines

- The groundwater flow model predicts that the planned dewatering bores will effectively dewater both the open-pit and underground mining operations at Coyote to the 230 mRL. It is not expected that significant aquifers will occur within the 230-220 mRL interval where mining will be completed. It is expected that an aquifer at this depth will have low permeability and the groundwater provided by it to the mine will be efficiently removed by sump pumping.

- At Larranganni the groundwater flow model predicts that the bores will effectively dewater both the Kookaburra and Sandpiper open-pits.

- Sump pumping is required to remove the ingress of groundwater from isolated aquifers that have not been dewatered by the bores. This may occur at any stage of mining beneath the water table. A high head sump pump(eg. Flyght) capable of pumping at 15 L/s should be made available at each mine. It is expected that sump pumping would be intermittent.

7.5.2 Groundwater Supply to the Plant

The Coyote plant is assured of receiving its processing requirement of 2,500 kL/d of groundwater from the dewatering bores at Coyote for the planned lifetime of the mine, possibly supplemented by two bores constructed outside the immediate influence of dewatering. These additional bores may be required as the dewatering bores diminish in yield. The bores would probably be established to utilise groundwater from the nearby palaeochannel.

It is expected that should the two bores be constructed before processing commences that an additional 1,000 kL/d could be supplied to the plant for the entire processing period. Additional groundwater from the evaporation pond could also be utilised.

The complete system of dewatering production bores would be established at Coyote before milling commences to ensure supply.

7.5.3 Bore Pumps

The following bore pumps are suitable for the dewatering the

Table 20 Coyote Design Bore Pump Specifications

Bore	Bore Depth (m)	Casing Diameter (mm)	Pump Setting (m)	Design Pump-Units (with J tubes)
PB02-08	180-220	155 mm	Initial - 100 Final - 200	Grundfos SP30-25 Rated power: 22 KW Rated current: 50/48/47.5A Motor size: 6” Required yield: 610-170 kL/d

The pump type has been selected for pumping to a pond 1.5 km distant from the bore with a rise in topography of 10 m.

Table 21 Larranganni Design Bore Pump Specification

Bore	Bore Depth (m)	Casing Diameter (mm)	Pump Setting (m)	Design Pump-Units (with J tubes)
PBS01 & PBS02	90	155	85	Grundfos SP17-10 Rated power: 5.5 KW Motor size: 4” Rated current: 13/13/13.4 A Yield: 260-175 kL/d
PBK03, PBS04, PBK05, PBK06	140	155	135	Grundfos SP17-15 Rated power: 9.2 KW

				Motor size: 6” Rated current: 21.8/21.8/21.8 A Yield: 260-175 kL/d

The pump type has been selected for pumping to a pond 1.5 km distant from the bore with a rise in topography of 10 m.

Mining feasibility studies for the Coyote and Larranganni Deposits have been in progress, with mining planned to commence in 2005. Mining will extend considerably below the water table and dewatering of the local groundwater systems would need to accompany development of the open pits and underground operations. As part of the feasibility studies a dewatering investigation program has been completed.

The dewatering program has included a review of the mine geology and the results from previous exploration and geotechnical drilling to identify geological structures that may possibly be associated with aquifers within and adjacent to the pits. This was followed with the construction of two test-production bores and three monitoring bores, and the test pumping of these test-production bores along with a water bore previously constructed within the Kookaburra Pit.

Test pumping has been completed at these bores to measure the aquifer response to groundwater abstraction. These tests have been analysed to determine the hydraulic properties of the rocks to assist in designing a dewatering system for the proposed mines. These parameters have then been used as representative values for all structures identified throughout the mine areas. Results from the program have been applied to develop a conceptual hydrogeological model of the deposits. This hydrogeological model has then been applied to the development of the groundwater flow model, in order to predict the potential volumes of groundwater that have to be pumped in order to achieve relatively dry and efficient mining conditions.

Key aspects of the Coyote hydrogeological model include:

- Based on the results of groundwater exploration drilling and aquifer testing the main occurrences of groundwater in the Coyote Deposit appear to be from highly permeable fractures, quartz veins and shear zones in the rocks that host the deposit and are adjacent to the deposit. Away from these structures, the rocks appear to have a considerably lower permeability, with the exception of palaeochannel sediments to the south of the deposit;

- The water table is within clay saprolite rock for the early stages of the planned pit. The model shows that the pit walls will be effectively dewatered. However, it must be noted that the groundwater model has been based on a number of assumptions and on the aquifer characteristics determined largely from one 24-hour pumping test at a single bore, CYPB01.

- The lateral extent of the aquifers and their regional flow characteristics are poorly defined at present; the monitoring of aquifer responses due to longer-term pumping during mine-dewatering will improve the definition of these aspects.

The groundwater flow model, which is based on the conceptual hydrogeological model, has been broadly calibrated to the observed aquifer responses during the aquifer tests. However, this model incorporates several unverified assumptions regarding the groundwater flow in regional structures and the hydraulic connection of these to the rocks in the pit area would have a bearing on the dewatering design.

The key aspects of the Coyote dewatering and water supply system includes:

- Commencement of dewatering at the commencement of mining, utilising four production bores to abstract a total of 2,000 kL/day;

- After 120 days of dewatering an additional 2 bores will commence dewatering to abstract a total of 3,000 kL/day. This total abstraction will increase to 3,400 kL/day after 300 days with an additional bore in operation, then reduce to 2,600 kL/d after 360 days and to 2,000 kL/day after 750 days until the completion of mining at 1,290 days. This rate will be increased from the current bores or from additional bores to maintain 2,500 kl/d to the plant;

- The model predicts that the bores will effectively dewater both the open-pit and underground mining operations with the possible exception of minor groundwater encountered between the 230-220 mRL at the last stage of underground mining. It is expected that sump pumping will be required occasionally once mining reaches the water table and will be able to deal with any aquifers encountered below the 230 mRL.

- The recommended pumping rates are only for start up and may need to be adjusted, particularly in the first few weeks. Production bores will become unproductive once total dewatering (or mining) of the aquifer takes place. It is therefore important to monitor dewatering in the first few months to confirm that actual drawdown is similar to predicted drawdown. This early pumping should be regarded as a controlled pumping test. A groundwater monitoring and management program has been recommended (see Section 6.3.7).

- It is important to provide a monitoring network of 4 monitoring bores to provide data on dewatering progress of the mines. As it likely that only one of the present monitoring bores will survive mining, another 3 monitoring bores should be installed.

- Sumps will be required to collect groundwater encountered from minor water intersections throughout the mining program. The groundwater will be removed by a sump pump.

- The maximum salinity measured for the groundwater is 10,000 mg/L. The surface environment will need to be protected from this groundwater.

Key aspects of the Larranganni hydrogeological model include:

- Based on the results of groundwater exploration drilling and aquifer testing the main occurrences of groundwater in the Larranganni Deposit appear to be from highly permeable fractures, quartz veins and shear zones in the rocks that host the deposit and are adjacent to the deposit. Away from these structures, the rocks appear to have a considerably lower permeability;

- The water table is within clay saprolite rock for the early stages of the planned pits. The model shows that the pit walls will be effectively dewatered. However, it must be noted that the groundwater model has been based on a number of assumptions and on the aquifer characteristics determined largely from a 24-hour pumping test at two bores, LPB01 at Sandpiper and the Kookaburra Bore (KB) at Kookaburra.

- The lateral extent of the aquifers and their regional flow characteristics are poorly defined at present; the monitoring of aquifer responses due to longer-term pumping during mine-dewatering will improve the definition of these aspects.

The groundwater flow model, which is based on the conceptual hydrogeological model, has been broadly calibrated to the observed aquifer responses during the aquifer tests. However, this model incorporates several unverified assumptions regarding the groundwater flow in regional structures and the hydraulic connection of these to the rocks in the pit area would have a bearing on the dewatering design.

The key aspects of the Larranganni dewatering system includes:

- Commencement of dewatering at the commencement of mining, utilising two production bores at Sandpiper to abstract 520 kL/day, and four production bores at Kookaburra to abstract 1,040 kL/day. Thus a total of 1,560 kL/day of groundwater will initially be abstracted from Larranganni;
- After 210 days of dewatering, abstraction from Sandpiper will reduce to 432 kL/day. Then the total abstraction will be 1,472 kL/day;
- After 240 days of dewatering, abstraction from Sandpiper will reduce to 389 kL/day. The total abstraction will then be 1,429 kL/day;
- After 270 days of dewatering, abstraction from Sandpiper will reduce to 346 kL/day. The total abstraction will then be 1,386 kL/day;
- After 360 days of dewatering abstraction from Sandpiper will finish and Kookaburra will pump 1,040 kL/day;
- After 410 days of dewatering abstraction from Kookaburra is expected to reduce to 953 kL/day;
- The model predicts that the bores will effectively dewater both the open-pits. It is expected that intermittent sump pumping will be required during mining to remove groundwater from minor intersections.
- The recommended pumping rates are only for start up and may need to be adjusted, particularly in the first few weeks. Production bores will become unproductive once total dewatering (or mining) of the aquifer takes place. It is therefore important to monitor dewatering in the first few months to confirm that actual drawdown is similar to predicted drawdown. This early pumping should be regarded as a controlled pumping test. A groundwater monitoring and management program has been recommended (see Section 6.3.7).
- It is important to provide a monitoring network of 3 monitoring bores at Sandpiper and 3 at Kookaburra to provide data on dewatering progress of the mines. As it likely that the present monitoring bore LMB01 will survive mining, another 5 monitoring bores should be installed at Larranganni.

- The maximum salinity measured for the groundwater is 27,000 mg/L. The surface environment will need to be protected from this groundwater.

To ensure the mine dewatering objectives and licensing conditions are met, it will be important to monitor the aquifer responses to pumping at all mines.

This monitoring would involve:

- measurement of abstraction volumes on a weekly basis;
- measurement of pumping water levels in each production bore on a weekly basis; and
- recording of groundwater levels in the monitoring bores on a weekly basis.

Assessments of these data would provide an understanding of the rate of dewatering progress, regional throughflow and the longer-term abstraction requirements.

Based on the work completed during this project, the following recommendations are made:

- This report, or relevant parts thereof, should be submitted to the Water and Rivers Commission in support of a Groundwater Well Licence (abstraction) for the dewatering of the Coyote and Larranganni Deposits during planned mining;
- A program to construct and test up to 7 production bores and 3 monitoring bores at Coyote, and up to 6 production bores and 5 monitoring bores at Larranganni be scheduled for completion so that they will be equipped to commence abstraction at the commencement of mining. Though the model predictions suggest that CYPB01 and LPB01 be replaced as they are too far from the pit perimeter, the option does remain to use these bores and reduce the number of new production bores at each deposit by one production bore.
- Consideration should be given to investigating the provision of additional bores at Coyote within the palaeochannel sediments to ensure supply to the plant, and also to the establishment of a standby bore for potable supply at Larranganni, during the dewatering bore construction program;
- Results from these bores would be used to update the hydrogeological model to generate updated computer simulations of predicted dewatering;
- It is strongly recommended that the initial few months of groundwater pumping be considered as a large-scale pumping test, and data be collected on a more regular basis (see Section 6.3.7).
- Groundwater discharge by sump pumping should be provided as mining proceeds below the water table.
- Monitoring and accurate recording of groundwater levels are extremely important to:
  - assess the dewatering progress;
  - determine or confirm appropriate pumping rates;
  - contribute to the assessment of pit wall stability; and
  - comply with groundwater well licence requirements.
- A groundwater monitoring and management program has been outlined (Section 6.3.7), and it is highly recommended to implement the program at the commencement of pumping. Groundwater monitoring data should be reviewed and assessed, after one to two months of pumping, so as to determine any further actions required.

Numerous Site Annual Reports, Geological and Engineering Databases and Personal Discussions with Tanami Gold NL Personnel.

URS Australia Pty Ltd (URS) has prepared this report for the use of Tanami Gold NL in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated March 2004.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared during June - September 2004 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.

Appendix A
Bore Construction Logs

URS	BORE COMPLETION REPORT	BOREHOLE: **CYMB01**

URS Australia Pty Ltd — Phone 08 92211630
20 Terrace Rd, East Perth, 6004 — Fax 08 92211639

DRILLING CO:	**Gorey & Cole Drillers**	PROJECT NAME:	**Dewatering Feasibility Investigation**
DRILL METHOD:	**Air Hammer**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**Tanami Gold NL**
		LOCATION:	**Coyote Deposit, W.A**

TOTAL DRILLED DEPTH:	**117m**	OPEN INTERVAL:	**36-107m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**116.9m**	STATIC WATER LEVEL (mbgs):	**13.85**	COORDINATES:	**482358E**
CASING DIAMETER:	**50mm**	DATE OF MEASUREMENT:	**5/6/04**		**7799642N**
SCREEN DIAMETER:	**50mm**	PUMPING TEST: -		DATUM:	**AMG 84**
		FINAL SALINITY:	**10,000 mg/L**		

START DATE: **25/5/04** FINISH DATE: **26/5/04** LOGGED BY: **V. Wilson**

BORE CONSTRUCTION	LITHOLOGY	DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)

155mm steel casing from +0.31 to 5.86m.

Concrete seal from 0 - 5.86m.

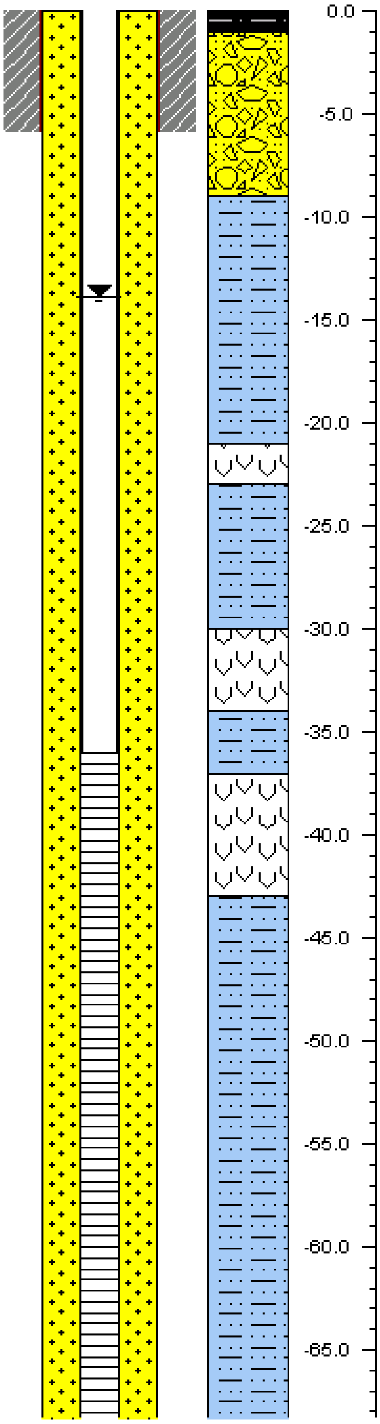
204mm diameter hole from 0.0m to 5.86m.

152mm hole diameter from 5.86 - 117m

class 18 uPVC 50mm casing from +0.42 to 36m

3.2 - 6.4mm graded gravel from 0 - 122m.

class 18 uPVC slotted casing from 36 - 107m.



SILT: Red-brown gravelly silt.

GRAVEL: Very weathered small to large rounded- subrounded gravel and minor milky quartz;

3-7m : Weathered well rounded gravel cemented in brown ferricrete and grey silcrete in clay;
7-9m : Large rounded siltstone gravel and grey quartz cemented in silcrete and ferricrete.

SILTSTONE: Red brown and khaki brown weathered siltstone with up to 10% grey quartz.

QUARTZ: Medium to small angular, fractured grey quartz (50%) in red-brown and orange-brown siltstone.

SILTSTONE: Red-brown and yellow-brown weathered siltstone with minor grey quartz.

QUARTZ: 60% small to medium fractured grey and milky quartz in pink-brown weathered siltstone.

SILTSTONE: Orange-brown and red-brown weathered siltstone with minor grey quartz.

QUARTZ: 60% large fractured grey quartz in weathered dark brown siltstone.

SILTSTONE: Very dark brown weathered siltstone with minor dark grey quartz;

45-56m : Dark brown and red-brown siltstone with 20-50% large fractured grey quartz;
56-60m : Red-brown and grey weathered siltstone with minor medium fractured quartz;
60-67m : Yellow-brown, brown and red weathered siltstone with minor fractured grey quartz;
67-70m : Yellow-brown, red-brown and grey weathered siltstone;
70-72m : Large fractured grey quartz in large fractured weathered siltstone and chips of grey and yellow-brown weathered siltstone;
72-76m : Yellow-brown weathered siltstone;
76-77m : Yellow-brown, brown and grey weathered siltstone;
77-82m : Yellow-brown weathered siltstone with minor weathered grey quartz.

FORMATION: TRANSPORTED; SAPROLITE

AIRLIFT YIELD (kL/sec)	TDS (mg/L)
1.7	2,800
2.1	2,900
2.1	3,200
2.7	3,000

DRAWN BY: BWJ DATE: 27/7/04
CHECKED BY: VW DATE: 27/7/04

BORE COMPLETION REPORT

BOREHOLE: CYMB01

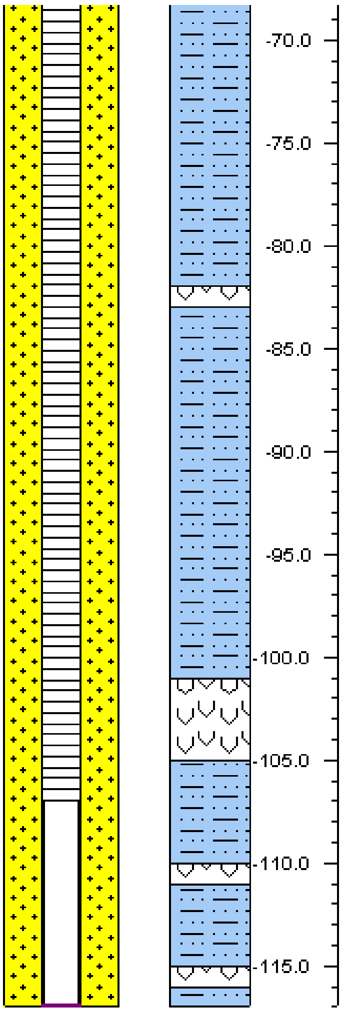
URS Australia Pty Ltd
20 Terrace Rd, East Perth, 6004
Phone 08 92211630
Fax 08 92211639

DRILLING CO:	**Gorey & Cole Drillers**	PROJECT NAME:	**Dewatering Feasibility Investigation**
DRILL METHOD:	**Air Hammer**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**Tanami Gold NL**
		LOCATION:	**Coyote Deposit, W.A**

TOTAL DRILLED DEPTH:	**117m**	OPEN INTERVAL:	**36-107m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**116.9m**	STATIC WATER LEVEL (mbgs):	**13.85**	COORDINATES:	**482358E**
CASING DIAMETER:	**50mm**	DATE OF MEASUREMENT:	**5/6/04**		**7799642N**
SCREEN DIAMETER:	**50mm**	PUMPING TEST:	-	DATUM:	**AMG 84**
		FINAL SALINITY:	**10,000 mg/L**		

START DATE: **25/5/04** FINISH DATE: **26/5/04** LOGGED BY: **V. Wilson**

BORE CONSTRUCTION | LITHOLOGY | DEPTH (m) | DESCRIPTION | FORMATION | AIRLIFT YIELD (kL/sec) | pH | TDS (mg/L)



class 18 uPVC 50mm casing from 107 - 116.9m.

End cap

Description:

QUARTZ: 50% large to small fractured grey quartz in in dark grey and yellow-brown weathered siltstone.

SILTSTONE: Yellow-brown, red-brown and grey weathered siltstone with minor milky and grey quartz;

91-95m: <50% fractured angular grey quartz in yellow-brown, brown and red-brown weathered siltstone;
95-101m: Yellow-brown, brown and grey weathered siltstone with minor large to medium angular quartz.

QUARTZ: 50% small to large fractured, angular grey quartz in grey and dark brown siltstone.

SILTSTONE: Grey, dark brown weathered siltstone with minor grey quartz;

107-108m: 50% fractured angular grey quartz and fractured angular brown and grey siltstone;
108-110m: Brown and grey weathered siltstone.

QUARTZ: 50% grey fractured quartz in grey siltstone.

SILTSTONE: Dark grey weathered siltstone;

112-113m: Dark grey siltstone with grey fractured quartz;
113-115m: Grey and brown weathered siltstone.

QUARTZ: 50% grey quartz and white quartz in weathered yellow-brown siltstone.

SILTSTONE: Weathered yellow-brown siltstone;

EOH @ 117m.

AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)
2.5		6,500
2.8		6,800
3.3		5,500
5.0		6,000
5.0		5,700
5.0	8.1	8,600
6.6		8,600
7		

DRAWN BY: BWJ DATE: 27/7/04
CHECKED BY: VW DATE: 27/7/04

BORE COMPLETION REPORT

BOREHOLE: **CYMB02**

URS Australia Pty Ltd
20 Terrace Rd, East Perth, 6004
Phone 08 92211630
Fax 08 92211639

DRILLING CO:	**Gorey & Cole Drillers**	PROJECT NAME:	**Dewatering Feasibility Investigation**
DRILL METHOD:	**Air Hammer**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**Tanami Gold NL**
		LOCATION:	**Coyote Deposit, W.A**

TOTAL DRILLED DEPTH:	**122m**	OPEN INTERVAL:	**28-106m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**121.5m**	STATIC WATER LEVEL (mbgs):	**12.58m**	COORDINATES:	**481936E**
CASING DIAMETER:	**50mm**	DATE OF MEASUREMENT:	**5/6/04**		**7799565N**
SCREEN DIAMETER:	**50mm**	PUMPING TEST:	-	DATUM:	**AMG 84**
		FINAL SALINITY:	**8,500 mg/L**		

START DATE: **24/5/04** FINISH DATE: **25/5/04** LOGGED BY: **V. Wilson**

BORE CONSTRUCTION	LITHOLOGY	DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)

BORE CONSTRUCTION:

155mm steel casing from +0.31 to 5.69m.

Concrete seal from 0 - 5.69m.

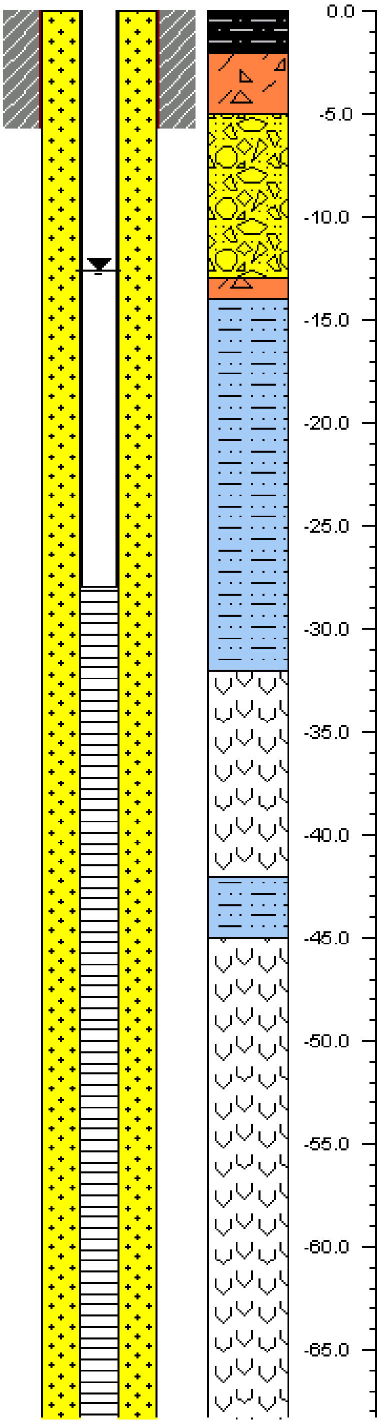
204mm hole diameter from 0.0 - 5.69m

class 18 uPVC 50mm casing from +0.42 to 28m

152mm hole diameter from 5.69 - 122m.

3.2 - 6.4mm graded gravel from 0 - 122m.

class 18 uPVC screen from 28 - 106m.



DESCRIPTION:

SILT: Gravelly, sandy, red-brown weakly cemented silt.

SILCRETE: Very weathered cream silcrete and dark brown ferricrete.

GRAVEL: Well rounded red-brown gravel with cream silcrete;

8-13m: Well rounded brown gravel and cream silcrete gravel weakly cemented by brown iron rich cement.

SILCRETE: Subrounded to angular grey quartz in very weathered grey and brown silcrete.

SILTSTONE: Angular grey quartz in orange-brown very weathered siltstone;

15-18m: Very weathered orange-brown siltstone;
18-19m: Very weathered orange-brown siltstone with minor milky quartz;
19-21m: Very weathered yellow-brown and grey siltstone;
21-22m: Large to small angular iron stained grey quartz in dark brown very weathered siltstone;
22-26m: Dark red very weathered siltstone with minor small angular clear quartz.

QUARTZ: 40-70% large to small angular grey quartz, fracture surfaces stained. With orange, red and brown sulphide-rich siltstone.

SILTSTONE: Very weathered, fractured brown and orange-brown siltstone with 30% large to small angular grey quartz.

QUARTZ: 30-80% large to small fractured, angular grey quartz and milky quartz with large, fractured weathered dark brown (sulphides), red-brown, brown, grey and verigated siltstone.

FORMATION: TRANSPORTED (0 - approx. 14m); SAPROLITE (below)

AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)
2.2		1,100
4.0		1,100
4.0		1,250
5		2,200

DRAWN BY: BWJ DATE: 27/7/04
CHECKED BY: VW DATE: 27/7/04

BORE COMPLETION REPORT

BOREHOLE: CYMB02

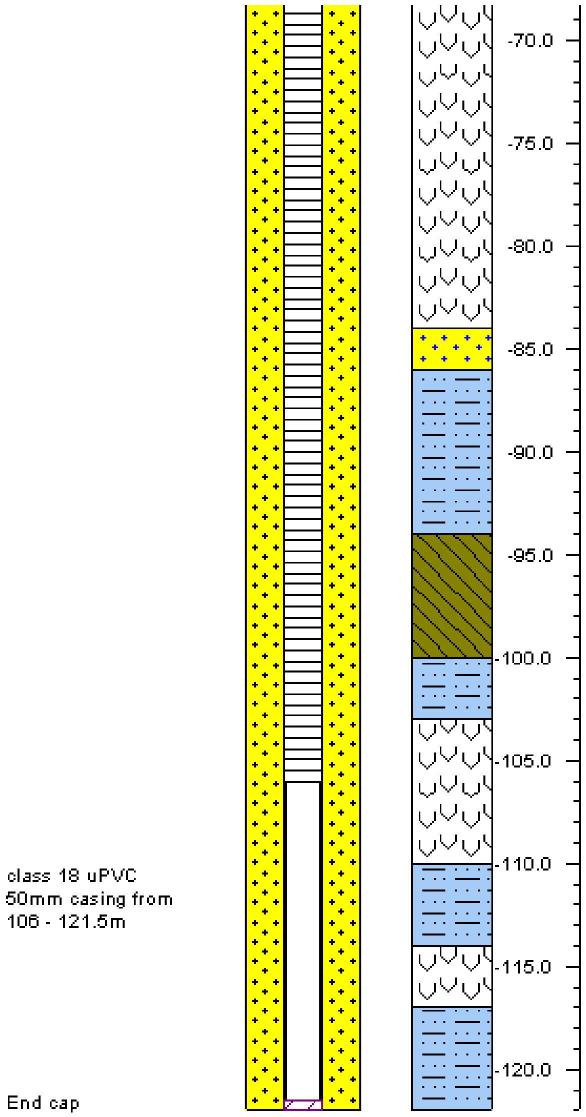
URS Australia Pty Ltd — Phone 08 92211630
20 Terrace Rd, East Perth, 6004 — Fax 08 92211639

DRILLING CO:	Gorey & Cole Drillers	PROJECT NAME:	Dewatering Feasibility Investigation
DRILL METHOD:	Air Hammer	PROJECT NUMBER:	53850-002
		CLIENT:	Tanami Gold NL
		LOCATION:	Coyote Deposit, W.A

TOTAL DRILLED DEPTH:	122m	OPEN INTERVAL:	28-106m	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	121.5m	STATIC WATER LEVEL (mbgs):	12.58m	COORDINATES:	481936E
CASING DIAMETER:	50mm	DATE OF MEASUREMENT:	5/6/04		7799565N
SCREEN DIAMETER:	50mm	PUMPING TEST: -		DATUM:	AMG 84
		FINAL SALINITY:	8,500 mg/L		

START DATE: 24/5/04 — FINISH DATE: 25/5/04 — LOGGED BY: V. Wilson

BORE CONSTRUCTION	LITHOLOGY	DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)



SANDSTONE: Pale grey sandstone with minor red-brown stained surfaces.

SILTSTONE: Yellow-brown, very weathered siltstone with minor pale grey and verigated siltstone;

88-90m: Large to small angular milky and grey quartz with some fractured surfaces in red-brown, brown and white siltstone;
90-92m: Red-brown, dark brown and brown weathered siltstone with minor fractured, angular, small to large milky and grey quartz;
92-93m: Very large, fractured clear and grey quartz in very weathered brown siltstone.

CLAY: Fractured angular milky and grey quartz in orange-brown clay.

SILTSTONE: Very weathered dark khaki brown siltstone with minor grey quartz;

101-103m: Dark khaki brown siltstone and weathered brown and grey siltstone with small, fractured milky quartz.

QUARTZ: Large fractured grey and milky white quartz with large, fractured, weathered grey, brown and red siltstone.

SILTSTONE: Orange-brown weathered siltstone with minor fractured quartz;

112-114m: Well rounded gravel of red-brown and yellow-brown weathered siltstone with minor large angular grey quartz.

QUARTZ: Large angular fractured grey quartz in minor grey and orange-brown siltstone.

SILTSTONE: Dark red-brown weathered siltstone with minor small fractured quartz;

119-122m: Dark brown and dark grey weathered friable siltstone;

EOH @ 122m.

AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)
6		3,300
6		4,300
6		
6		6,500
7		7,900
7	8.1	
7		8,700

DRAWN BY: BWJ — DATE: 27/7/04
CHECKED BY: VW — DATE: 27/7/04

BORE COMPLETION REPORT

BOREHOLE: **CYPB01**

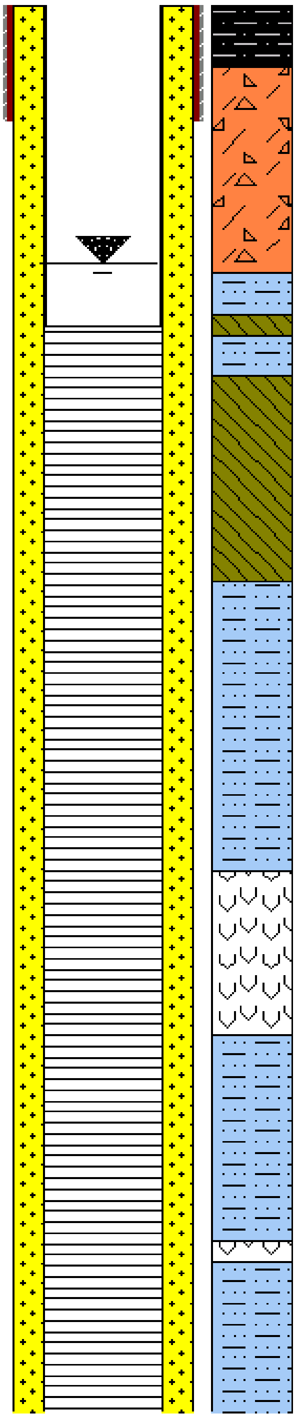
URS Australia Pty Ltd — Phone 08 92211630
20 Terrace Rd, East Perth, 6004 — Fax 08 92211639

DRILLING CO:	**Gorey & Cole Drillers**	PROJECT NAME:	**Dewatering Feasibility Investigation**
DRILL METHOD:	**Air Hammer**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**Tanami Gold NL**
		LOCATION:	**Coyote Deposit, W.A**

TOTAL DRILLED DEPTH:	**124m**	OPEN INTERVAL:	**15.6 -123.6m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**123.6m**	STATIC WATER LEVEL (mbgs):	**12.5m**	COORDINATES:	**481886E**
CASING DIAMETER:	**155mm**	DATE OF MEASUREMENT:	**5/6/04**		**7799567N**
SCREEN DIAMETER:	**155mm**	PUMPING TEST:	**Multi- & Const- Rate Tests**	DATUM:	**AMG 84**
		FINAL SALINITY:	**6,700**		

START DATE: **21/5/04** FINISH DATE: **23/5/04** LOGGED BY: **V. Wilson**

BORE CONSTRUCTION	DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)
254mm steel casing from +0.43 to 5.57m; 266mm Diameter Hole from 0 - 5.57m	0.0	SILT: Brown gravelly,clayey, weakly cemented fine silt.	TRANSPORTED			
	-5.0	SILCRETE: Grey friable weathered silcrete with minor brown gravel and silt; 4-5m : Grey weathered silcrete and dark brown ferricrete; 5-13m : Weathered grey silcrete with minor dark brown ferricrete and gravel	TRANSPORTED			
Class 9 uPVC 155mm casing from +0.48 to 15.6m	-10.0	SILTSTONE: White siltstone with minor clear quartz and pink silty clay; 14-15m : Brown siltstone and large angular milky quartz with pink-brown clay and minor small clear quartz.				
	-15.0	CLAY: Pink-brown and white silty clay.				
254mm Diameter Hole from 5.57 to 124m		SILTSTONE: Pink and grey weathered siltstone and small to large angular grey and milky quartz.				
	-20.0 / -25.0	CLAY: Grey clay with small to large angular grey quartz in grey clay; 19-20m : Grey and red clay; 20-21m : Grey clay with large angular grey and milky quartz; 21-24m : Red clay; 24-26m : Red to pink clay with minor angular milky and grey quartz; 26-28m : Red clay.		0.44		
3.2 - 6.4mm Graded Gravel from 0 to 124m:	-30.0 / -35.0 / -40.0	SILTSTONE: White and red weathered siltstone in brown clay; 30-31m : White and red weathered siltstone in brown clay with minor large grey quartz; 31-33m : Weathered red siltstone; 33-34m : Weathered red siltstone with angular grey quartz; 34-35m : Weathered red and khaki siltstone; 35-42m : Hard chips of red, with minor white and khaki, siltstone and minor angular grey quartz.				
Class 12 uPVC 155mm Slotted Casing from 15.6 - 123.6m	-45.0	QUARTZ: Large to small angular grey quartz with minor red, grey, white and brown siltstone.		0.6		
	-50.0 / -55.0	SILTSTONE: Dark brown to brown, minor red and white siltstone with <50% very large to small angular grey quartz.	SAPROLITE	1.4		
	-60.0	QUARTZ: Very large, iron stained grey quartz with minor brown and white siltstone.	SAPROLITE	2.8		
	-65.0	SILTSTONE: Red, brown and white siltstone with <50% medium to very large angular, iron stained grey quartz and minor milky quartz; 68-69m : Dark red-brown, brown siltstone with minor very large angular grey quartz; 69-70m : Dark brown, brown and white siltstone with 50% very large to small angular grey and milky quartz;	SAPROLITE	2.8		



DRAWN BY:	BWJ	DATE:	27/7/04
CHECKED BY:	VW	DATE:	27/7/04

URS | **BORE COMPLETION REPORT** | BOREHOLE: **CYPB01**

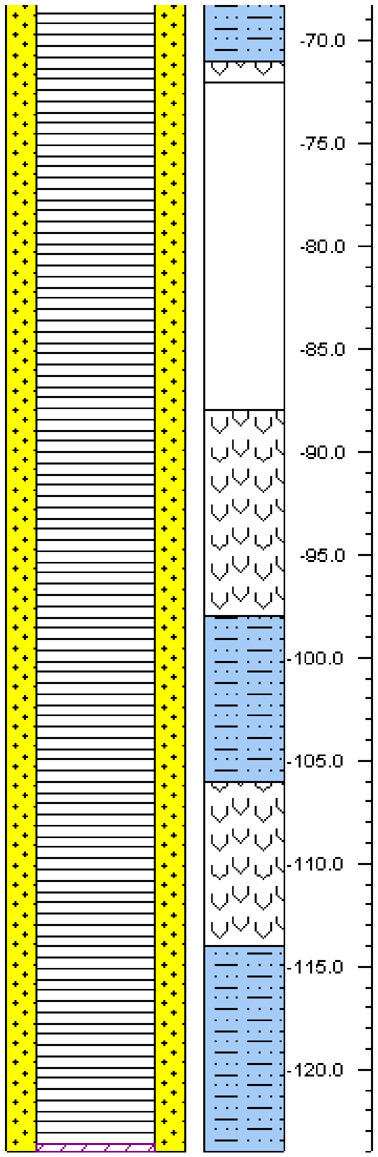
URS Australia Pty Ltd — Phone 08 92211630
20 Terrace Rd, East Perth, 6004 — Fax 08 92211639

PROJECT NAME:	**Dewatering Feasibility Investigation**	DRILLING CO:	**Gorey & Cole Drillers**
PROJECT NUMBER:	**53850-002**	DRILL METHOD:	**Air Hammer**
CLIENT:	**Tanami Gold NL**		
LOCATION:	**Coyote Deposit, W.A**		

TOTAL DRILLED DEPTH:	**124m**	OPEN INTERVAL:	**15.6 -123.6m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**123.6m**	STATIC WATER LEVEL (mbgs):	**12.5m**	COORDINATES:	**481886E**
CASING DIAMETER:	**155mm**	DATE OF MEASUREMENT:	**5/6/04**		**7799567N**
SCREEN DIAMETER:	**155mm**	PUMPING TEST:	**Multi- & Const- Rate Tests**	DATUM:	**AMG 84**
		FINAL SALINITY:	**6,700**		

START DATE: **21/5/04** FINISH DATE: **23/5/04** LOGGED BY: **V. Wilson**

BORE CONSTRUCTION | LITHOLOGY | DEPTH (m) | DESCRIPTION | FORMATION | AIRLIFT YIELD (kL/sec) | pH | TDS (mg/L)



DESCRIPTION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)
70-71m: Dark brown siltstone with minor milky small to medium pieces of milky and grey quartz.	2.8		
QUARTZ: Very large to small iron stained grey quartz with minor brown siltstone chips.			
SILTSTONE: Grey, white and brown siltstone with <50% large to small angular iron stained grey quartz.	2.8		
	3.3		
	3.3		
QUARTZ: Very large to small angular iron stained grey quartz with friable brown, grey, white and orange weathered siltstone.	3.6		
SILTSTONE: Dark brown and grey friable siltstone <50% very large to small angular grey quartz.	4.0		
	4.0		
QUARTZ: Large to small angular grey quartz with friable grey, brown, orange weathered siltstone.	6.0	8.1	7,200
SILTSTONE: Friable grey, orange, brown and red siltstones with <50% very large to small angular grey quartz; EOH @ 124.	7		
	7		

DRAWN BY: BWJ DATE: 27/7/04
CHECKED BY: VW DATE: 27/7/04

BORE COMPLETION REPORT

BOREHOLE: **LMB1**

URS Australia Pty Ltd
20 Terrace Rd, East Perth, 6004
Phone 08 92211630
Fax 08 92211639

DRILLING CO:	**GOREY & COLE DRILLERS**	PROJECT NAME:	**DEWATERING FEASIBILITY INVESTIGATION**
DRILL METHOD:	**AIR HAMMER**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**TANAMI GOLD NL**
		LOCATION:	**LARRANGANNI, W.A**

TOTAL DRILLED DEPTH:	**118m**	OPEN INTERVAL:	**0 - 51.1m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**118m**	STATIC WATER LEVEL (mbgs):	**21.11**	COORDINATES:	**485510E**
CASING DIAMETER:	**50mm**	DATE OF MEASUREMENT:	**2/6/04**		**7834115N**
SCREEN DIAMETER:	**50mm**	PUMPING TEST: -		DATUM:	**AMG 84**
		FINAL SALINITY:	-		

START DATE: **31/5/04** FINISH DATE: **2/6/04** LOGGED BY: **V. WILSON**

BORE CONSTRUCTION	LITHOLOGY	DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)

+0.32 to 6.18m of 155mm steel casing

Cement seal from 0 - 6.18m.

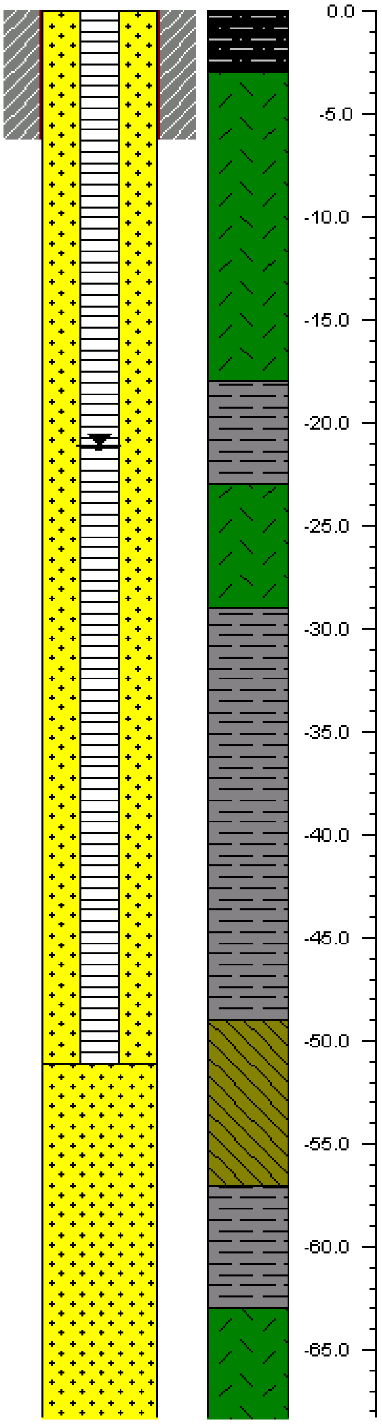
204mm hole diameter from 0 - 6.18m.

152mm hole diameter from 6.18m - 118m.

class 18 uPVC 50mm screen from +0.46 to 51.1m.

0 to 118m graded gravel

End Cap



SILT: Red-brown, orange-brown gravelly silt.

DOLERITE: Weathered, foliated orange-brown to green;

5-6m: Weathered, foliated with 50% angular weathered milky quartz;
6-7m: Weathered, foliated red, yellow, brown;
7-12m: weathered, folited dark brown, red, yellow with minor clay and angular milky quartz;
12-15m: Weathered, foliated, red, brown, orange with 10% weathered, small chips of angular quartz;
15-18m: Weathered, foliated, red, orange to dark brown with 10% weathered, small chips of angular quartz.

SHALE: Micaceous, orange-brown weathered with a minor white clay and minor quartz;

21-23m: Orange-brown weathered.

DOLERITE: Weathered, green in brown and grey clays.

SHALE: Weathered, micaceous brown shales with abundant orange chert with minor milky, angular, weathered quartz;
33-36m: Micaceous, weathered, brown shales, minor milky quartz;
36-38m: Micaceous, weathered brown shales, minor brown gravel in green clay;
38-40m: Weathered brown shale in brown clay;
40-47m: Micaceous, weathered, grey;
47-49m: Weathered brown shale, sulphidic, minor quartz.

CLAY: Grey, silty clay;

54-57m: Brown, silty clay.

SHALE: Weathered, green and brown, micaceous;

61-63m: Weathered, brown and green, minor rounded gravel.

DOLERITE: Angular, fractured, green dolerite with minor brown weathered shales, siltstones.

DRAWN BY: BWJ DATE: 27/7/04

CHECKED BY: V. WILSON DATE: 27/7/04

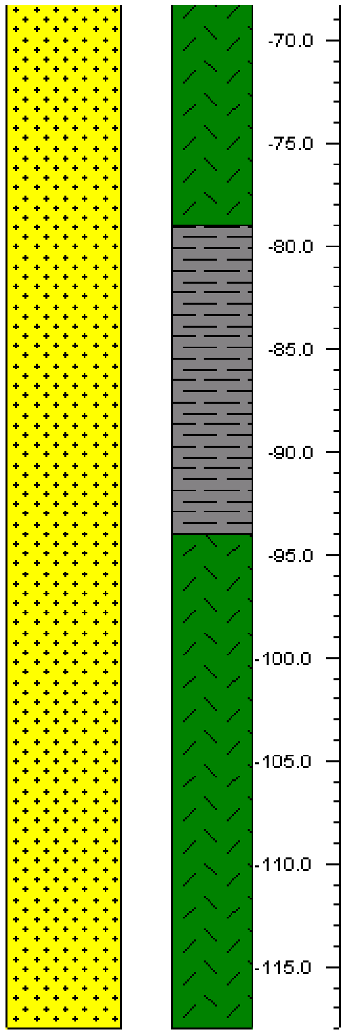
URS	**BORE COMPLETION REPORT**	BOREHOLE: **LMB1**

URS Australia Pty Ltd — Phone 08 92211630
20 Terrace Rd, East Perth, 6004 — Fax 08 92211639

DRILLING CO:	**GOREY & COLE DRILLERS**	PROJECT NAME:	**DEWATERING FEASIBILITY INVESTIGATION**
DRILL METHOD:	**AIR HAMMER**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**TANAMI GOLD NL**
		LOCATION:	**LARRANGANNI, W.A**

TOTAL DRILLED DEPTH:	**118m**	OPEN INTERVAL:	**0 - 51.1m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**118m**	STATIC WATER LEVEL (mbgs):	**21.11**	COORDINATES:	**485510E**
CASING DIAMETER:	**50mm**	DATE OF MEASUREMENT:	**2/6/04**		**7834115N**
SCREEN DIAMETER:	**50mm**	PUMPING TEST:	-	DATUM:	**AMG 84**
		FINAL SALINITY:	-		

START DATE: **31/5/04** FINISH DATE: **2/6/04** LOGGED BY: **V. WILSON**



BORE CONSTRUCTION / LITHOLOGY / DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)
-80.0 to -95.0	SHALE: Weathered sulphidic black shale with dolerite, fractured, minor chert; 84-89m : Weathered fractured angular pieces, with similar siltstone; 89-94m : Micaceous grey, red, brown weathered shale with siltstone;	SAPROLITE			
-90.0 to -96.0		SAPROLITE	1.0		
-95.0 to -118.0	DOLERITE: weathered, green; 96-118m : Weathered, green with multicoloured weathered shale; EOH @ 118m .	SAPROLITE	1.0		
			1.5		
			2.2	7.9	20,000
			2.0		

DRAWN BY:	BWJ	DATE:	27/7/04
CHECKED BY:	V. WILSON	DATE:	27/7/04

BORE COMPLETION REPORT

BOREHOLE: LPB01

URS Australia Pty Ltd
20 Terrace Rd, East Perth, 6004
Phone 08 92211630
Fax 08 92211639

DRILLING CO:	**Gorey & Cole Drillers**	PROJECT NAME:	**Dewatering Feasibility Investigation**
DRILL METHOD:	**Air Hammer**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**Tanami Gold NL**
		LOCATION:	**Larranganni, W.A**

TOTAL DRILLED DEPTH:	**123m**	OPEN INTERVAL:	**14.3 - 122.3m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**122.3m**	STATIC WATER LEVEL (mbgs):	**21.46m**	COORDINATES:	**485514E**
CASING DIAMETER:	**155mm**	DATE OF MEASUREMENT:	**2/6/04**		**7834140N**
SCREEN DIAMETER:	**155mm**	PUMPING TEST:	**Multi- & Const- Rate Test**	DATUM:	**AMG 84**
		FINAL SALINITY:	**20,000 mg/L**		

START DATE: **31/5/04** FINISH DATE: **2/6/04** LOGGED BY: **V. Wilson**

BORE CONSTRUCTION	LITHOLOGY	DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)

254mm steel casing from +0.43 to 5.85m

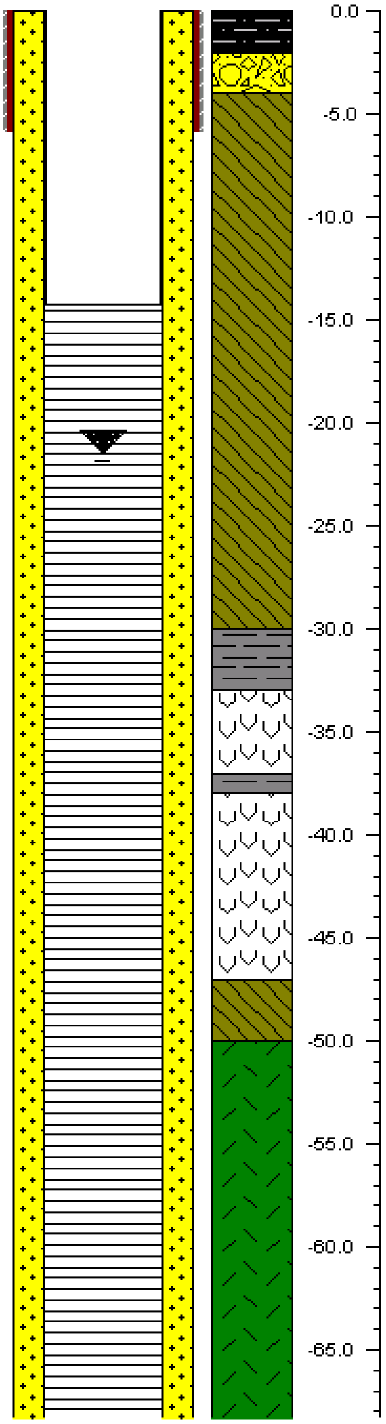
311mm Diameter Hole from 0 - 5.85m

Class 9 uPVC 155mm casing from +0.48 to 14.3m

254mm Diameter Hole from 5.57 to 123m

Graded Gravel from 0 to 123m:

Class 12 uPVC 155mm Slotted Casing from 15.6 - 122.3m



SILT: Red and brown gravelly, clayey silt with iron cement on gravel

GRAVEL: Rounded gravel in iron cement, with reworked orange-brown and yellow-brown cemented siltstone.

CLAY: Small black gravel in yellow-brown and grey silty clay

7-14m: Very weathered, fractured dolerite in green, grey and light brown clay;
14-30m: Green-brown puggy clay.

SHALE: Sub rounded brown friable clay.

QUARTZ: Angular white quartz, yellow-brown chert and large angular shale.

SHALE: Friable weathered green-brown shale.

QUARTZ: Very fractured ground with, large angular, weathered, iron-stained milky quartz and very weathered dark brown, brown and grey shale. Frequent brown-yellow chert.

CLAY: Green-brown clay with minor milky quartz and weathered brown shale.

DOLERITE: Hard and friable fractured weathered dolerite;

57-60m: Weathered, fractured green dolerite with minor milky quartz and brown chert;
60-86m: Weathered, friable green dolerite with some shales and minor milky quartz;
86-87m: Friable green and red-brown dolerite;
87-88m: Friable green dolerite with brown-green clay and milky quartz.

FORMATION: TRANS. ; SAPROLITE

AIRLIFT YIELD (kL/sec): 0.7 ; 0.7

DRAWN BY: BWJ DATE: 27/7/04

CHECKED BY: VW DATE: 27/7/04

URS

BORE COMPLETION REPORT

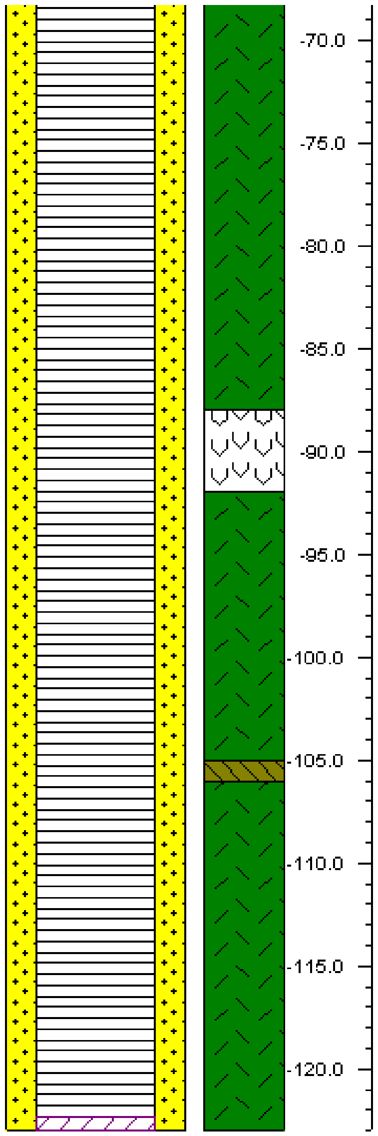
BOREHOLE: **LPB01**

URS Australia Pty Ltd — Phone 08 92211630
20 Terrace Rd, East Perth, 6004 — Fax 08 92211639

DRILLING CO:	**Gorey & Cole Drillers**	PROJECT NAME:	**Dewatering Feasibility Investigation**
DRILL METHOD:	**Air Hammer**	PROJECT NUMBER:	**53850-002**
		CLIENT:	**Tanami Gold NL**
		LOCATION:	**Larranganni, W.A**

TOTAL DRILLED DEPTH:	**123m**	OPEN INTERVAL:	**14.3 - 122.3m**	R.L OF COLLAR:	-
TOTAL CASED DEPTH:	**122.3m**	STATIC WATER LEVEL (mbgs):	**21.46m**	COORDINATES:	**485514E**
CASING DIAMETER:	**155mm**	DATE OF MEASUREMENT:	**2/6/04**		**7834140N**
SCREEN DIAMETER:	**155mm**	PUMPING TEST:	**Multi- & Const- Rate Test**	DATUM:	**AMG 84**
		FINAL SALINITY:	**20,000 mg/L**		

START DATE: **31/5/04** FINISH DATE: **2/6/04** LOGGED BY: **V. Wilson**



End Cap

DEPTH (m)	DESCRIPTION	FORMATION	AIRLIFT YIELD (kL/sec)	pH	TDS (mg/L)
~85–87			1.3		
~87–91	QUARTZ: Large fractured quartz in green-yellow clay and highly weathered green-brown dolerite and brown shale.		1.8		
~91–104	DOLERITE: Weathered green to brown dolerite, green-brown clay and minor quartz; 101-105m: Weathered red sulphidic dolerite.		1.8		
~104–106	CLAY: Green-brown clay and very weathered red dolerite.		2.2		
~106–123	DOLERITE: Green sulphidic weathered dolerite; 110-113m: Green and red weathered dolerite; 113-123m: Green and red weathered dolerite with brown-green clay; EOH @ 123m.		2.8	7.7	20,000

DRAWN BY: BWJ DATE: 27/7/04
CHECKED BY: VW DATE: 27/7/04

Appendix B
Groundwater Chemical Analyses

SGS

LABORATORY REPORT COVERSHEET

DATE:	22 July 2004
TO:	URS Corporation Level 3, The Hyatt Centre 20 Terrace Road EAST PERTH WA 6004
ATTENTION:	Mr Vern Wilson
YOUR REFERENCE:	53850-002
OUR REFERENCE:	82122
SAMPLES RECEIVED:	02/07/04
SAMPLES/QUANTITY:	9 Waters

The above samples were received intact and analysed according to your written instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

NATA Accredited Laboratory
Number: 2562 (1705)

NATA ENDORSED TEST REPORT
This document shall not be reproduced, except in full.

JANICE VENNING
Manager, Perth

LIEN TANG
Manager Reporting Systems

This report supersedes our preliminary results that were reported by facsimile.
This report must not be reproduced except in full.

REG No. 16-2004-1037
DATE 26/7/04

NAME	INFO	ACTION	Complete (Sign)	DATE
VW				

FILE No

SGS Australia Pty Ltd ABN 44 000 964 278 | Environmental Services t +61 (0)8 9458 7278 | 52 Murray Road f +61 (0)8 9451 3505 | Welshpool 6106 Western Australia | www.au.sgs.com
Member of the SGS Group

SGS

CLIENT: URS Corporation **OUR REFERENCE:** 82122

PROJECT: 53850-002

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	LPB1-30 minutes 82122-1 Water	CYPB1 - 60 minutes 82122-2 Water	Kookaburra Bore - 40mins 82122-5 Water
pH	pH Units	7.0	7.6	7.3
Electrical Conductivity @ 25 oC	μS/cm	40000	9900	35000
Total Dissolved Solids (calc as NaCl)	mg/L	26000	6200	22000

Your Reference Our Reference Type of Sample	Units	Kookaburra Bore - 1200 mins 82122-3 Water	LMB1 82122-4 Water	CYPB1 - 1400mins 82122-6 Water	CYMB1 82122-7 Water	CYMB2 82122-8 Water
pH	pH Units	7.3	7.4	7.6	7.8	8.0
Electrical Conductivity @ 25 oC	μS/cm	36000	41000	9300	13000	11000
Total Dissolved Solids (calc as NaCl)	mg/L	23000	26000	5900	7700	6500
Total Dissolved Solids (grav) @ 180°C	mg/L	23000	27000	6700	10000	8500
Total Alkalinity as $CaCO_3$	mg/L	250	180	440	480	460
Iron, Fe (soluble)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Aluminium, Al	mg/L	<0.1	0.2	<0.1	0.2	0.1
Sodium, Na	mg/L	5600	6000	1700	2700	2300
Potassium, K	mg/L	140	140	140	180	160
Calcium, Ca	mg/L	940	1100	110	160	140
Magnesium, Mg	mg/L	1200	1600	250	370	330
Chloride, Cl	mg/L	13000	12000	2400	3800	3100
Hydroxide, OH	mg/L	<1	<1	<1	<1	<1
Carbonate, CO_3	mg/L	<1	<1	<1	<1	<1
Bicarbonate, HCO_3	mg/L	300	210	540	590	560
Hardness (equivalent $CaCO_3$)	mg/L	7300	9300	1300	2300	1700

SGS

CLIENT: URS Corporation **OUR REFERENCE:** 82122
PROJECT: 53850-002

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	Kookaburra Bore - 1200 mins 82122-3 Water	LMB1 82122-4 Water	CYPB1 - 1400mins 82122-6 Water	CYMB1 82122-7 Water	CYMB2 82122-8 Water
Sulphate, SO_4	mg/L	3200	4900	1600	2400	2100
Nitrate, NO_3	mg/L	8.7	5.8	9.9	8.5	9.3
Nitrite, NO_2	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese, Mn	mg/L	<0.05	0.20	0.15	0.30	<0.05
Silica, SiO_2	mg/L	28	21	17	17	17
Sum of Ions (calc.)	mg/L	24389	25956	6843	10183	8684
Cation/Anion balance	%	-5.48	0.79	-2.42	-1.60	-0.76

Your Reference Our Reference Type of Sample	Units	LPB1 - 1420 mins 82122-9 Water
pH	pH Units	7.3
Electrical Conductivity @ 25 oC	µS/cm	41000
Total Dissolved Solids (calc as NaCl)	mg/L	26000
Total Dissolved Solids (grav) @ 180°C	mg/L	27000
Total Alkalinity as $CaCO_3$	mg/L	250
Iron, Fe (soluble)	mg/L	<0.05
Aluminium, Al	mg/L	0.2
Sodium, Na	mg/L	5700
Potassium, K	mg/L	140
Calcium, Ca	mg/L	1000
Magnesium, Mg	mg/L	1700
Chloride, Cl	mg/L	12000
Hydroxide, OH	mg/L	<1
Carbonate, CO_3	mg/L	<1
Bicarbonate, HCO_3	mg/L	310
Hardness (equivalent $CaCO_3$)	mg/L	9500

CLIENT: URS Corporation **OUR REFERENCE:** 82122
PROJECT: 53850-002

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	LPB1 - 1420mins 82122-9 Water
Sulphate, SO_4	mg/L	4900
Nitrate, NO_3	mg/L	4.7
Nitrite, NO_2	mg/L	<0.2
Manganese, Mn	mg/L	<0.05
Silica, SiO_2	mg/L	30
Sum of Ions (calc.)	mg/L	25755
Cation/Anion balance	%	-0.49

TEST PARAMETERS	UNITS	LOR	METHOD
--------			
pH	pH Units	0.1	PEI-001
Electrical Conductivity @ 25°C	µS/cm	1	PEI-032
Total Dissolved Solids (calc as NaCl)	mg/L	5	PEI-032
Standard 2			
pH	pH Units	0.1	PEI-001
Electrical Conductivity @ 25°C	µS/cm	1	PEI-032
Total Dissolved Solids (calc as NaCl)	mg/L	5	PEI-032
Total Dissolved Solids (grav) @ 180°C	mg/L	10	PEI-002
Total Alkalinity as $CaCO_3$	mg/L	5	PEI-006
Iron, Fe (soluble)	mg/L	0.05	PEM-001
Aluminium, Al	mg/L	0.1	PEM-002
Sodium, Na	mg/L	0.5	PEM-001
Potassium, K	mg/L	0.5	PEM-001
Calcium, Ca	mg/L	0.5	PEM-002
Magnesium, Mg	mg/L	0.5	PEM-002
Chloride, Cl	mg/L	1	PEI-020
Hydroxide, OH	mg/L	1	PEI-006
Carbonate, CO_3	mg/L	1	PEI-006
Bicarbonate, HCO_3	mg/L	5	PEI-006

CLIENT: URS Corporation

PROJECT: 53850-002

OUR REFERENCE: 82122

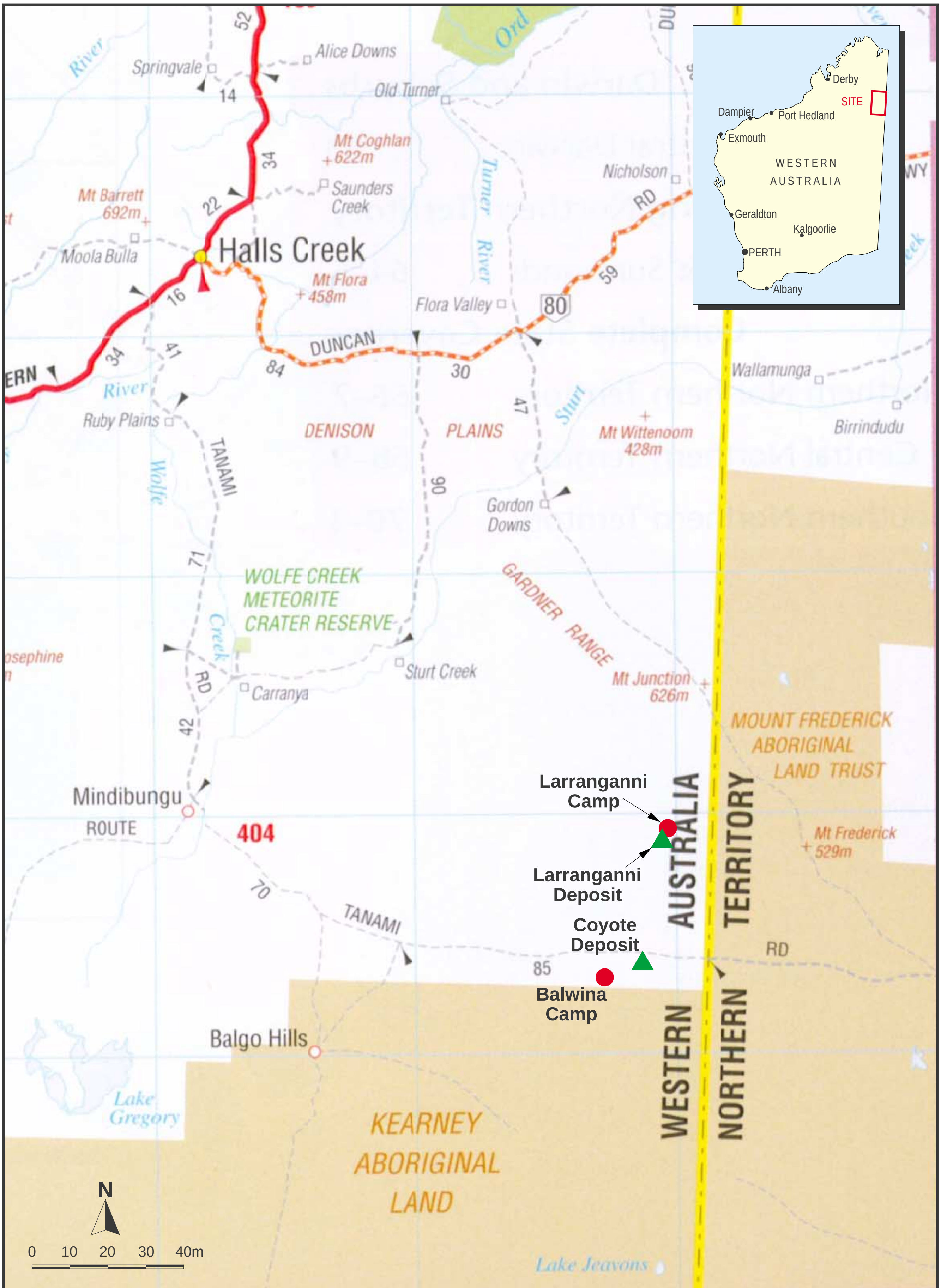
LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Hardness (equivalent $CaCO_3$)	mg/L	5	PEI-043
Sulphate, SO_4	mg/L	1	PEI-020
Nitrate, NO_3	mg/L	0.2	PEI-020
Nitrite, NO_2	mg/L	0.2	PEI-020
Manganese, Mn	mg/L	0.05	PEM-001
Silica, SiO_2	mg/L	2	PEM-002
Sum of Ions (calc.)	mg/L		Calc.
Cation/Anion balance	%		Calc.

NOTES:
LOR - Limit of Reporting.

FIGURES

Mon 09 Aug 04



Job No.	53850-002-562		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **LOCALITY PLAN**	**Figure 1** URS
Prep. By	VCW	6 Aug 04		
Chk'd By	VCW	6 Aug 04		
Revision No.		0		

URS AUSTRALIA PTY LTD Perth Office +61 8 9221 1630

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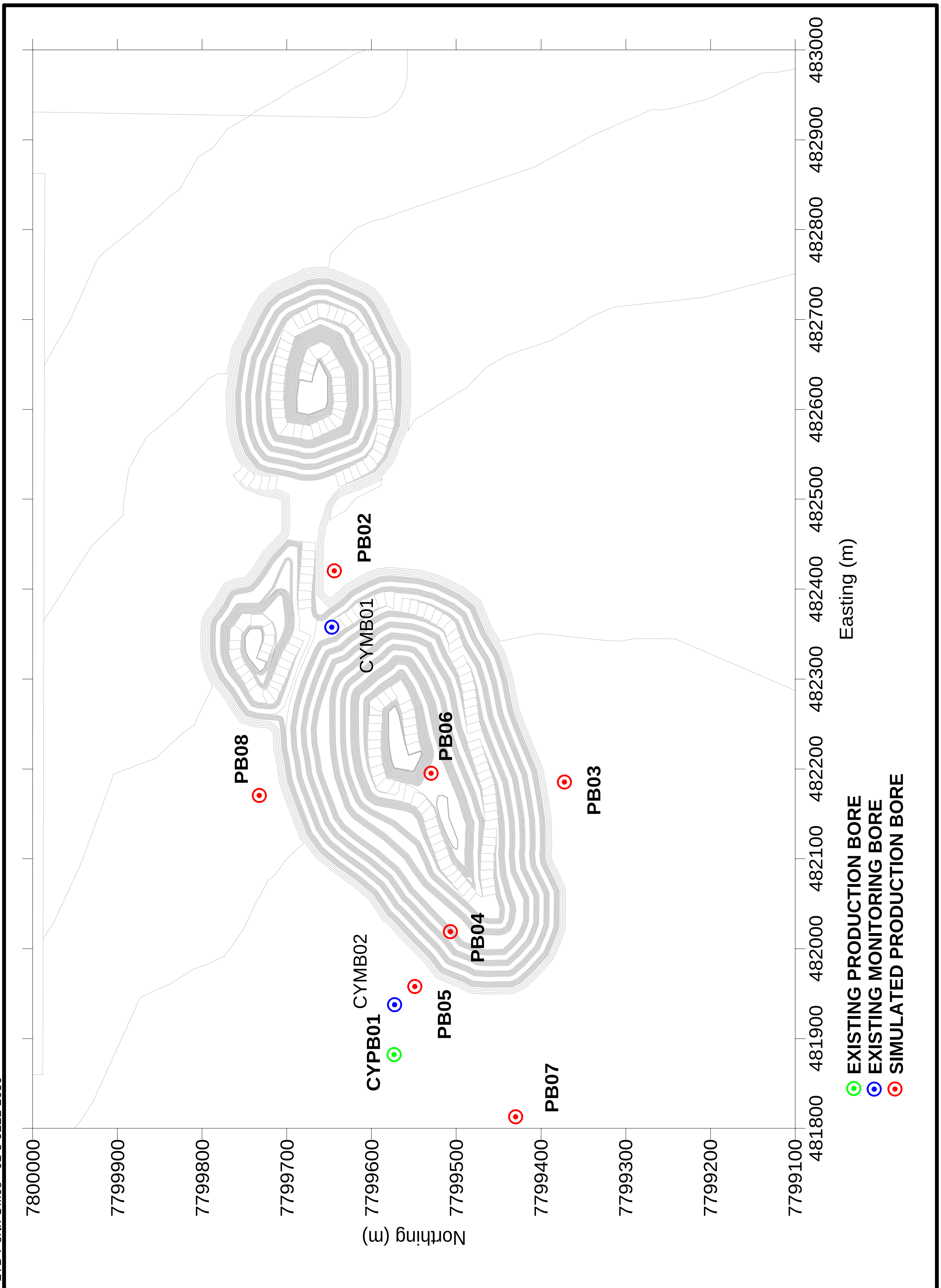

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Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **LOCATION OF BORES AND PIT OUTLINES COYOTE DEPOSIT**	**Figure 2** URS
Prep. By	AS	30/07/04		
Chk'd By	VW	6/08/04		
Revision No.		0		

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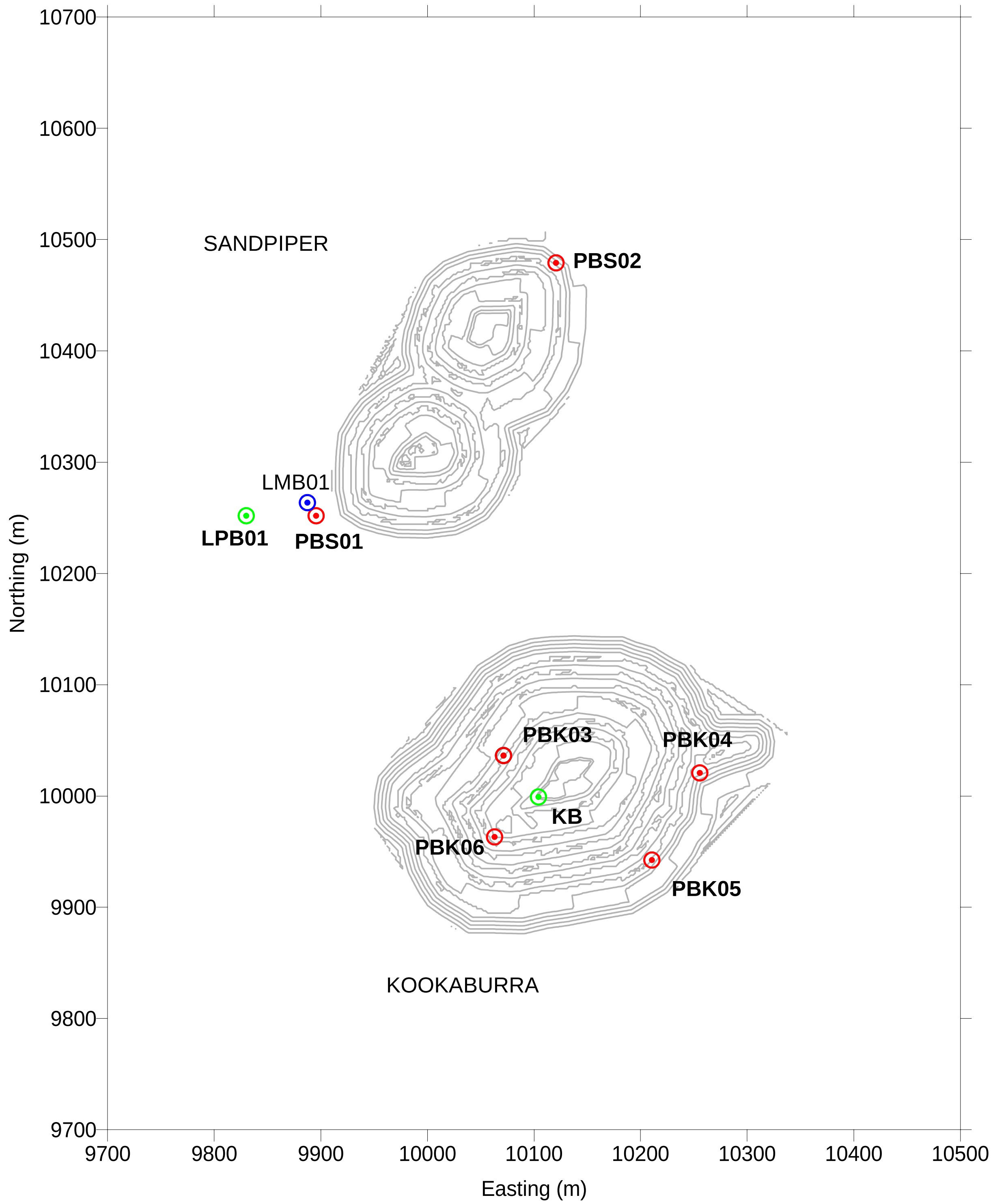

EXISTING PRODUCTION BORE

EXISTING MONITORING BORE

SIMULATED PRODUCTION BORE

Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **LOCATION OF BORES AND PIT OUTLINES LARRANGANNI DEPOSIT**	**Figure 3** URS
Prep. By	AS	30/07/04		
Chk'd By	VW	30/07/04		
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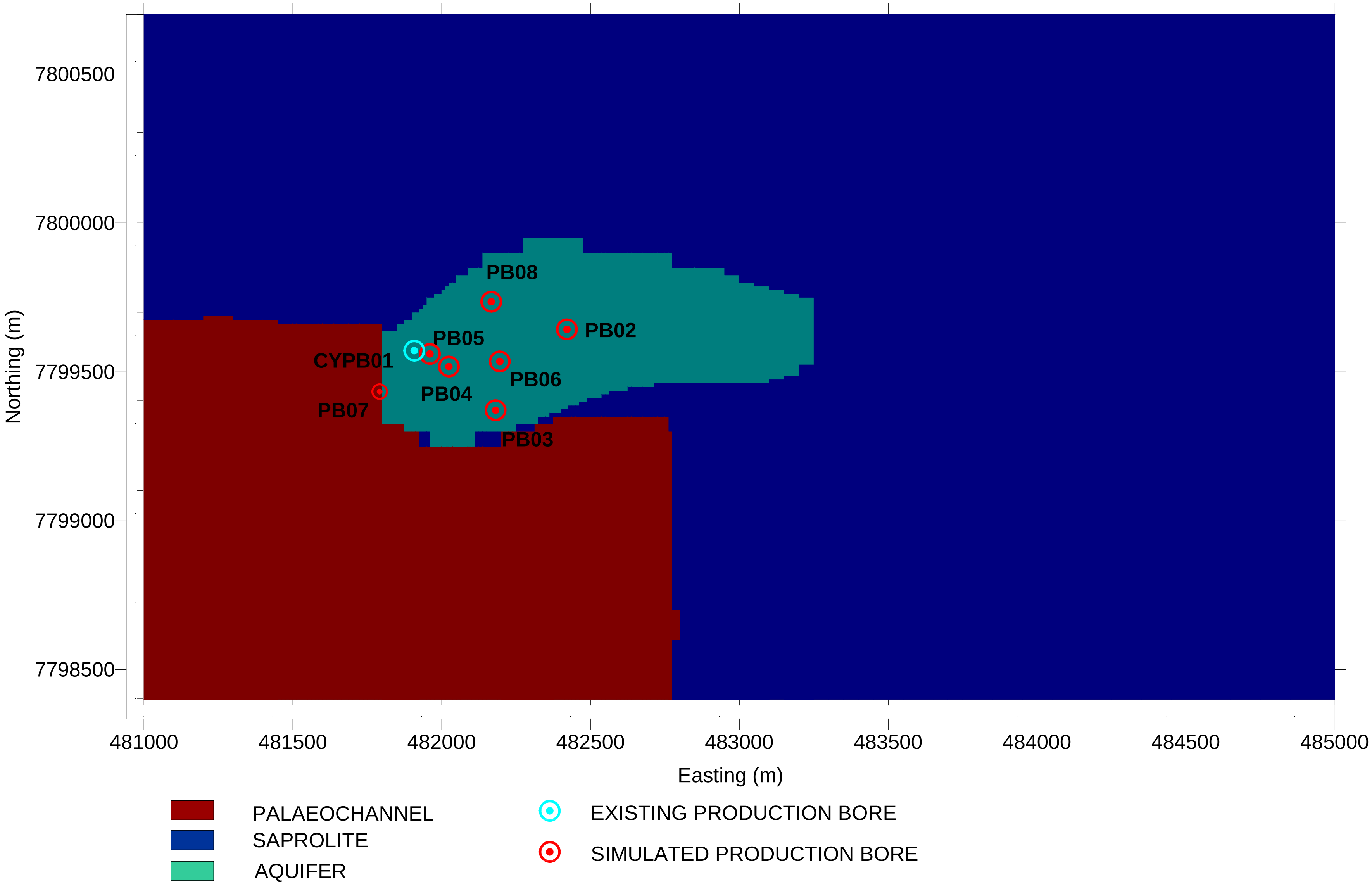


Job No.	53850-002	
Prep. By	AS	01/08/04
Chk'd By	VW	01/08/04
Revision Indicator	0	

TANAMI GOLD NL

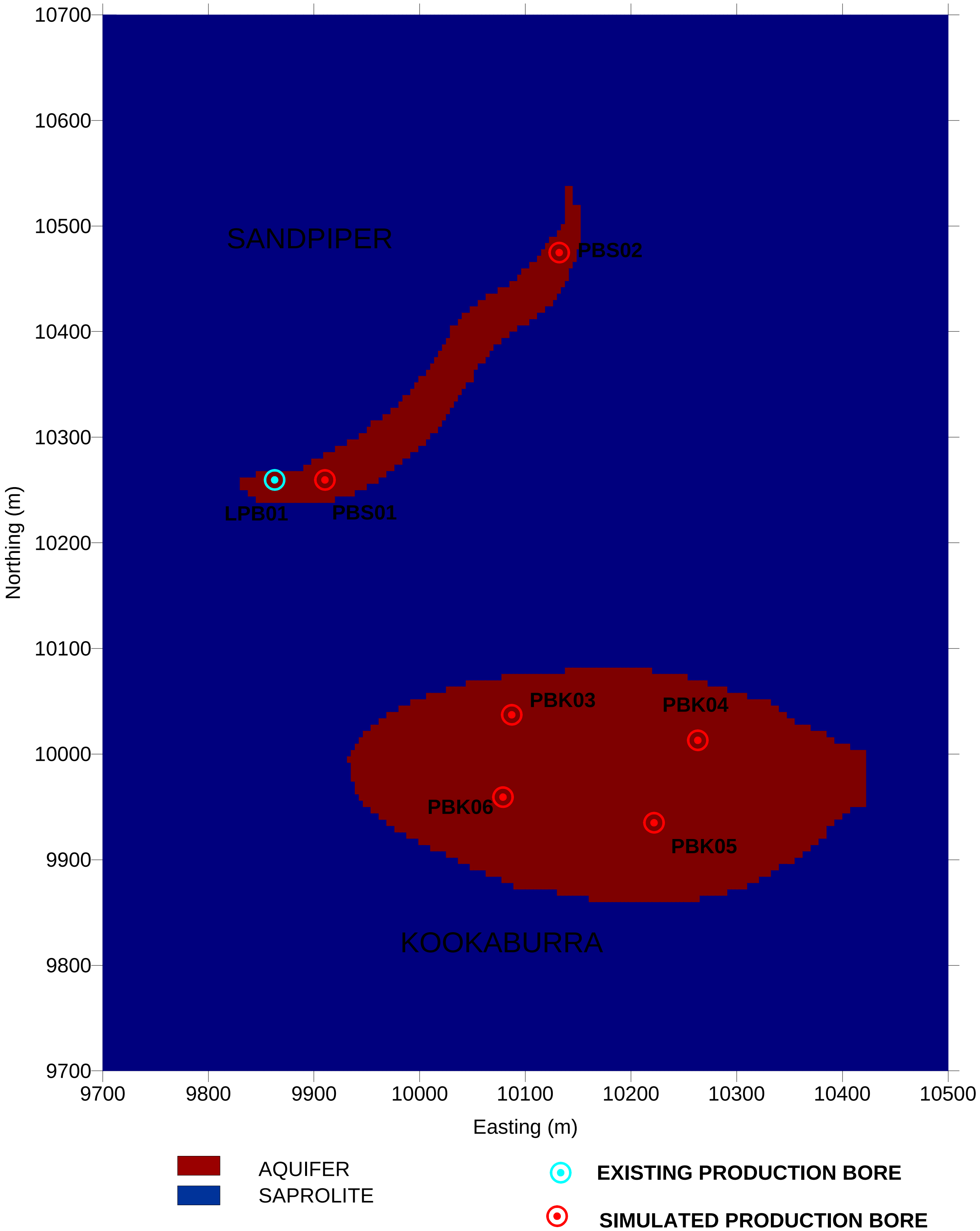
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

INTERPRETED AQUIFER SYSTEM DISTRIBUTION - COYOTE

URS

Figure 4

figurek.srf



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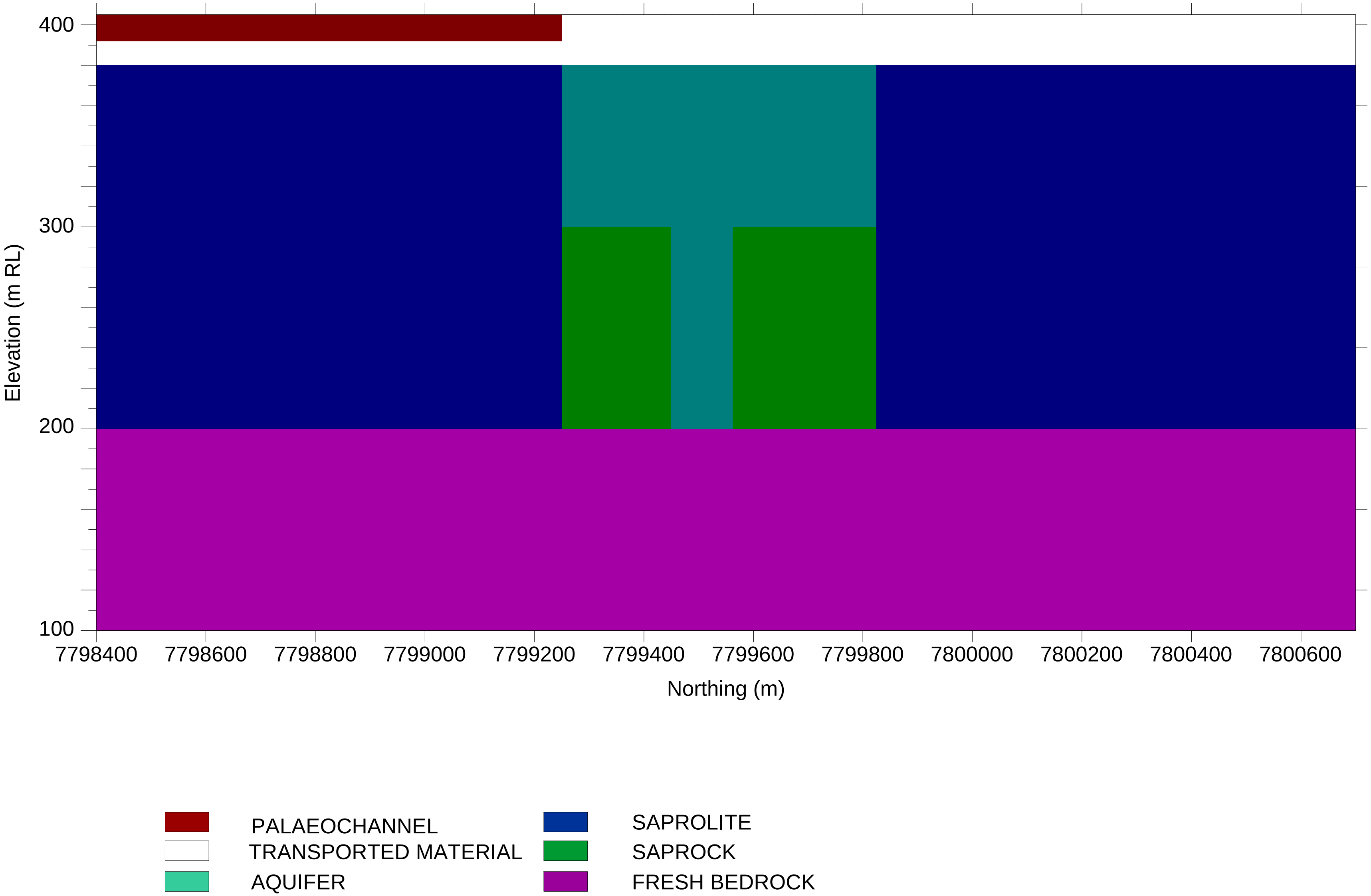
Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **INTERPRETED AQUIFER SYSTEM DISTRIBUTION - LARRANGANNI**	**Figure 5**
Prep. By	AS	30/07/04		URS
Chk'd By	VW	30/07/04		
Revision No.		0		

figure11.srf



Job No.	53850-002
Prep. By	AS 01/08/04
Chk'd By	VW 01/08/04
Revision Indicator	0

TANAMI GOLD NL
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTION OF INTERPRETED AQUIFER SYSTEM TROUGH 482056 mE OF MODEL DOMAIN COYOTE

Figure 6

figurek.srf

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figurek.srf

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TANAMI GOLD NL
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS
CROSS SECTION OF INTERPRETED AQUIFER SYSTEM TROUGH 10109 mE OF MODEL DOMAIN LARRANGANNI

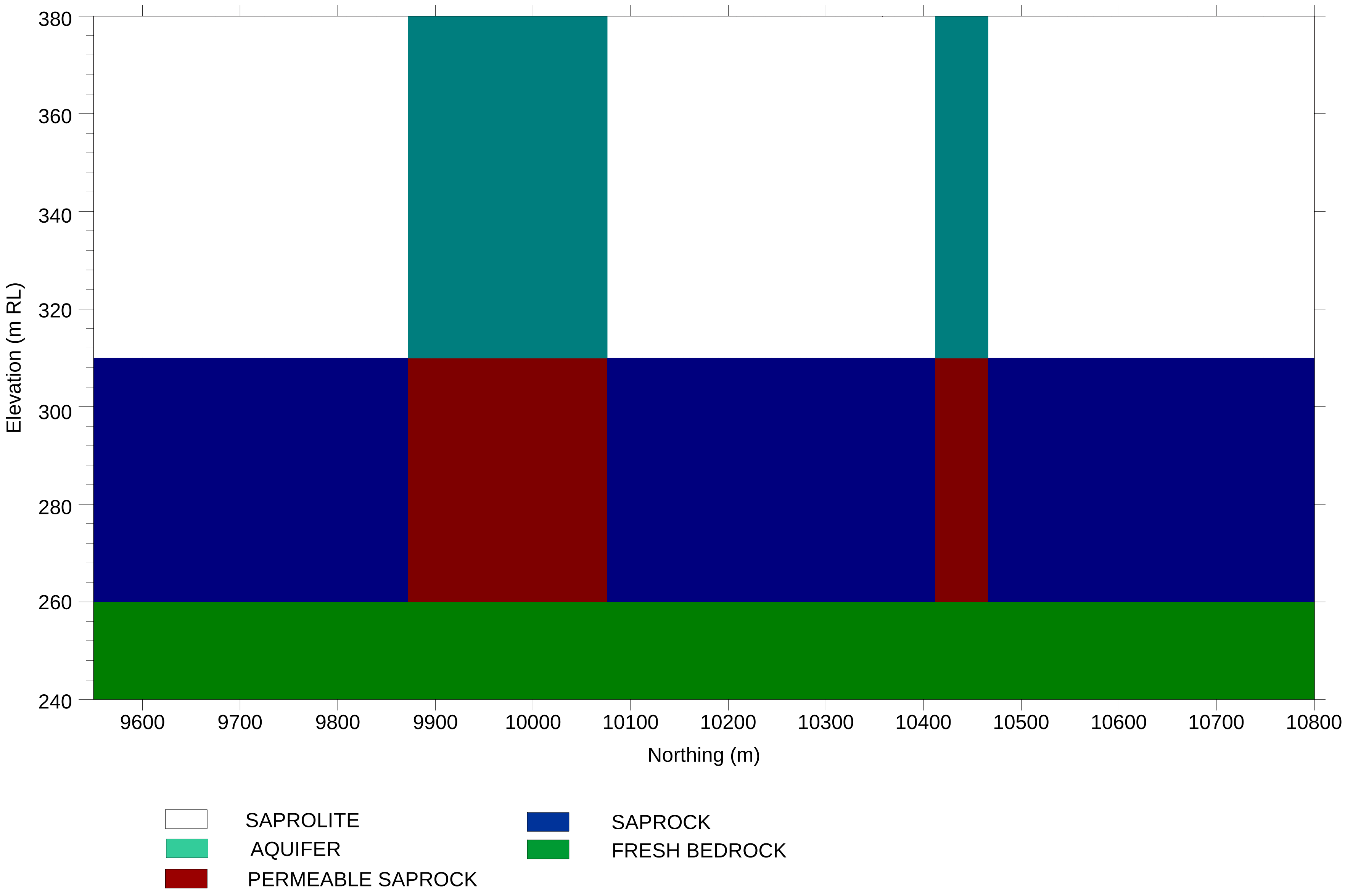
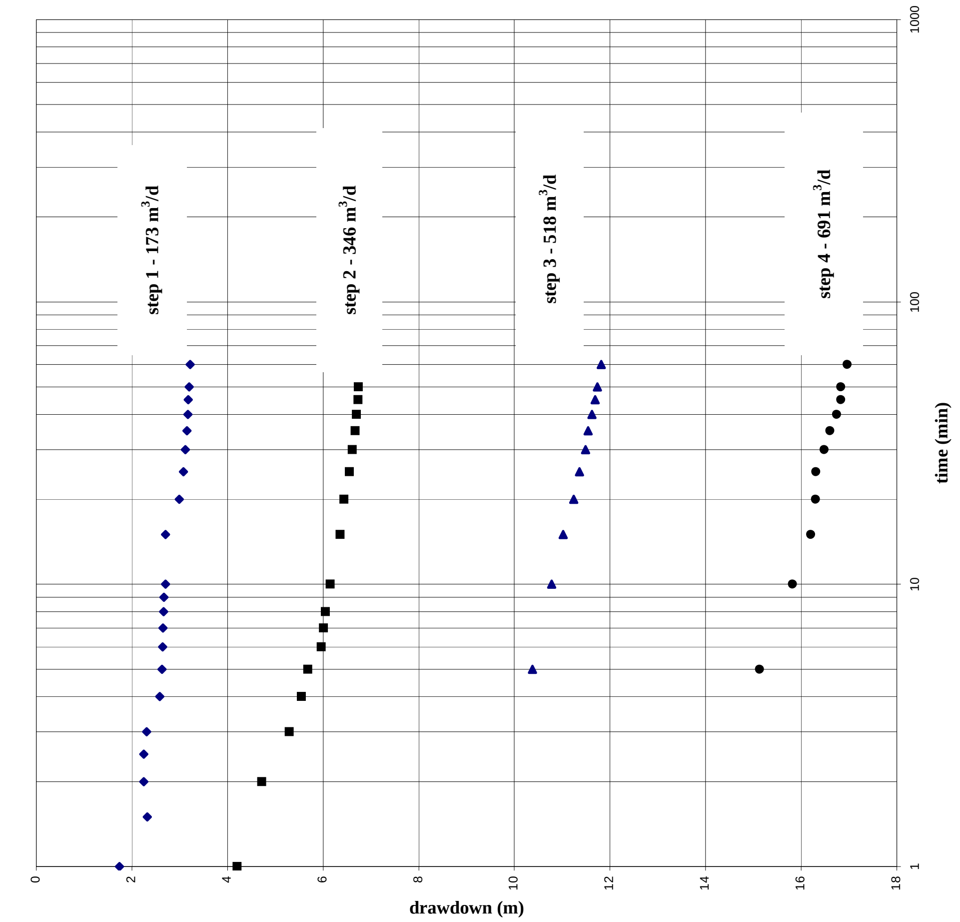
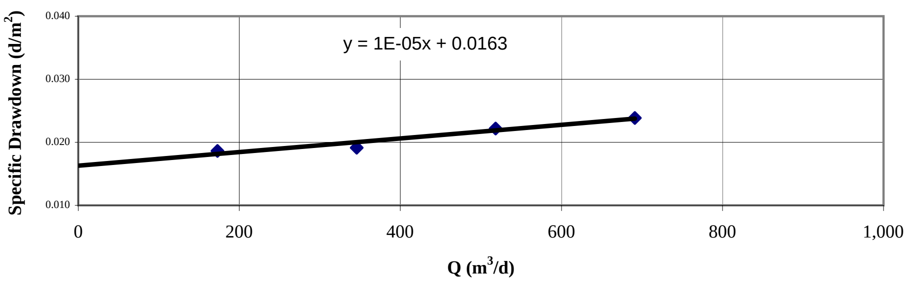


Figure 7

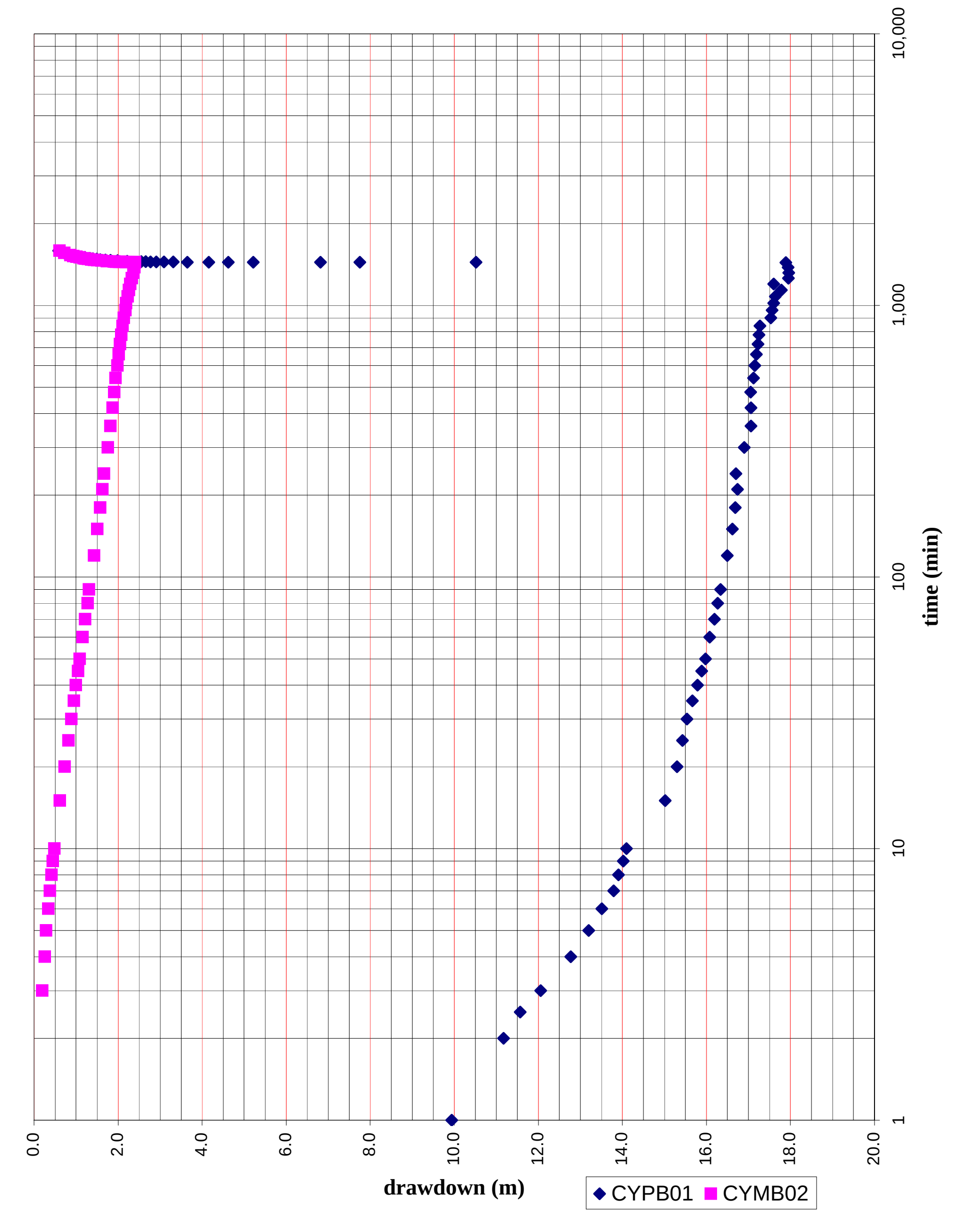
URS



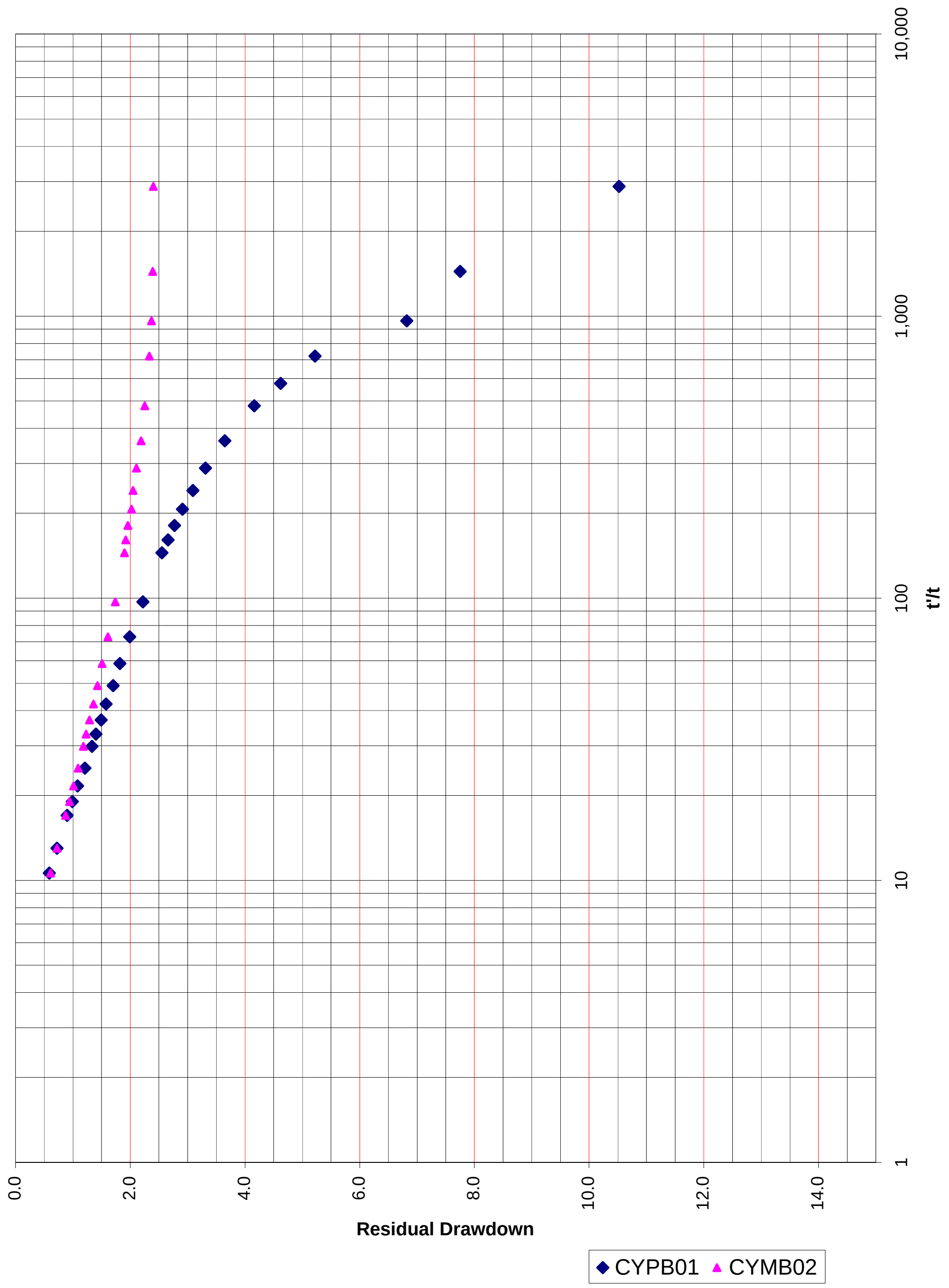
Bierschenk & Wilson Analysis



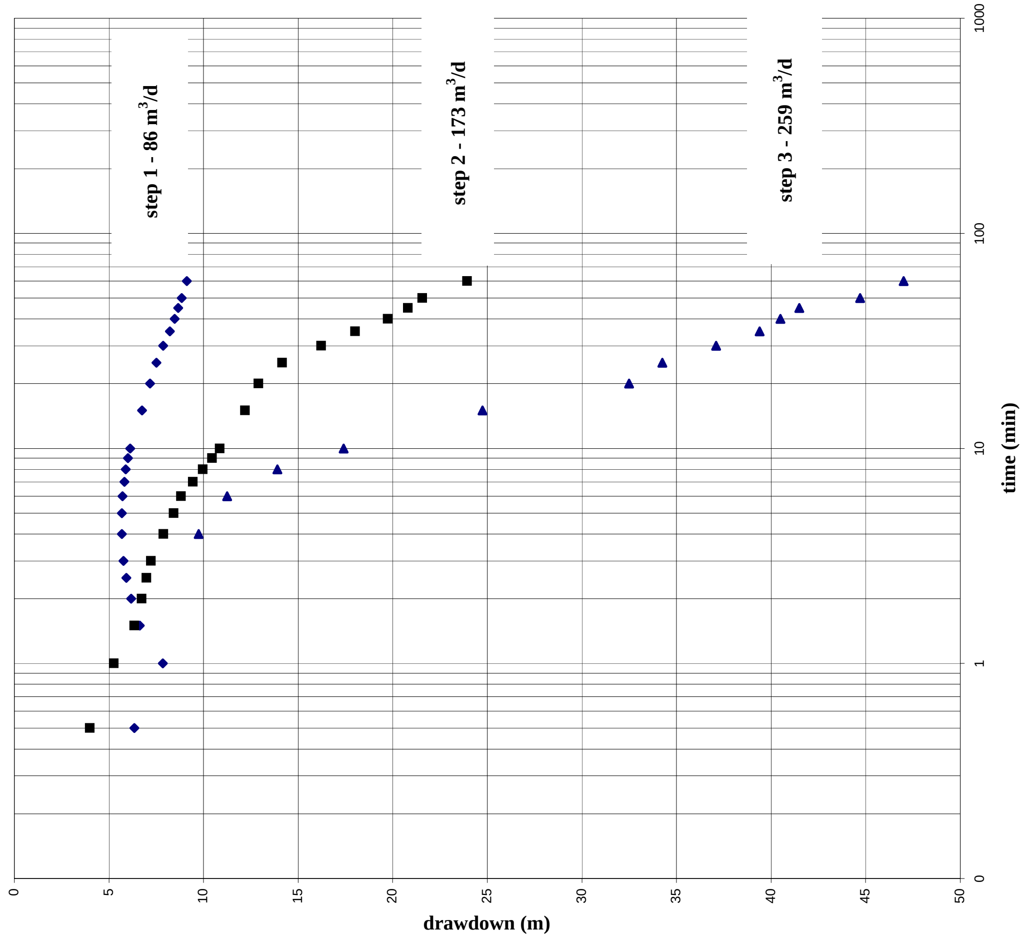
Job No.	53850-002-562		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS **CYPB01 MULTI - RATE TEST** **Drawdown Data and Bierschenk & Wilson Analysis**	**Figure 8**
Prep. by	BWJ	20-Jun-04		URS
Chk'd by	VCW	21-Jun-04		



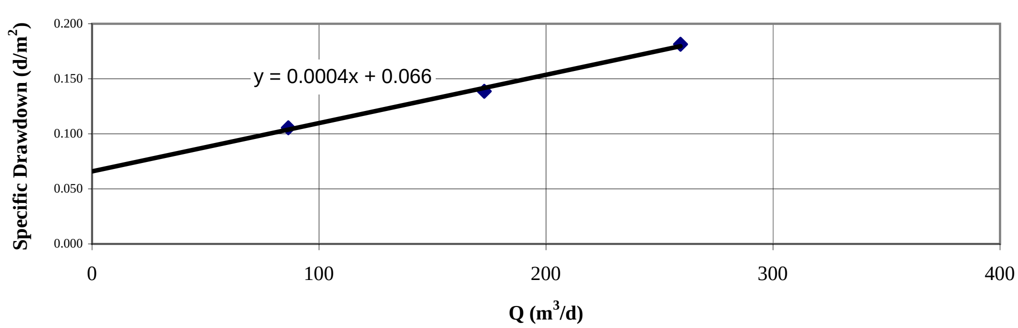
Job No.	53850-002-562		TANAMI GOLD NL	**FIGURE 9**
Prep. by	BWJ	20-Jun-04	DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS	URS
Chk'd by	VCW	21-Jun-04	**CYPB01 CONSTANT - RATE TEST DRAWDOWN**	
			Drawdown and Recovery Response in Dewatering Bore and Observation Bores	



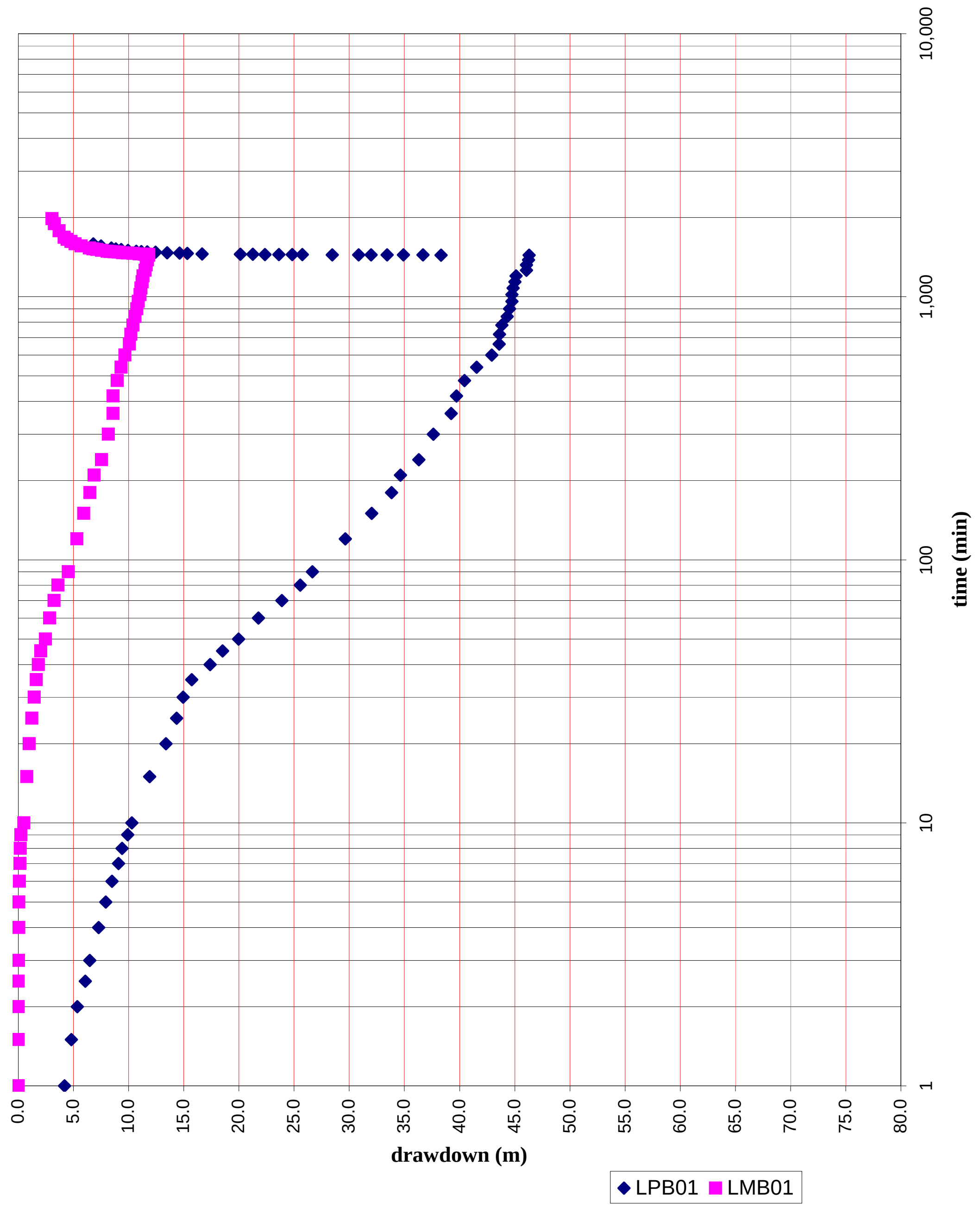
Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS **CYPB01 CONSTANT - RATE TEST RESIDUAL DRAWDOWN** **Drawdown and Recovery Response in Dewatering Bore and Observation Bores**	**Figure 10**
Prep. by	BWJ	21-Jun-04		URS
Chk'd by	VCW	21-Jun-04		



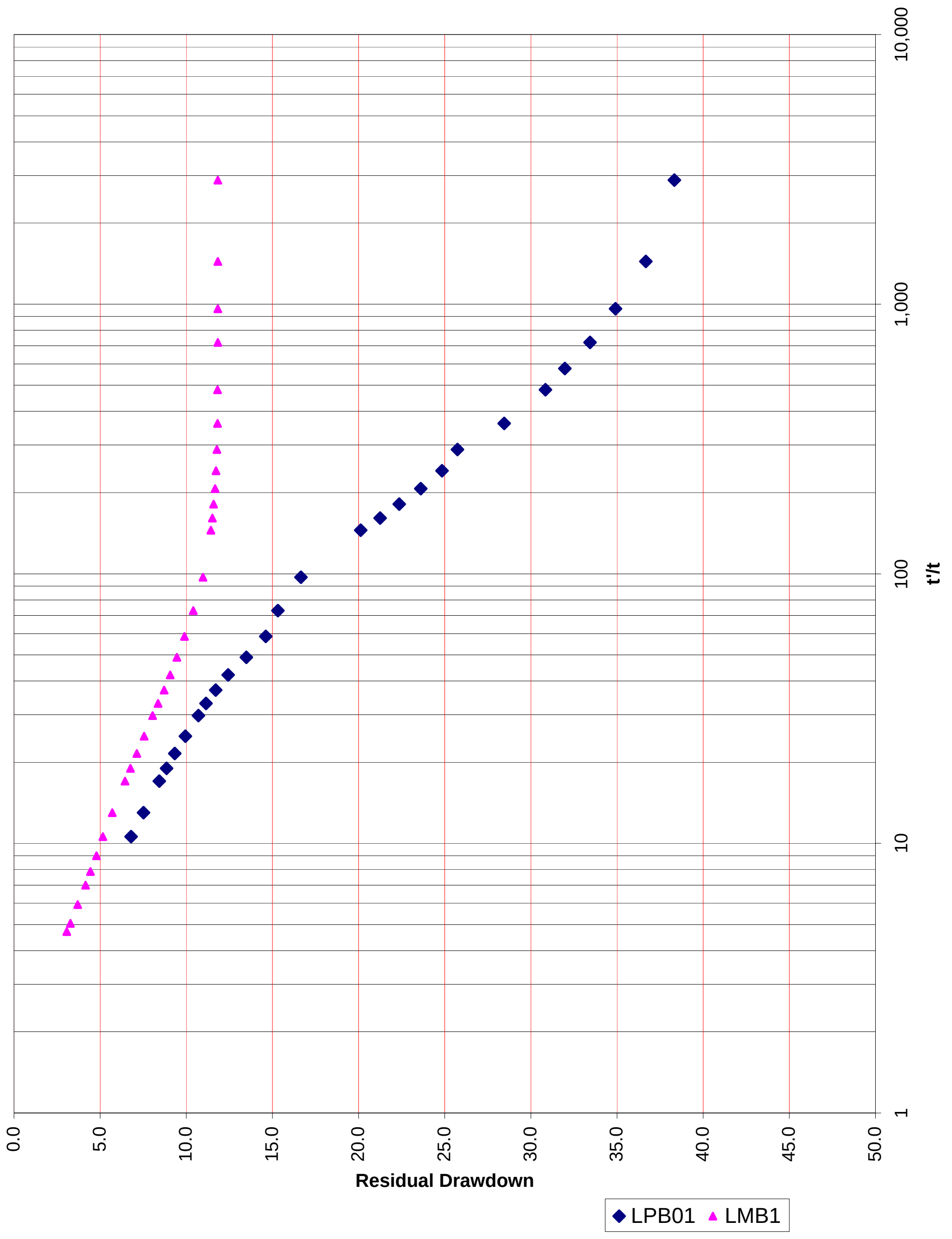
Bierschenk & Wilson Analysis



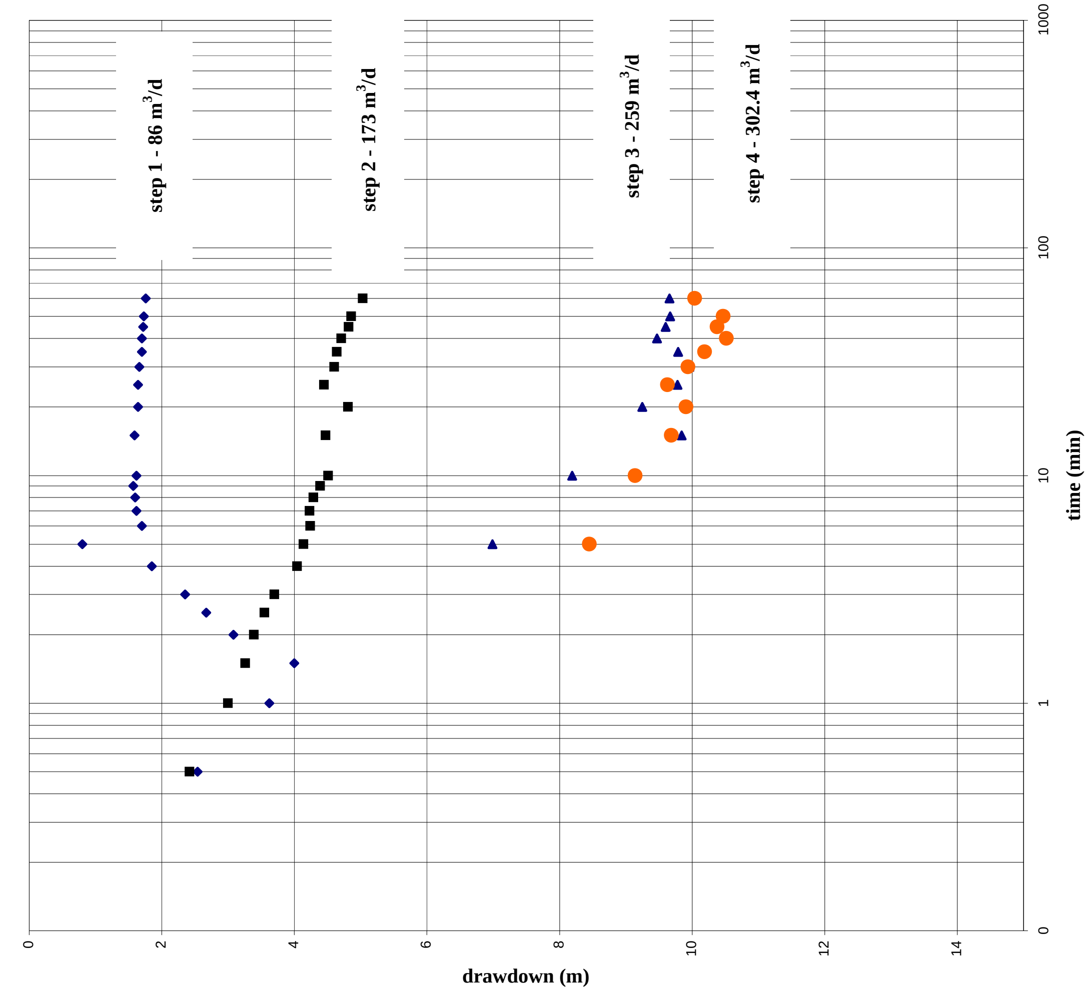
Job No.	53850-002-562		TANAMI GOLD NL	**Figure 11**
Prep. by	BWJ	20-Jun-04	DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS	URS
Chk'd by	VCW	21-Jun-04	**LPB01 MULTI - RATE TEST**	
			Drawdown Data and Bierschenk & Wilson Analysis	

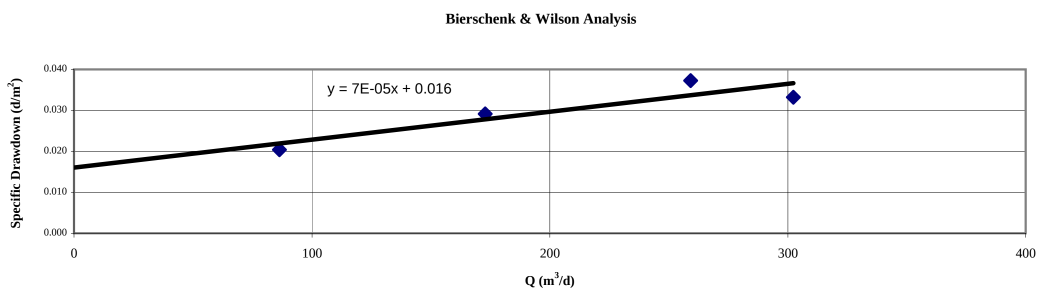


Job No.	53850-002-562		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS **LPB01 CONSTANT - RATE TEST DRAWDOWN** **Drawdown and Recovery Response in Dewatering Bore and Observation Bores**	**Figure 12**
Prep. by	BWJ	20-Jun-04		URS
Chk'd by	VCW	21-Jun-04		

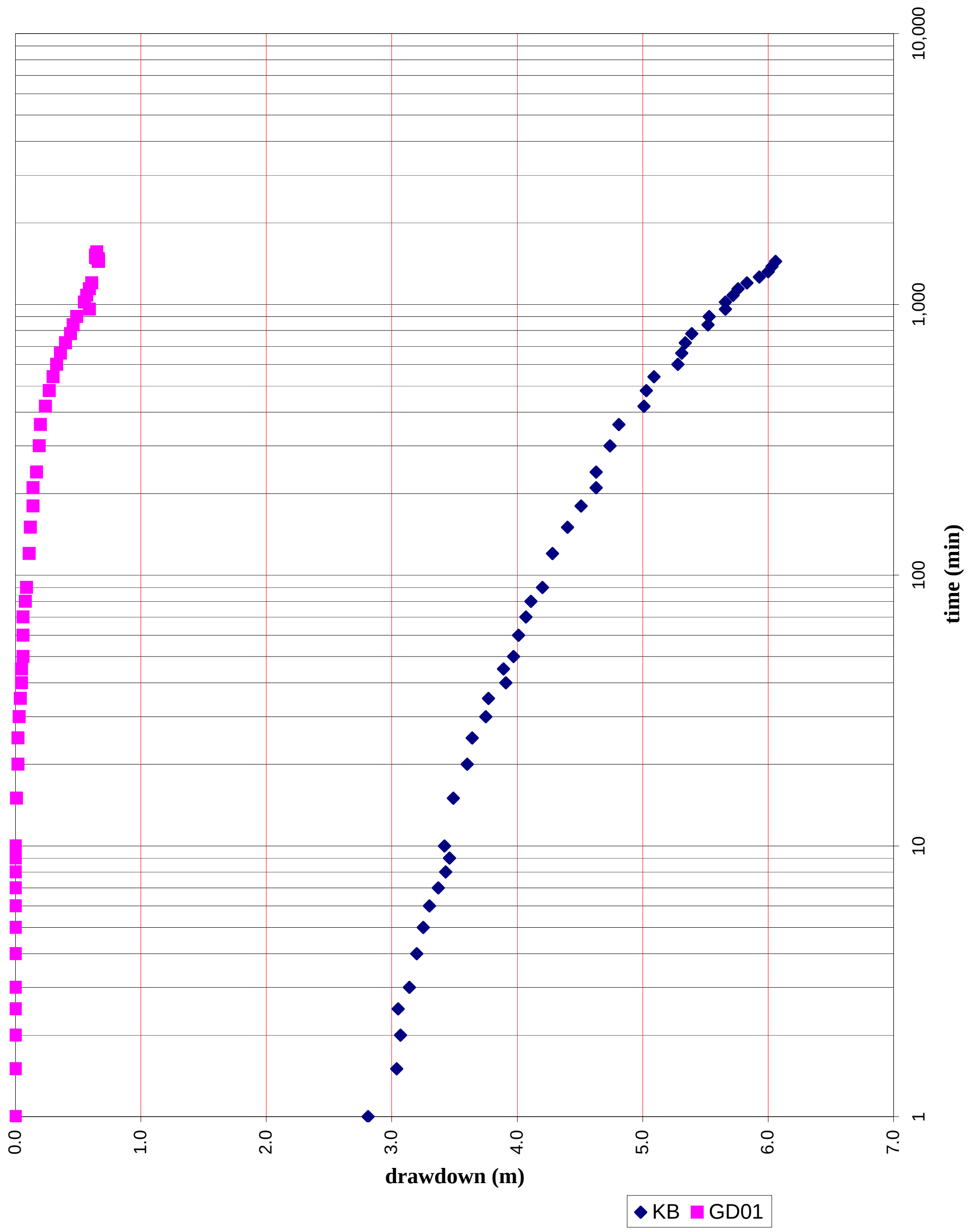


Job No.	53850-002		TANAMI GOLD NL	**Figure 13**
Prep. by	BWJ	24-Jun-04	DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS	URS
Chk'd by	VCW	25-Jun-04	**LPB01 CONSTANT RATE TEST RESIDUAL DRAWDOWN**	
			Residual Drawdown in Production Bore and Observation Bore	

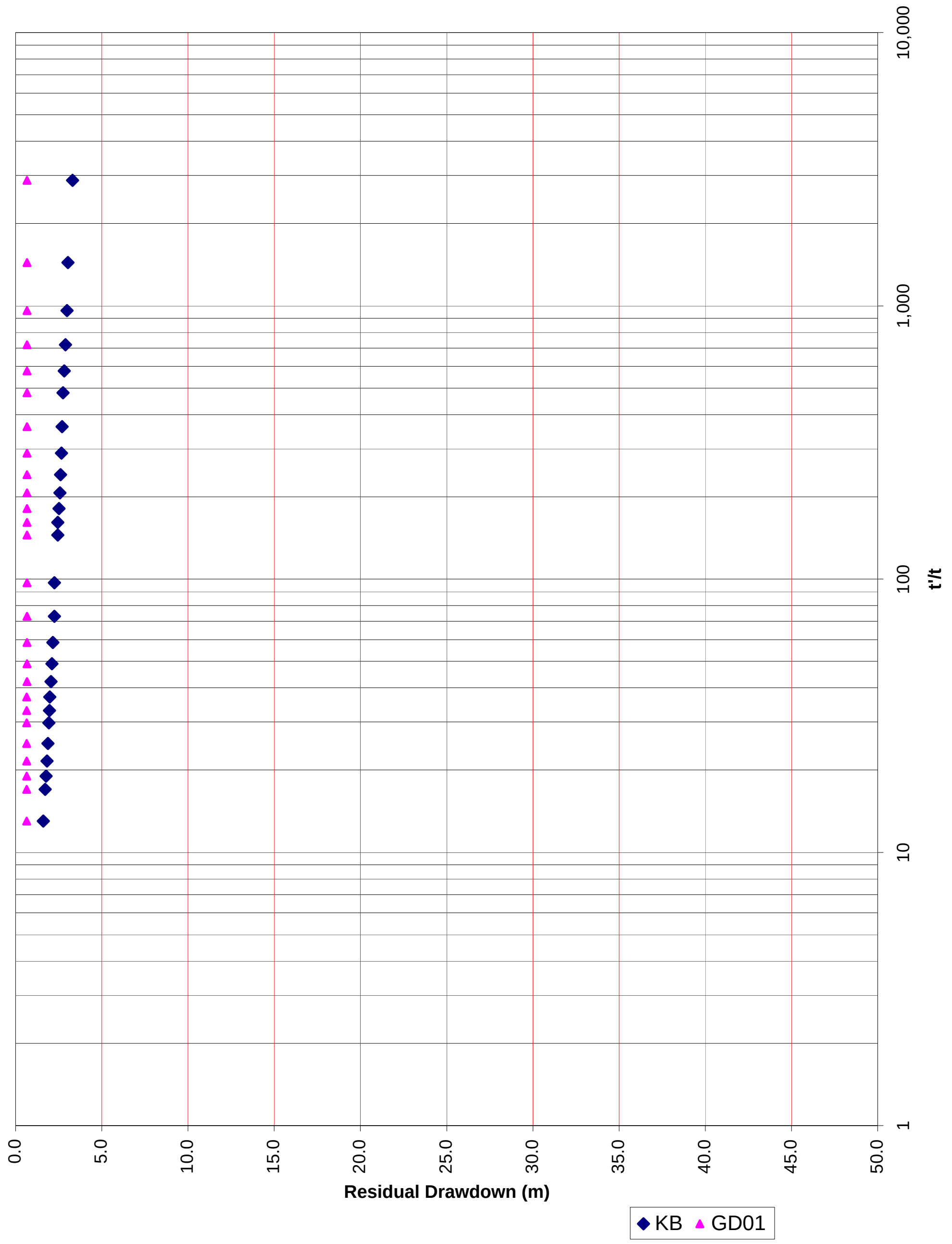




Job No.	53850-002-562		TANAMI GOLD NL	**Figure 14**
Prep. by	BWJ	20-Jun-04	DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS	URS
Chk'd by	VCW	07-Aug-04	**KOOKABURRA BORE (KB) MULTI - RATE TEST**	
			Drawdown Data and Bierschenk & Wilson Analysis	



Job No.	53850-002-562		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS **KOOKABURRA BORE (KB) CONSTANT - RATE TEST DRAWDOWN** **Drawdown and Recovery Response in Dewatering Bore and Observation Bores**	**Figure 15** URS
Prep. by	BWJ	20-Jun-04		
Chk'd by	VCW	21-Jun-04		



Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE & LARRANGANNI DEPOSITS **KOOKABURRA BORE (KB) CONSTANT - RATE TEST** **RESIDUAL DRAWDOWN** **Residual Drawdown in Production Bore and Observation Bore**	**Figure 16**
Prep. by	BWJ	24-Jun-04		URS
Chk'd by	VCW	25-Jun-04		

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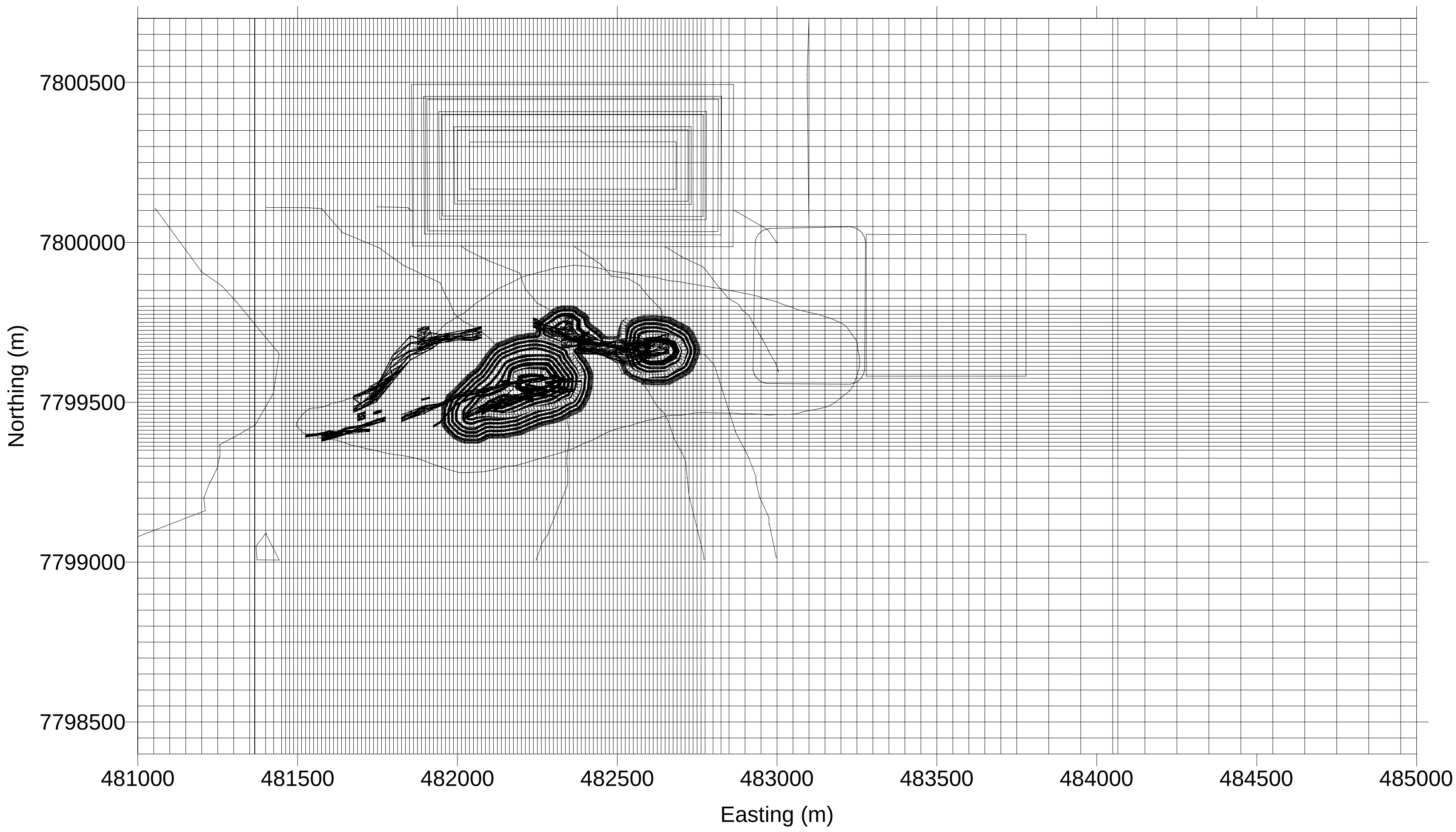
Revision Indicator	0	

TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

MODEL DOMAIN - COYOTE

Figure 17



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TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

MODEL DOMAIN - LARRANGANNI

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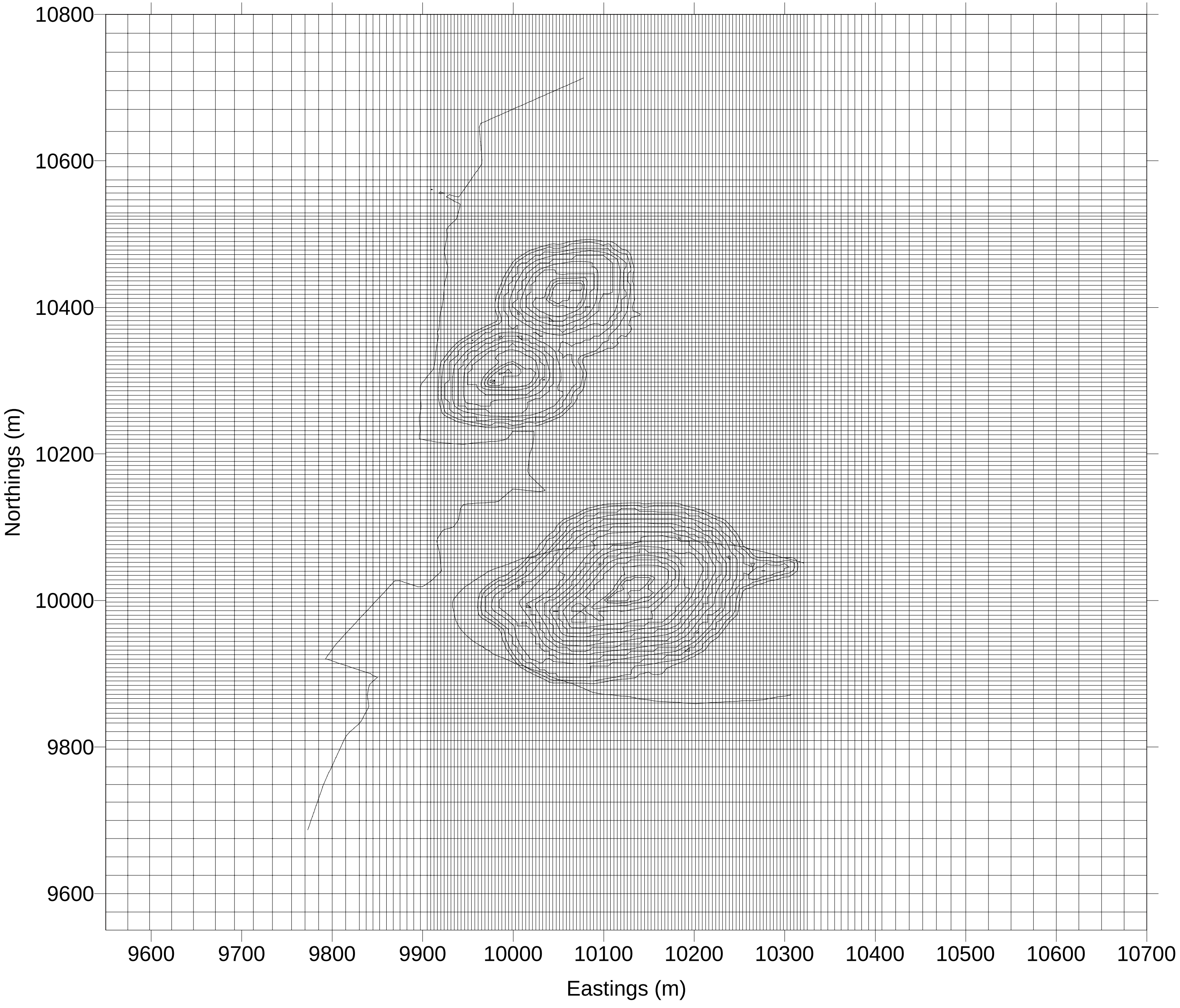
Figure 18



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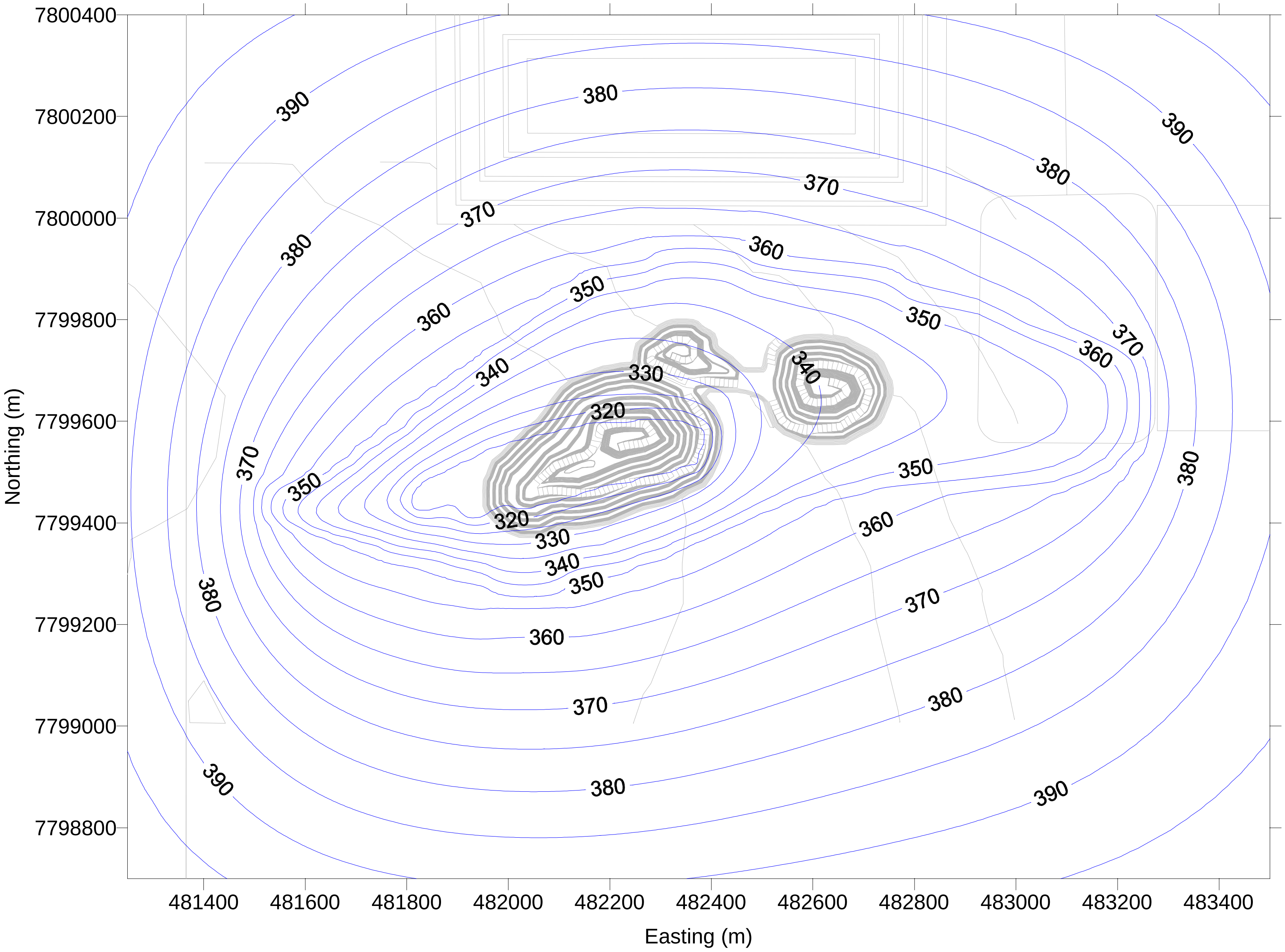

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Chk'd By	VW 01/08/04
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TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

SIMULATED DRAWDOWN AFTER 360 DAYS OF DEWATERING - COYOTE

Figure 19a

figurek.srf

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figurek.srf

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TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

SIMULATED DRAWDOWN AFTER 720 DAYS OF DEWATERING - COYOTE

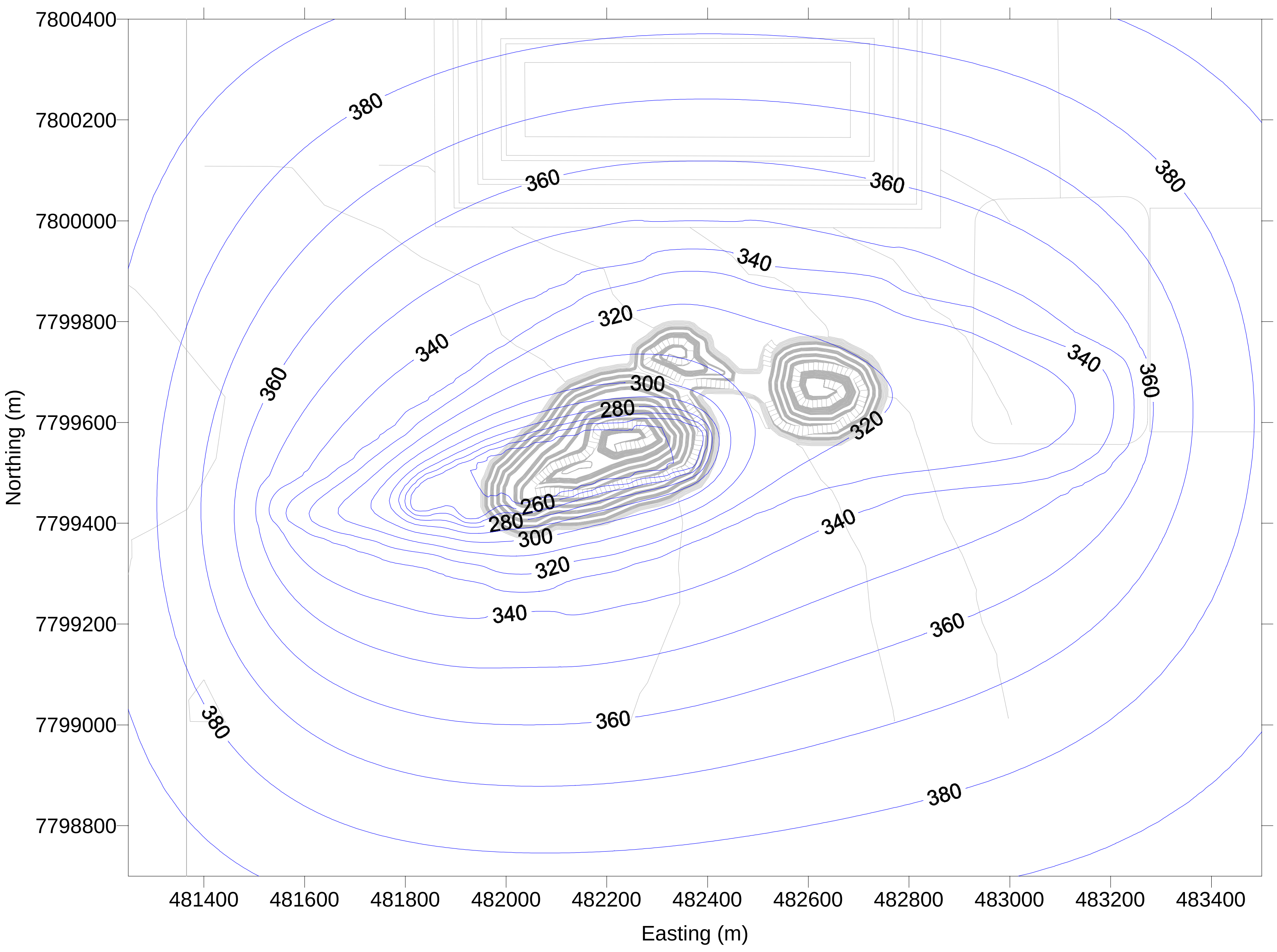

Figure 19b

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figurek.srf

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TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

SIMULATED DRAWDOWN AFTER 1080 DAYS OF DEWATERING - COYOTE

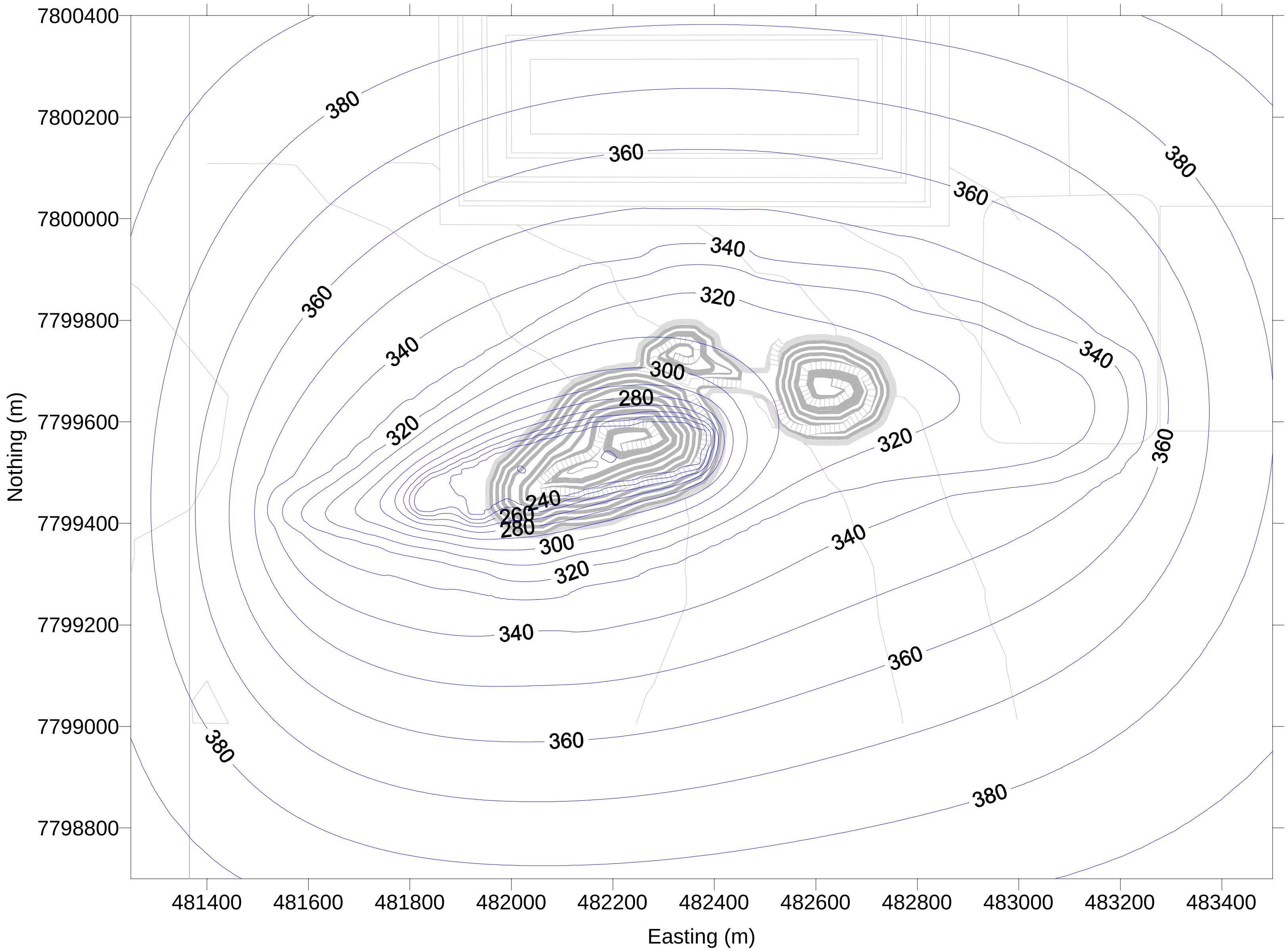

Figure 19c

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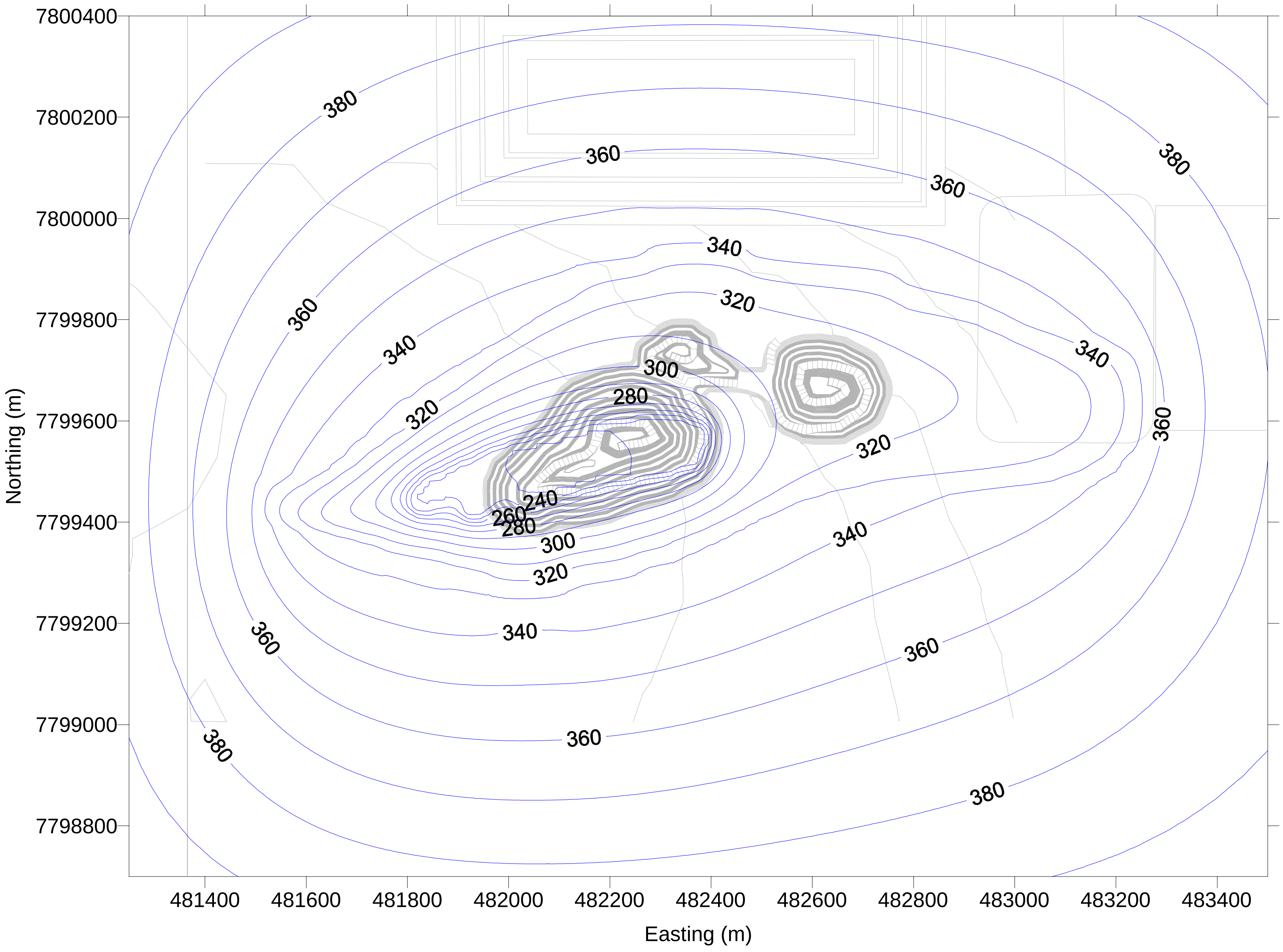

figurek.srf

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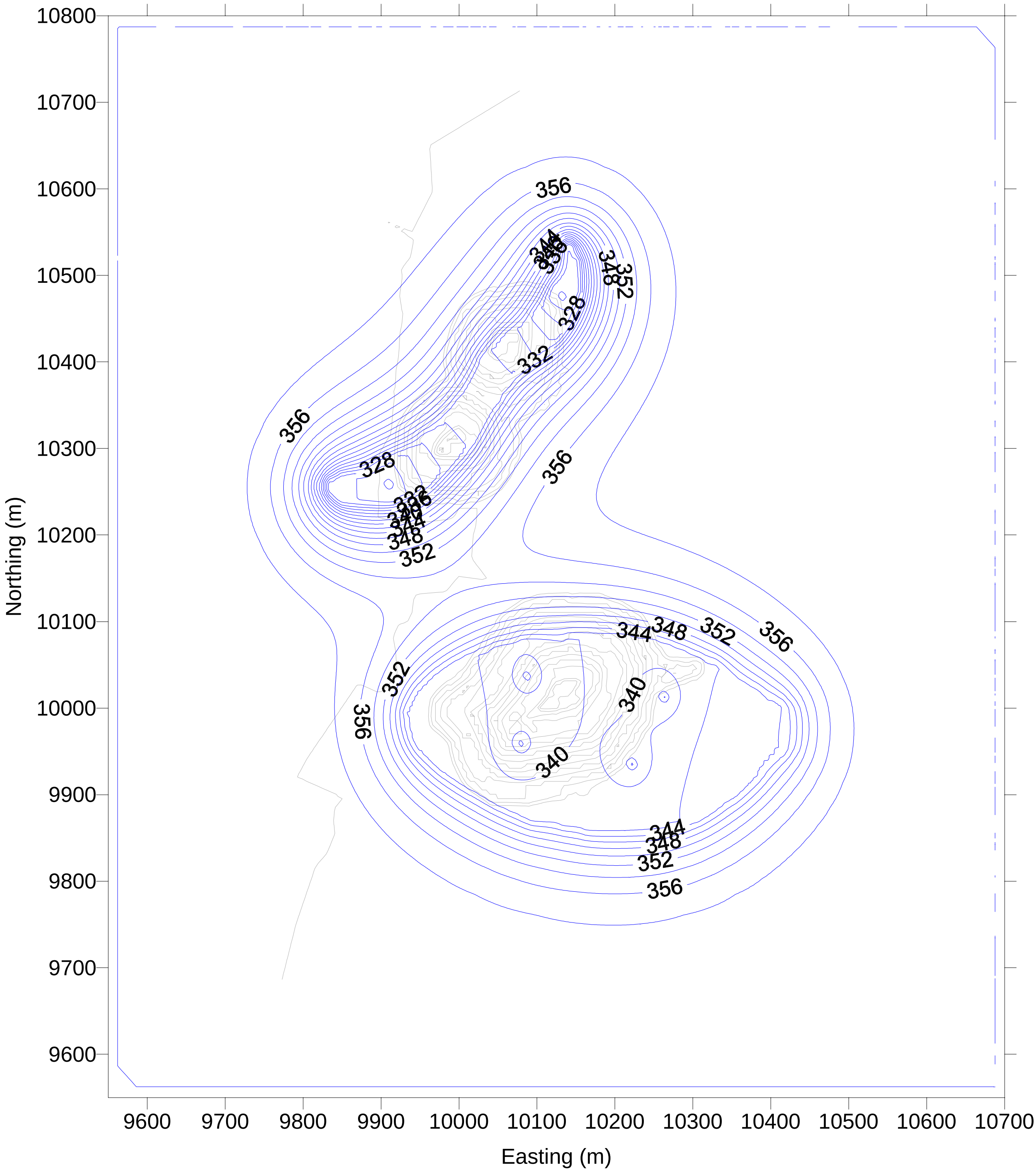
Chk'd By	VW 01/08/04
Revision Indicator	0

TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

SIMULATED DRAWDOWN AFTER 1140 DAYS OF DEWATERING - COYOTE

Figure 19d



Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **SIMULATED DRAWDOWN AFTER 90 DAYS OF DEWATERING - LARRANGANNI**	**Figure 20a**
Prep. By	AS	30/07/04		URS
Chk'd By	VW	30/07/04		
Revision No.		0		

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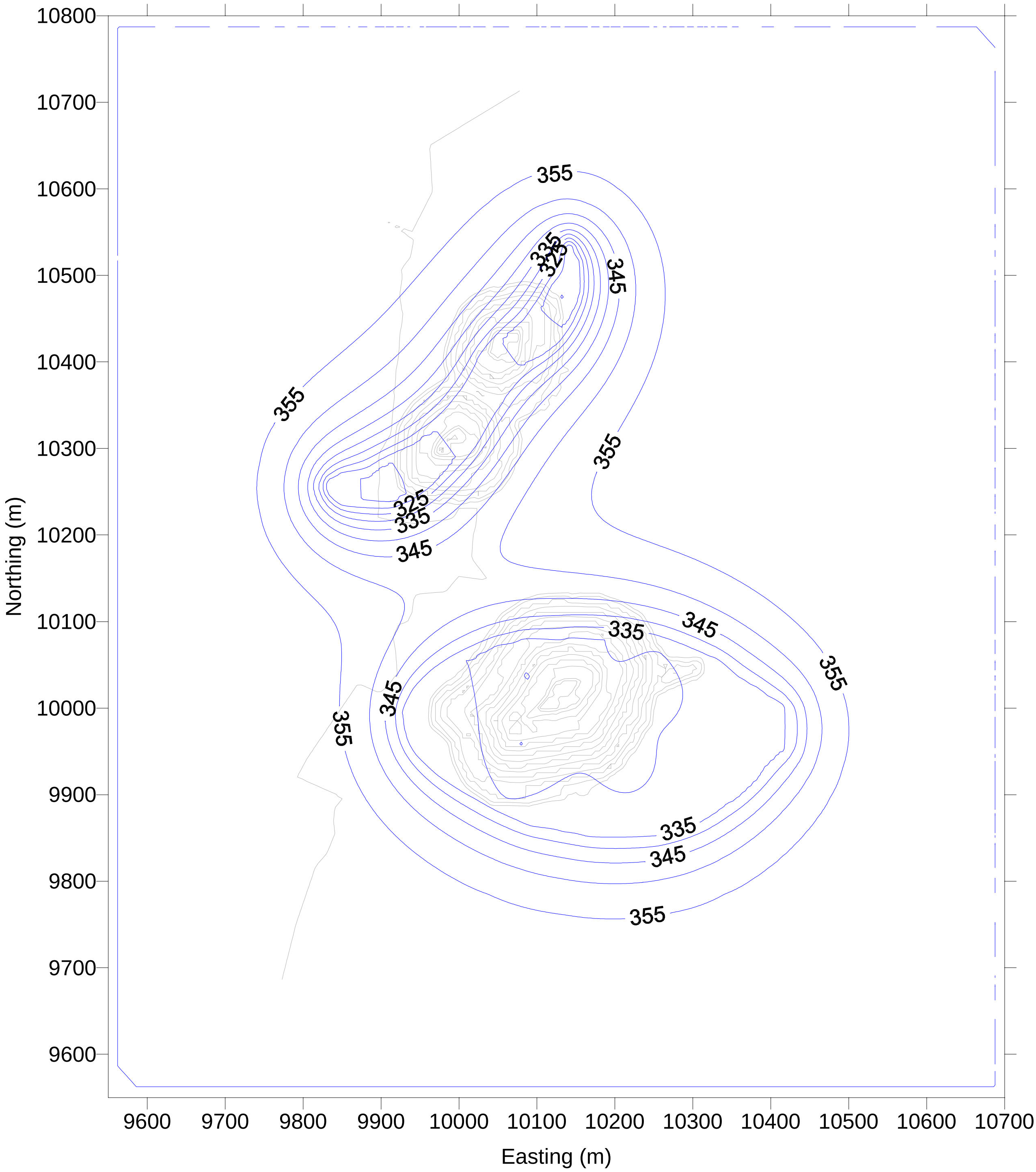
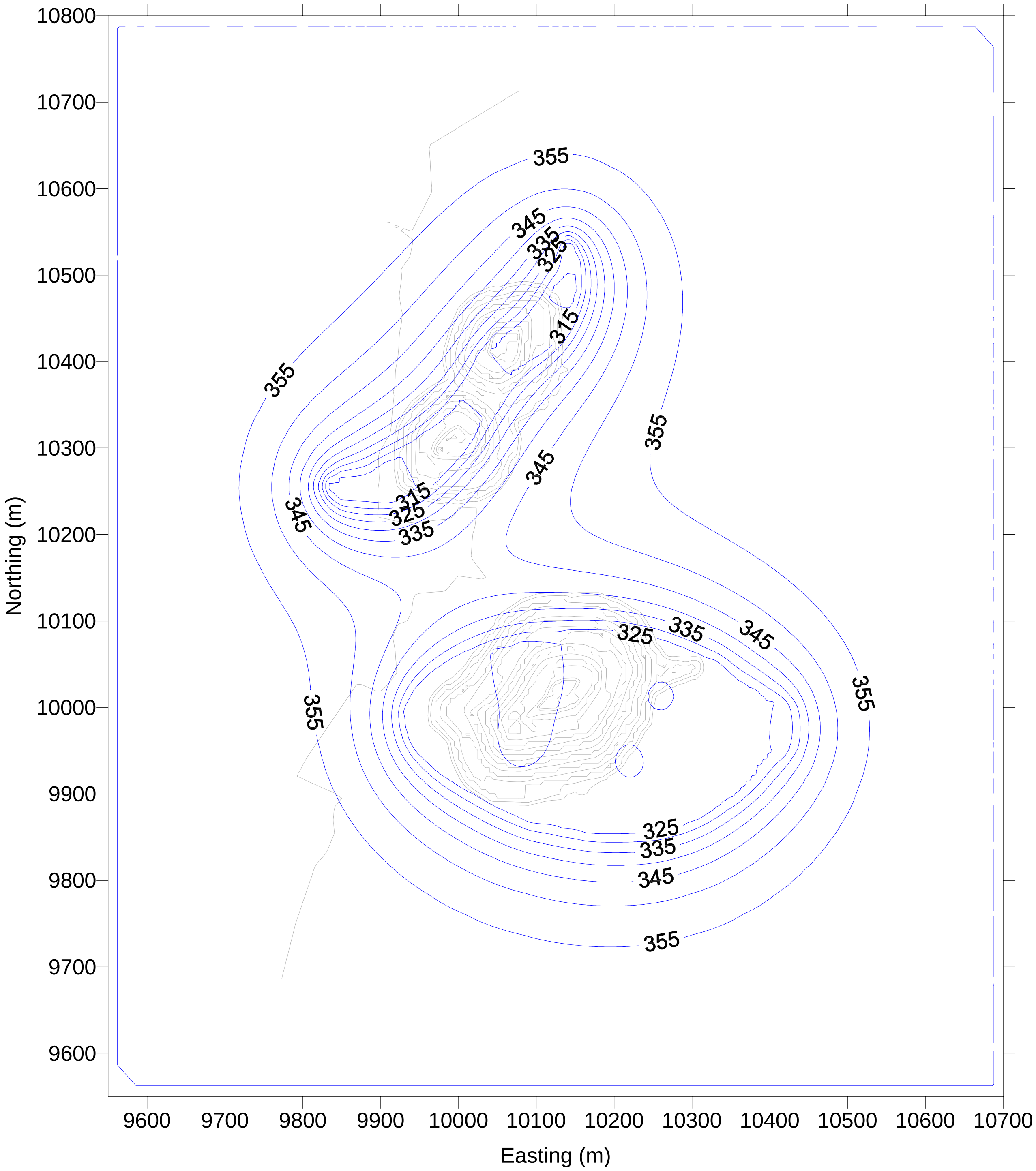
figure11.srf



Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **SIMULATED DRAWDOWN AFTER 180 DAYS OF DEWATERING - LARRANGANNI**	**Figure 20b**
Prep. By	AS	30/07/04		URS
Chk'd By	VW	30/07/04		
Revision No.		0		

figure11.srf



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TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS

COYOTE AND LARRANGANNI DEPOSITS

SIMULATED DRAWDOWN AFTER 270 DAYS OF DEWATERING - LARRANGANNI

Figure 20c

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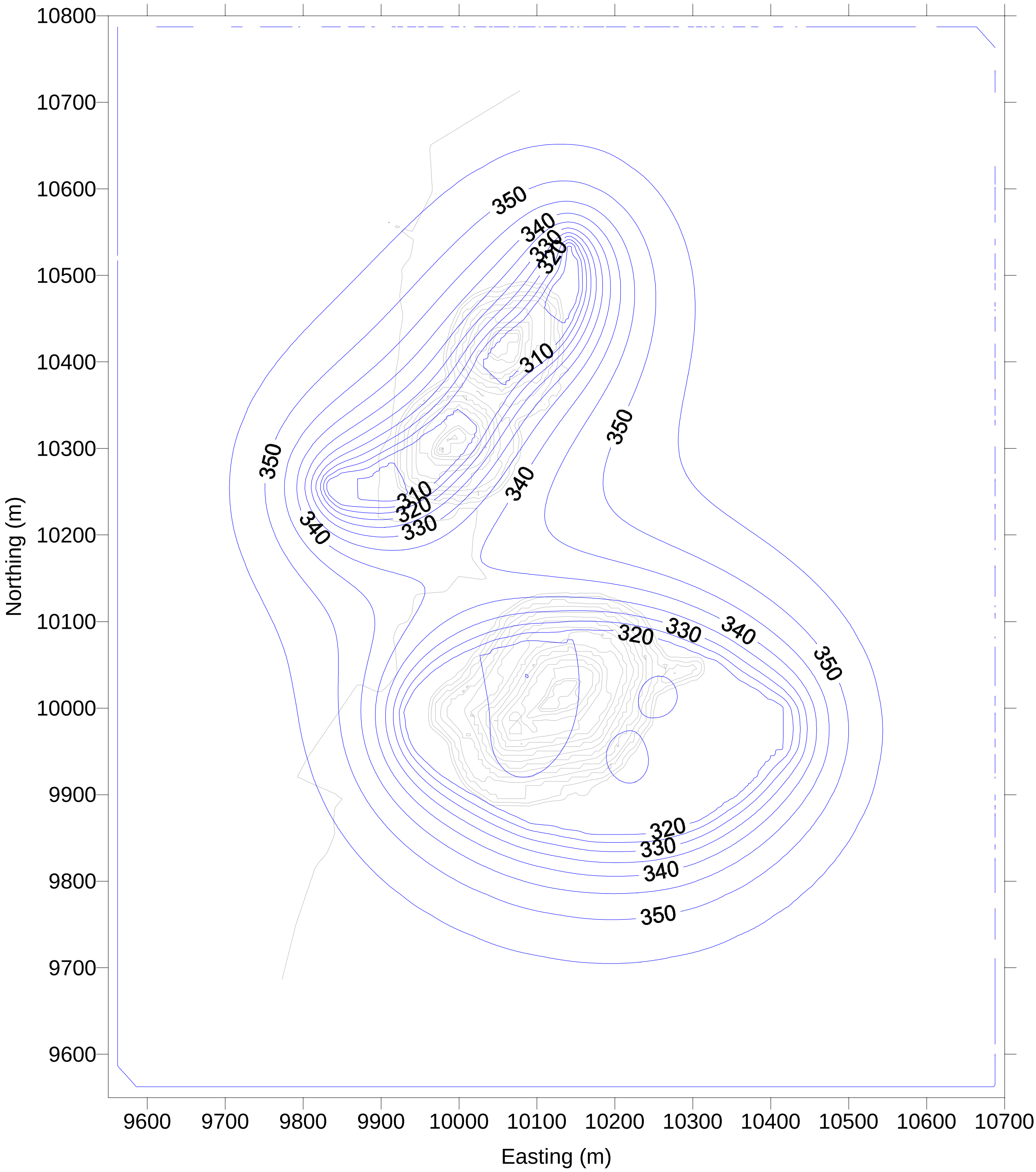
figure11.srf



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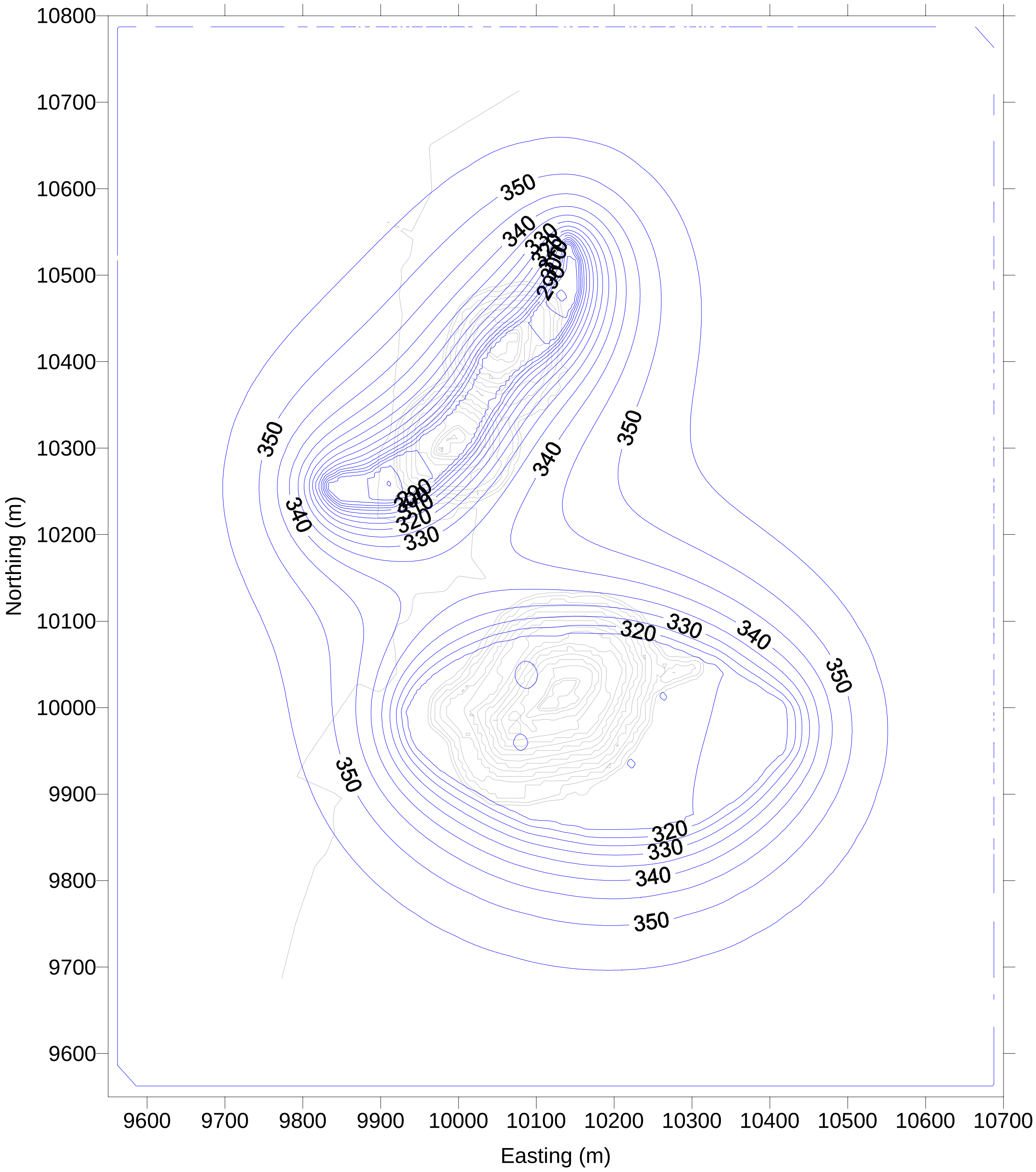
Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **SIMULATED DRAWDOWN AFTER 330 DAYS OF DEWATERING - LARRANGANNI**	**Figure 20d**
Prep. By	AS	30/07/04		URS
Chk'd By	VW	30/07/04		
Revision No.		0		

figure11.srf



Job No.	53850-002	
Prep. By	AS	30/07/04
Chk'd By	VW	30/07/04
Revision No.		0

TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS

COYOTE AND LARRANGANNI DEPOSITS

SIMULATED DRAWDOWN AFTER 360 DAYS OF DEWATERING - LARRANGANNI

Figure 20e

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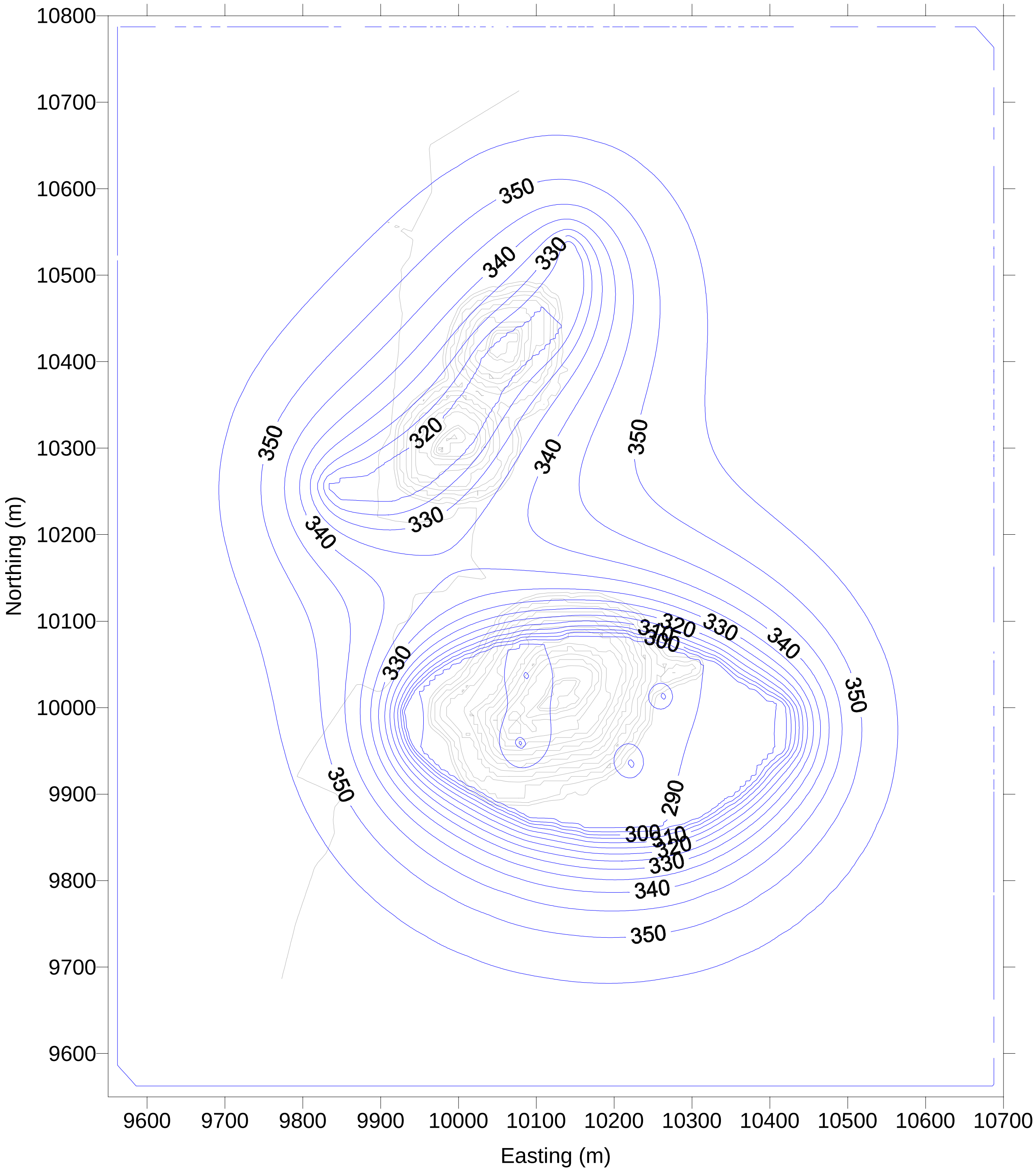
figure11.srf



Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **SIMULATED DRAWDOWN AFTER 415 DAYS OF DEWATERING - LARRANGANNI**	**Figure 20f**
Prep. By	AS	30/07/04		URS
Chk'd By	VW	30/07/04		
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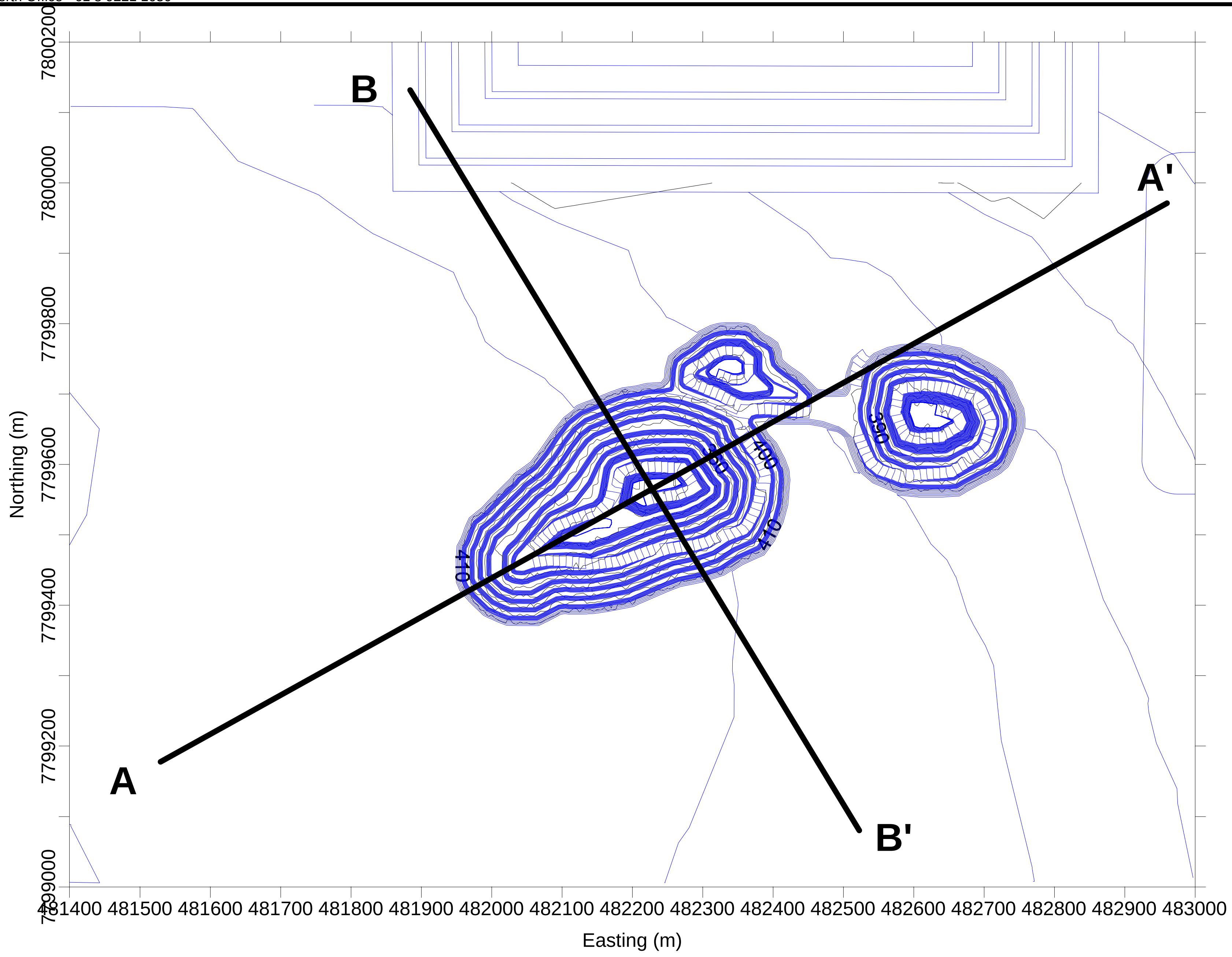
figurek.srf



Job No.	53850-002
Prep. By	AS 02/08/04
Chk'd By	VW 02/08/04
Revision Indicator	0

TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS

COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTION LAYOUTS FOR SIMULATED DRAWDOWN OF DEWATERING COYOTE

Figure 21

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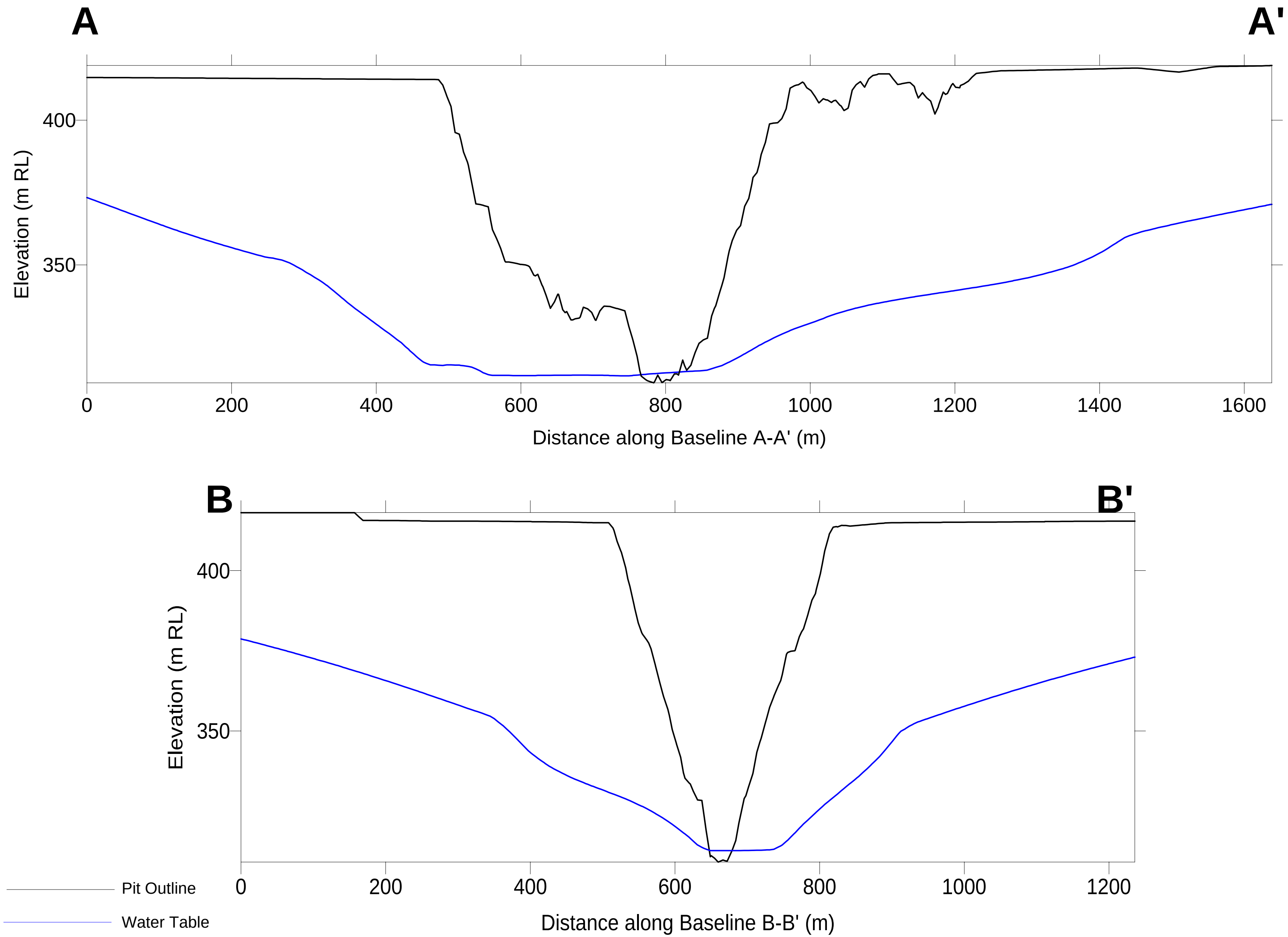

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Chk'd By	VW	02/08/04
Revision Indicator	0	

TANAMI GOLD NL
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 360 DAYS OF DEWATERING - COYOTE

Figure 22a

figurek.srf

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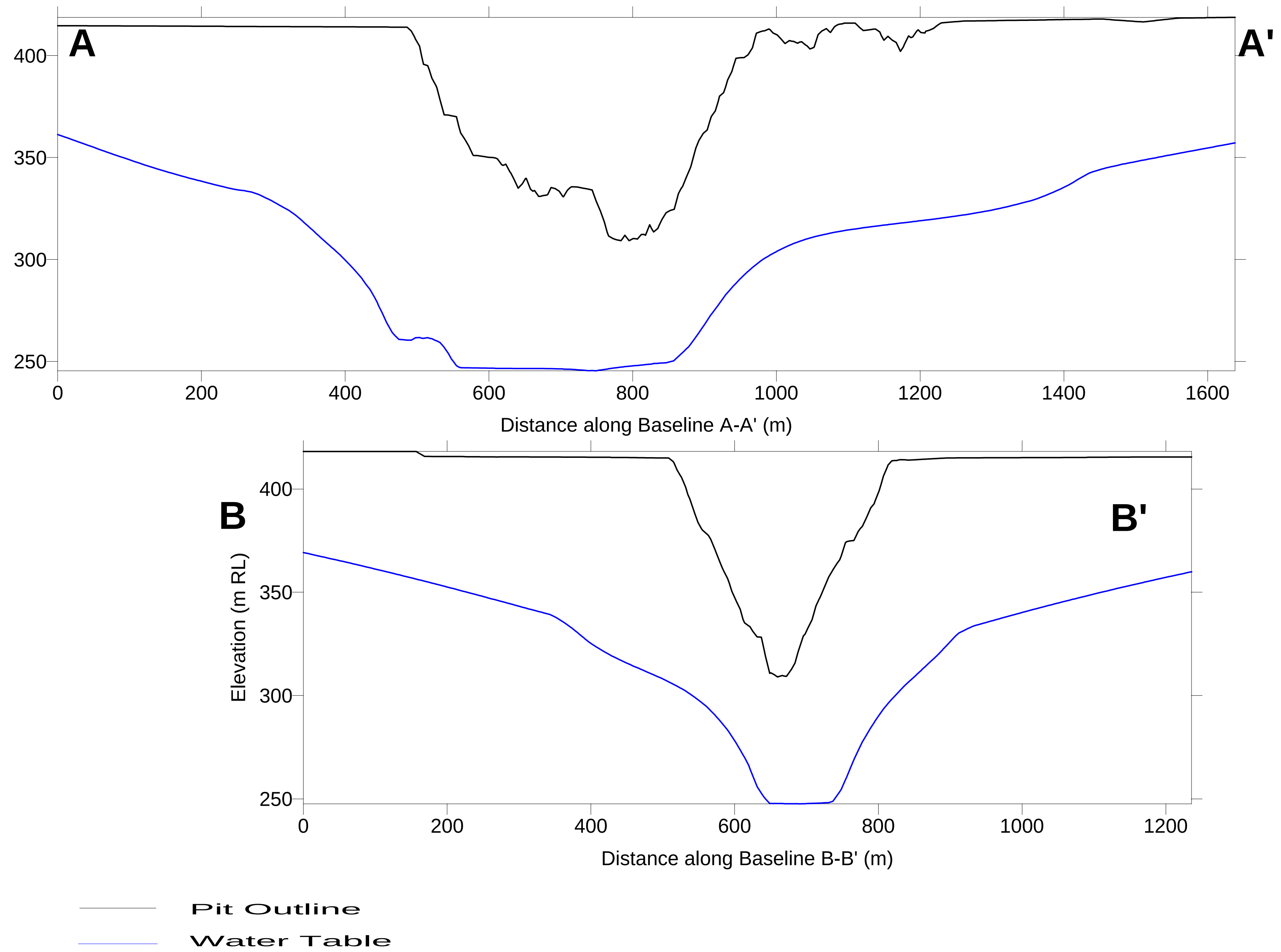
figurek.srf



Job No.	53850-002	
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Chk'd By	VW	02/08/04
Revision Indicator	0	

TANAMI GOLD NL
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR
SIMULATED DRAWDOWN AFTER 720 DAYS
OF DEWATERING - COYOTE

Figure 22b

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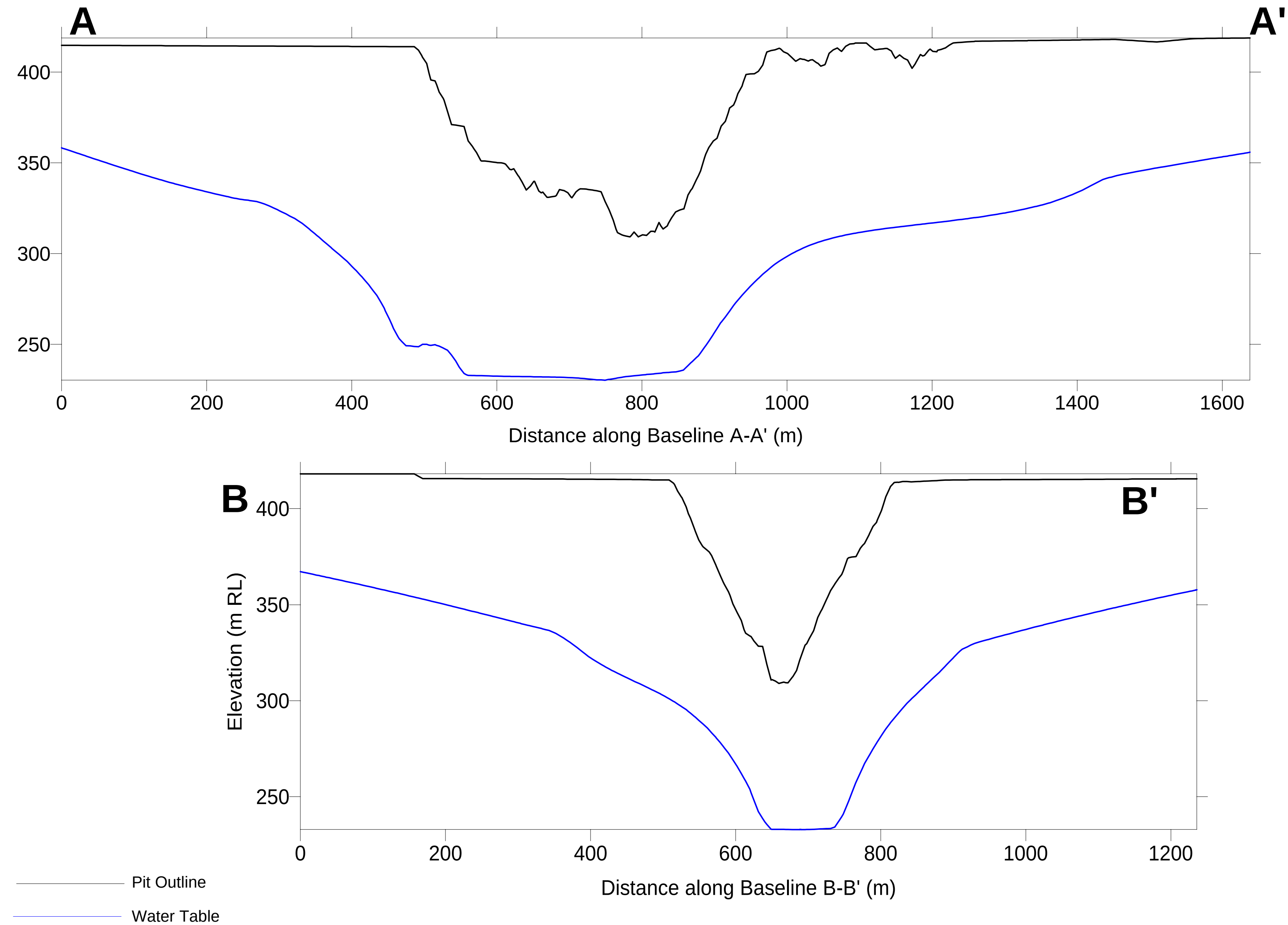
figurek.srf



Job No.	53850-002	
Prep. By	AS	02/08/04
Chk'd By	VW	02/08/04
Revision Indicator	0	

TANAMI GOLD NL
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR
SIMULATED DRAWDOWN AFTER1080 DAYS
OF DEWATERING - COYOTE

Figure 22c

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figurek.srf

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TANAMI GOLD NL
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 1140 DAYS OF DEWATERING - COYOTE

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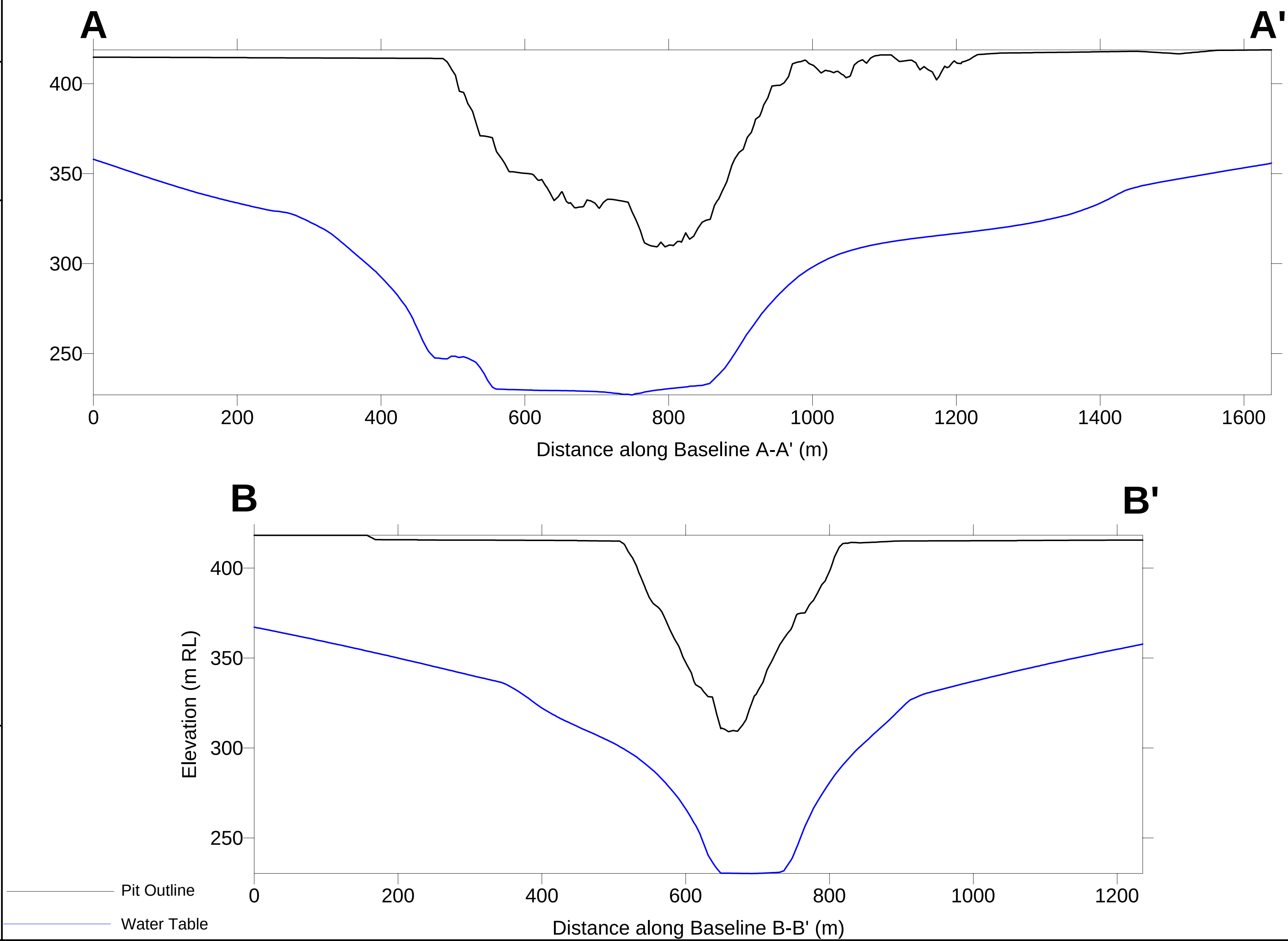
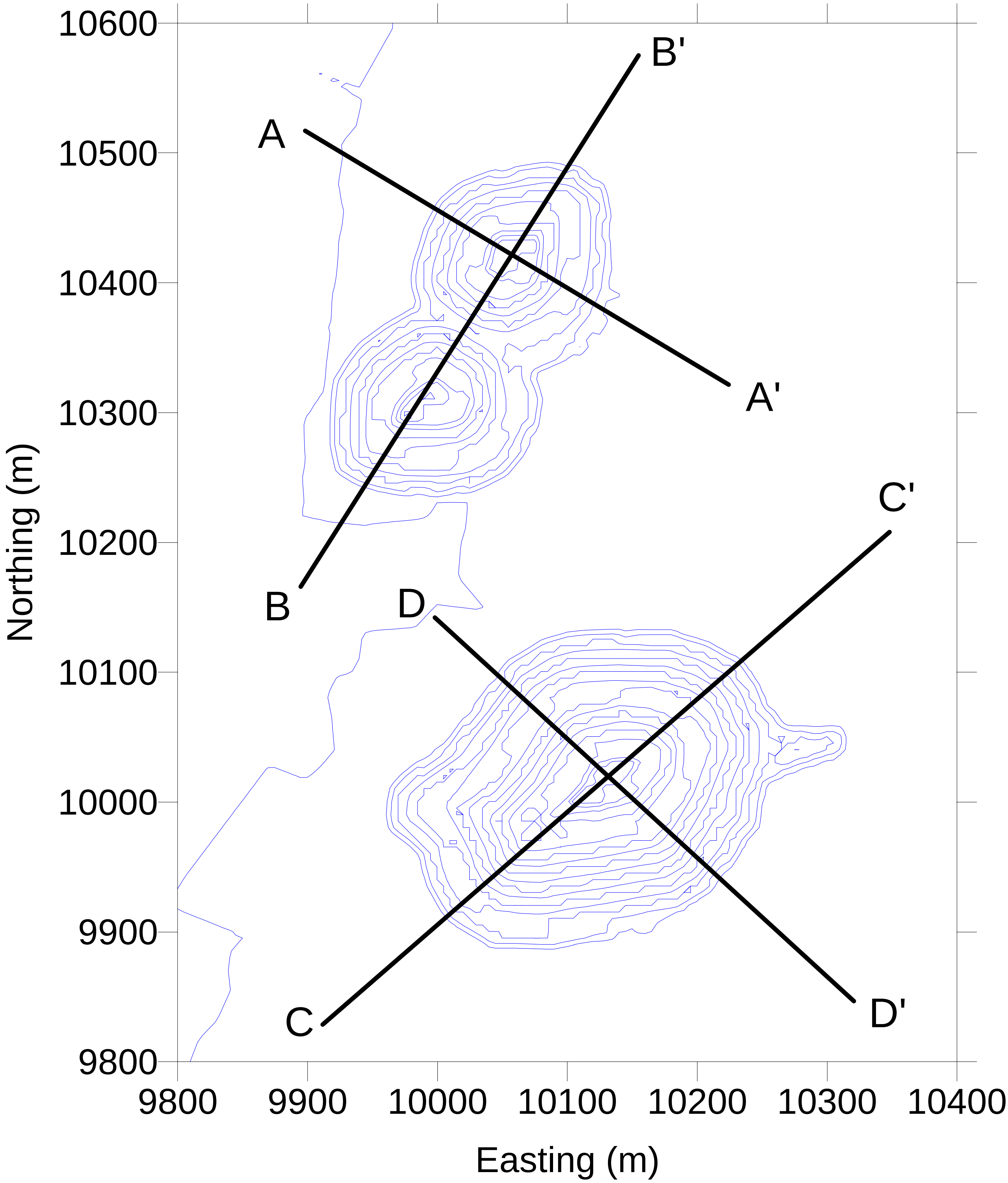
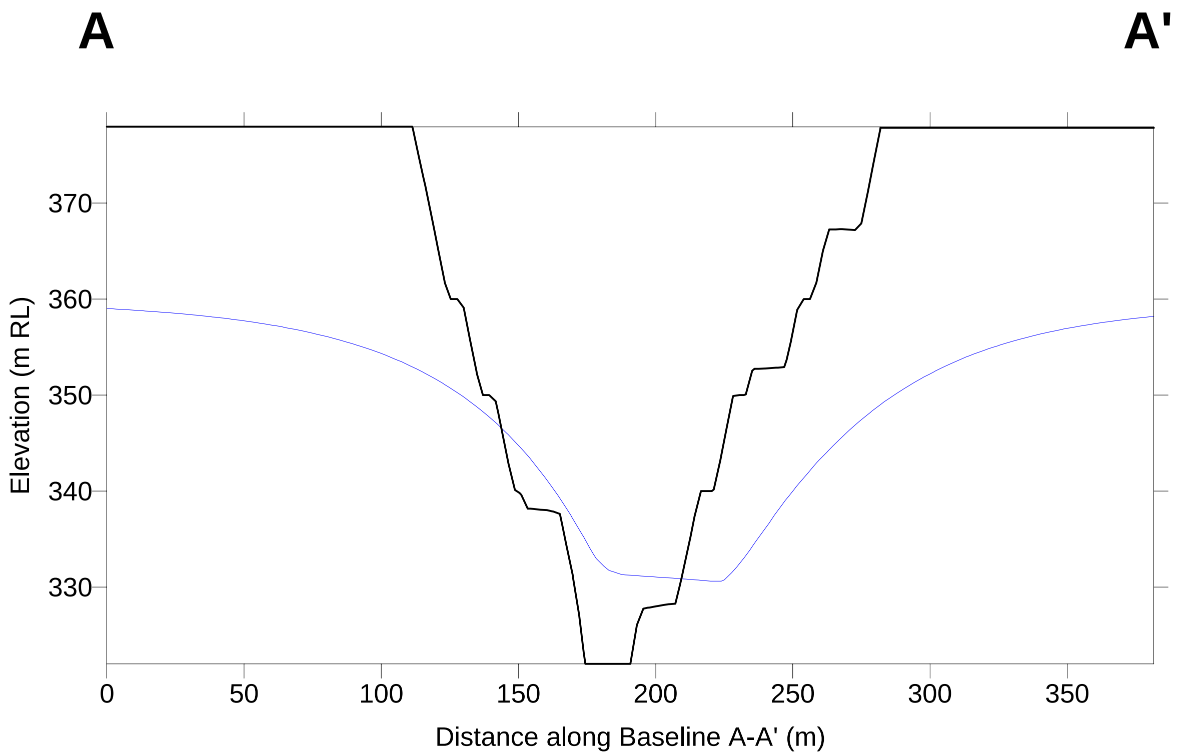
Figure 22d

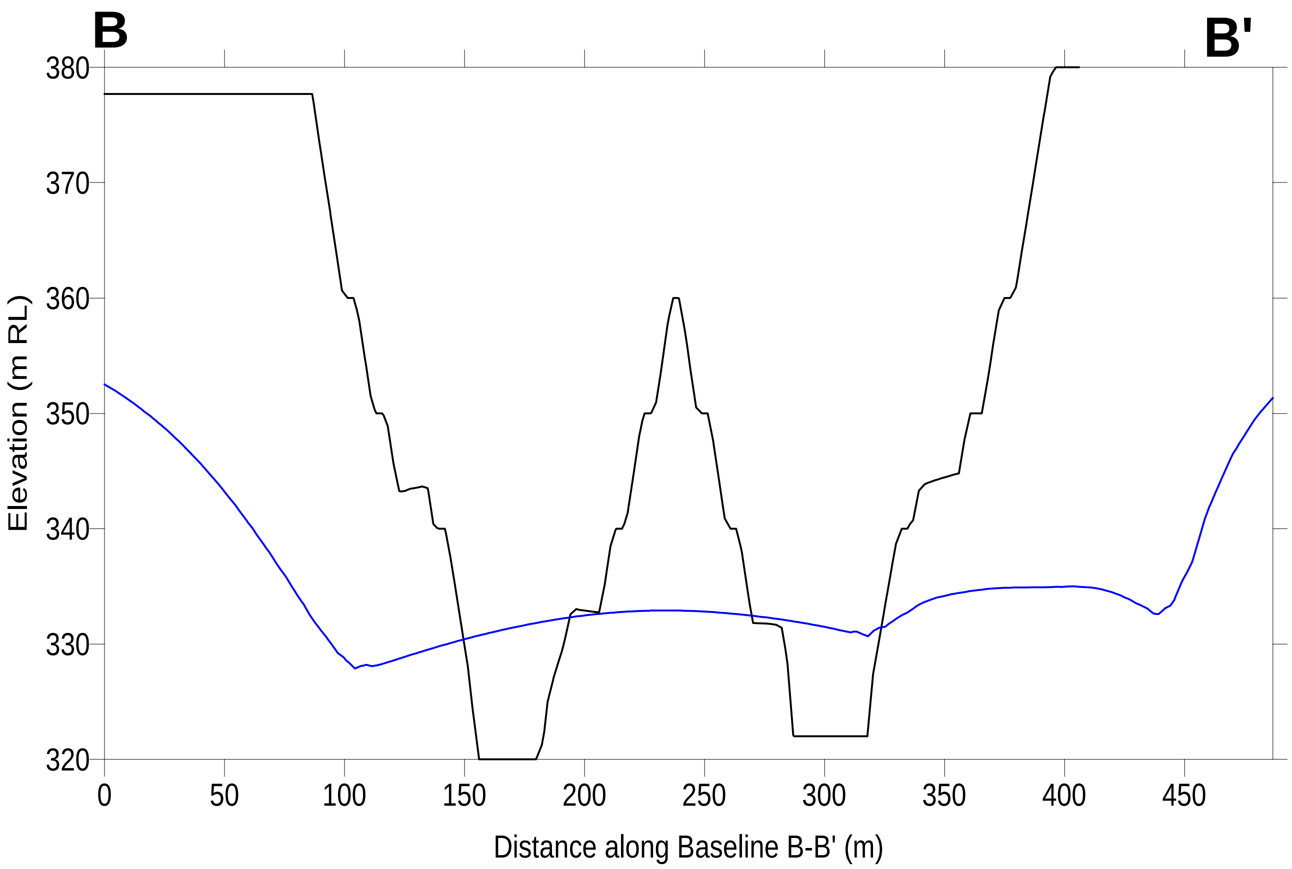




Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **CROSS SECTION LAYOUTS FOR SIMULATED DRAWDOWN OF DEWATERING LARRANGANNI**	**Figure 23**
Prep. By	AS	28/07/04		URS
Chk'd By	VW	28/07/04		
Revision No.		0		

figure11.srf





Pit Outline

Water Table

Job No.	53850-002	
Prep. By	AS	28/07/04
Chk'd By	VW	28/07/04
Revision No.		0

TANAMI GOLD NL

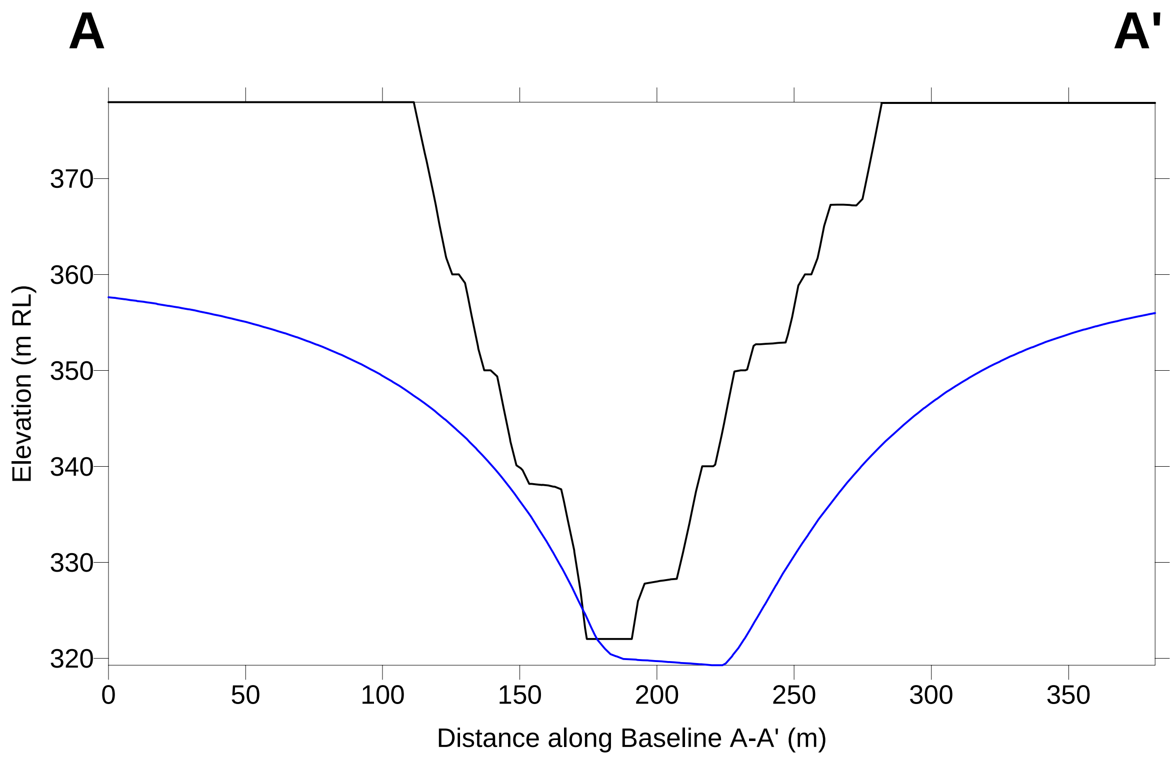
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

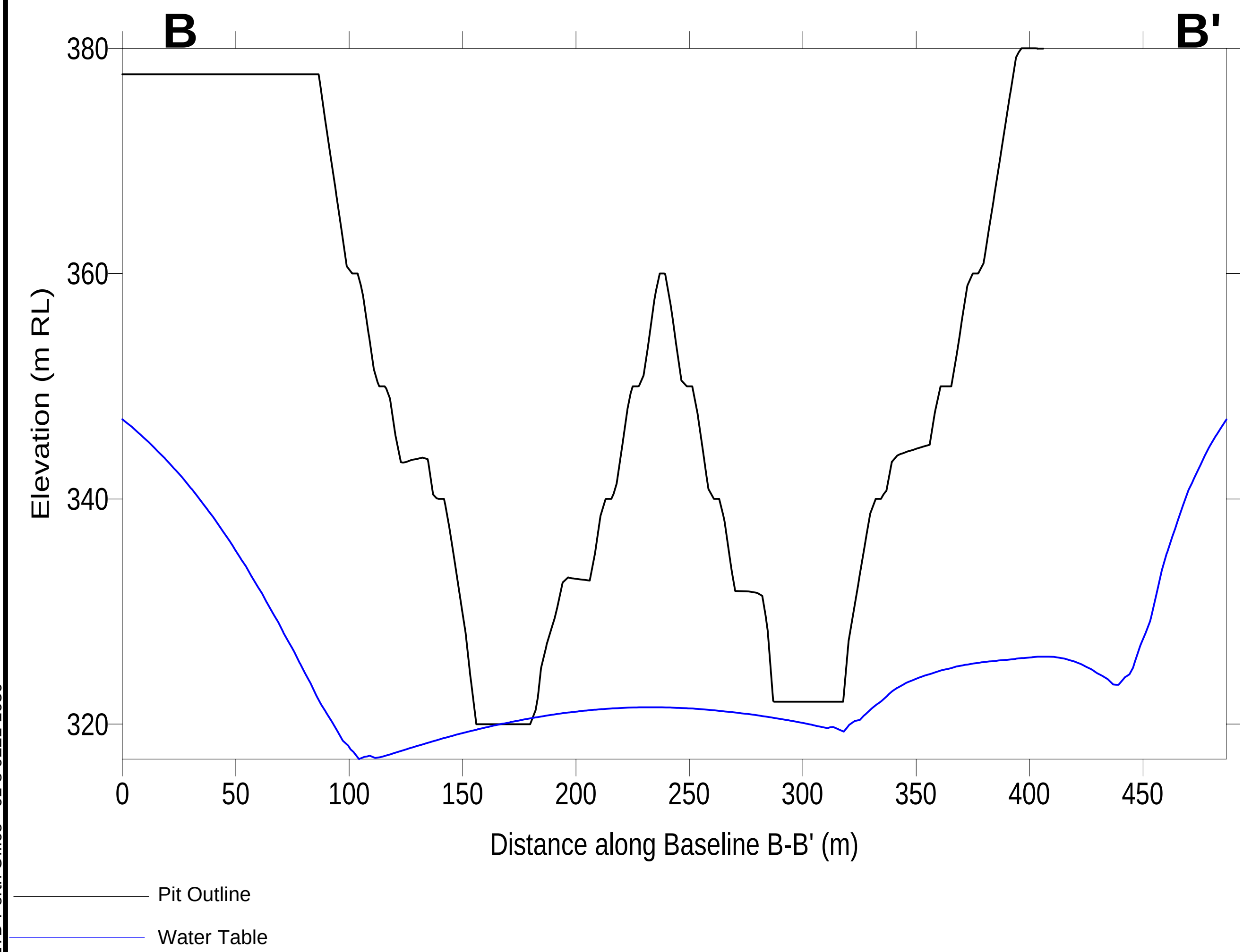
CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 90 DAYS OF DEWATERING - SANDPIPER

Figure 24a

URS

figure11.srf

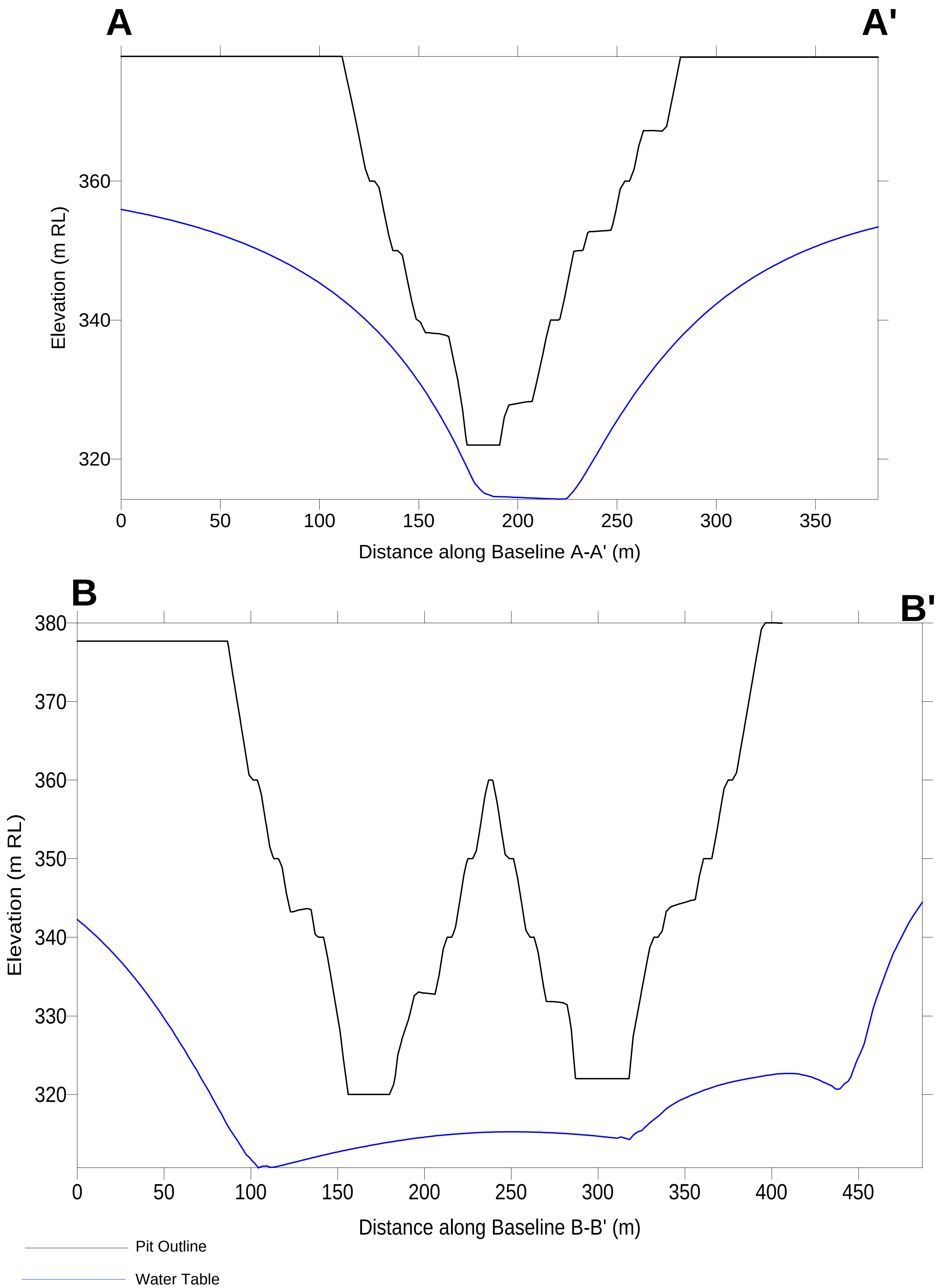




URS AUSTRALIA PTY LTD Perth Office +61 8 9221 1630

Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 180 DAYS OF DEWATERING - SANDPIPER**	**Figure 24b**
Prep. By	AS	28/07/04		URS
Chk'd By	VW	28/07/04		
Revision No.		0		

figure11.srf



Job No.	53850-002	
Prep. By	AS	28/07/04
Chk'd By	VW	28/07/04
Revision No.		0

TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR
SIMULATED DRAWDOWN AFTER 270 DAYS
OF DEWATERING - SANDPIPER

Figure 24c

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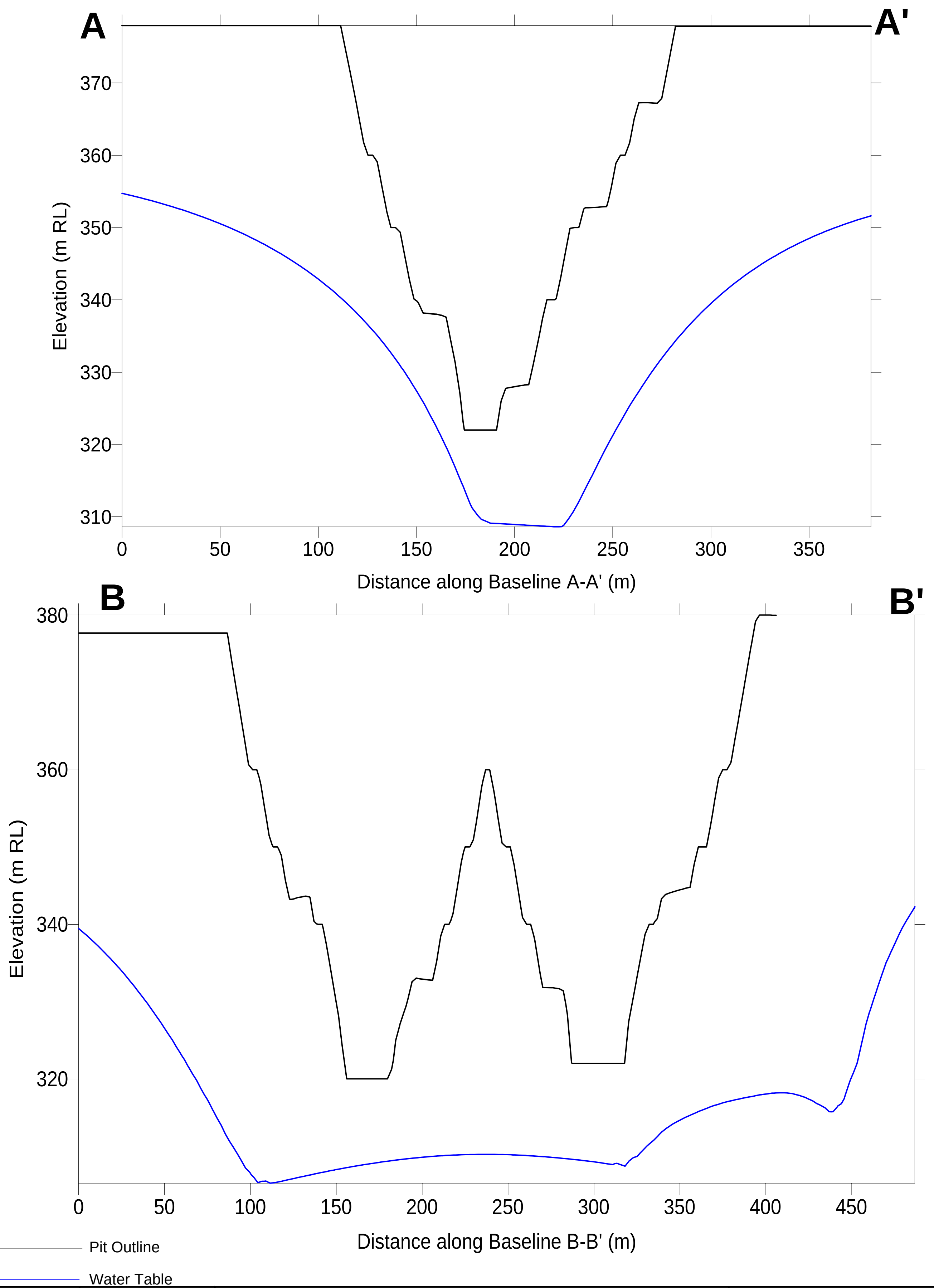
figure11.srf



Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 330 DAYS OF DEWATERING - SANDPIPER**	**Figure 24d**
Prep. By	AS	28/07/04		URS
Chk'd By	VW	28/07/04		
Revision No.		0		

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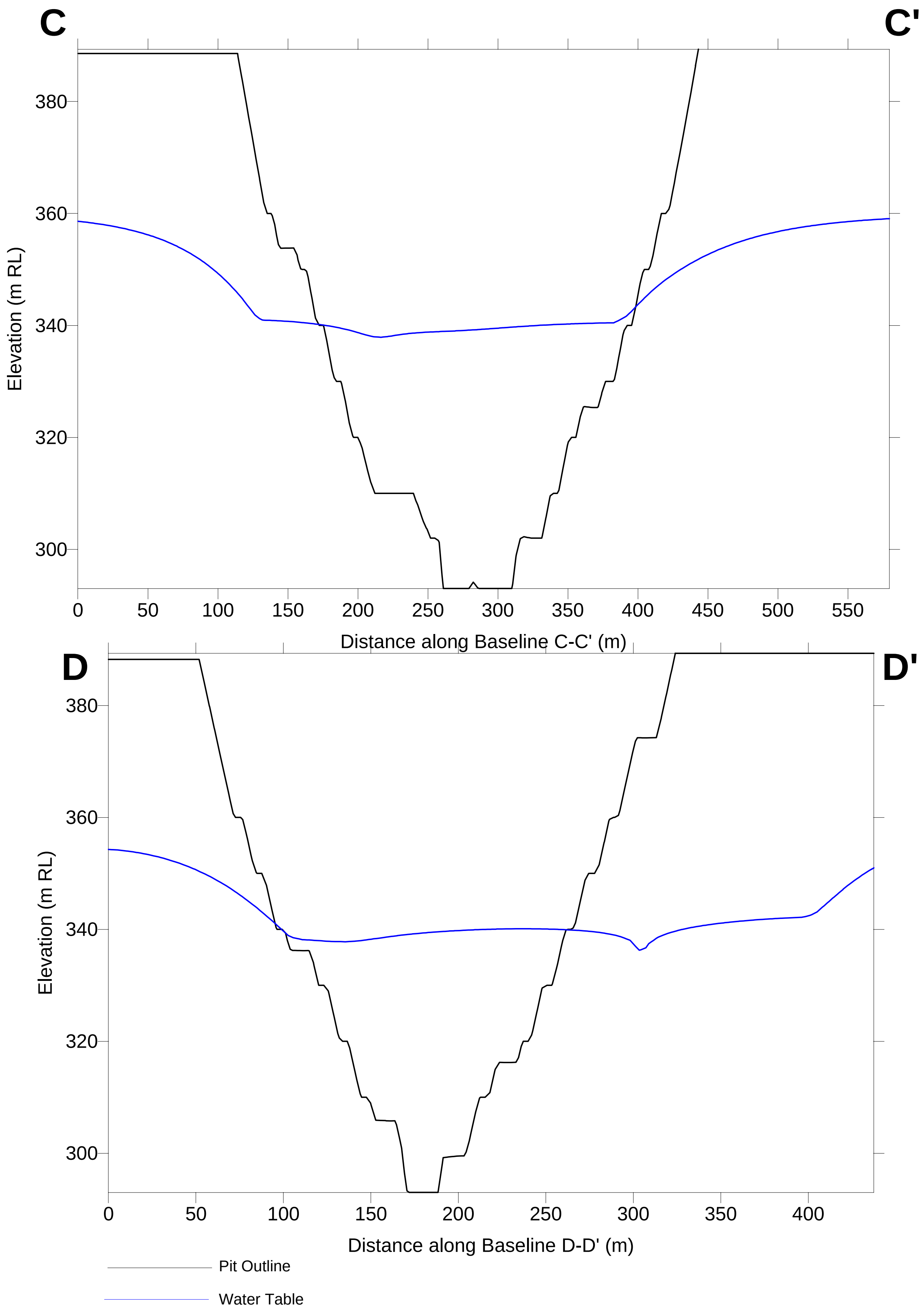


Job No.	53850-002	
Prep. By	AS	28/07/04
Chk'd By	VW	28/07/04
Revision No.		0

TANAMI GOLD NL

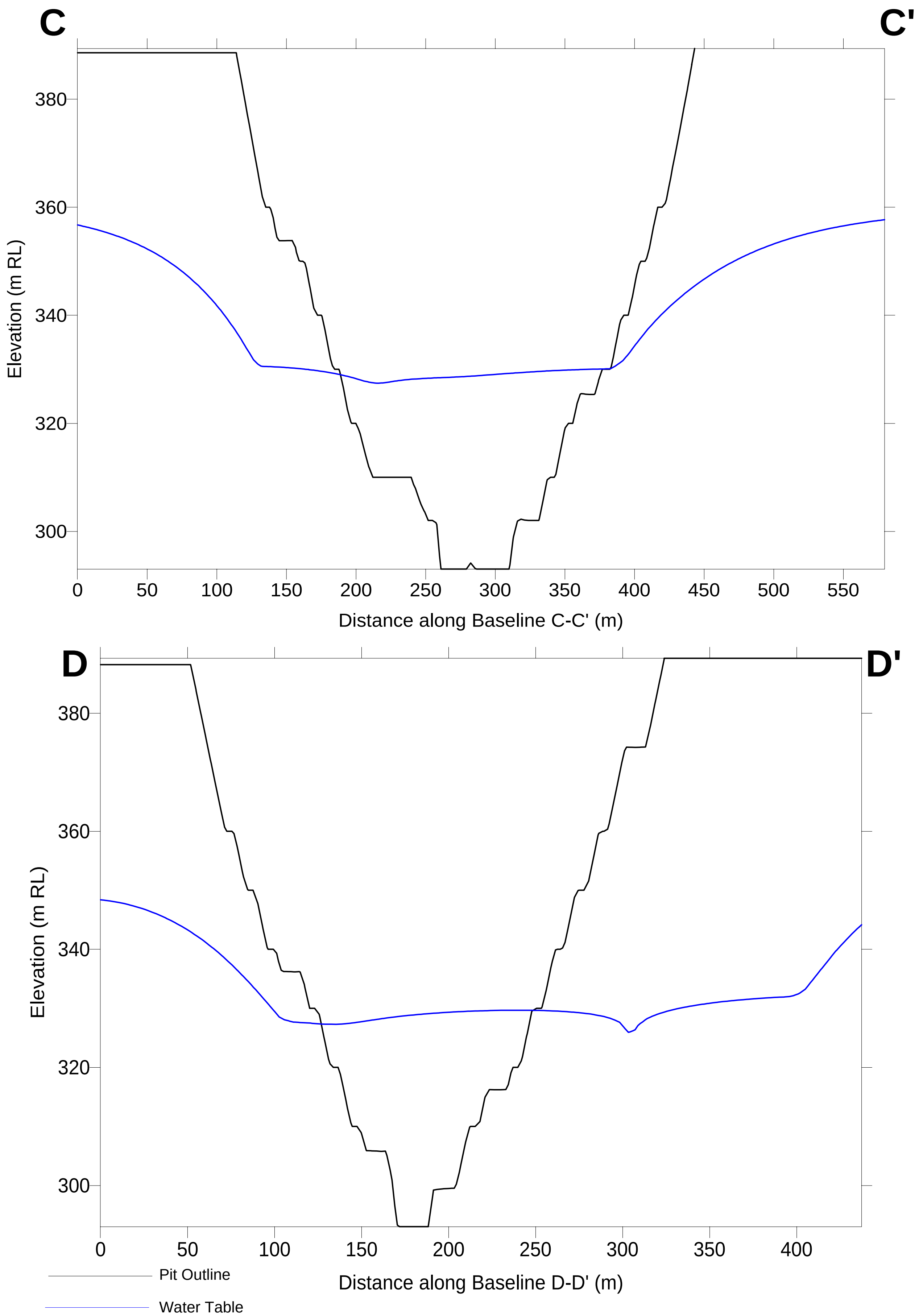
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR
SIMULATED DRAWDOWN AFTER 90 DAYS
OF DEWATERING - KOOKABURRA

Figure 25a

URS

figure11.srf



Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 180 DAYS OF DEWATERING - KOOKABURRA**
Prep. By	AS	28/07/04	
Chk'd By	VW	28/07/04	
Revision No.		0	

Figure 25b

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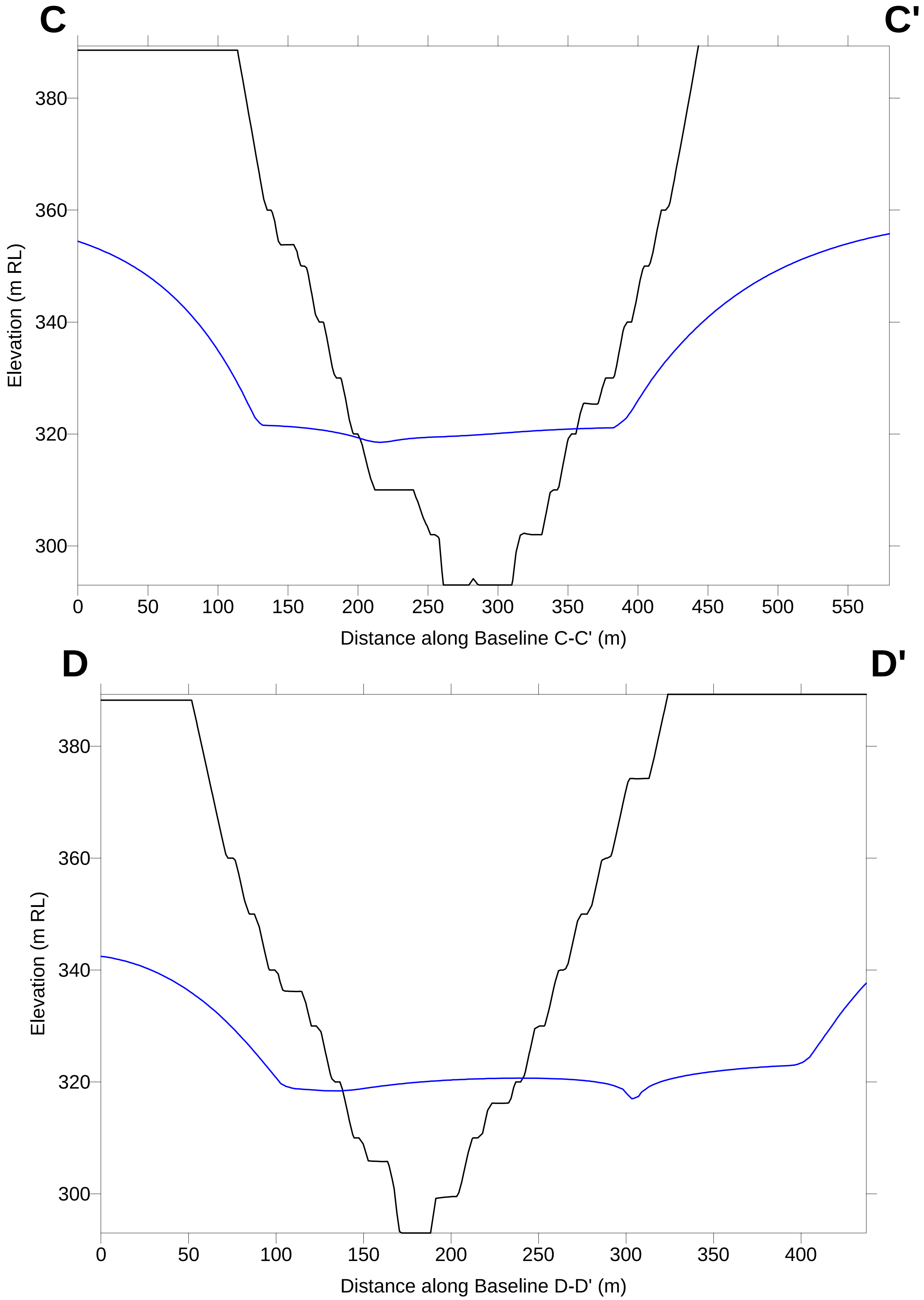
figure11.srf



Job No.	53850-002	
Prep. By	AS	28/07/04
Chk'd By	VW	28/07/04
Revision No.		0

TANAMI GOLD NL

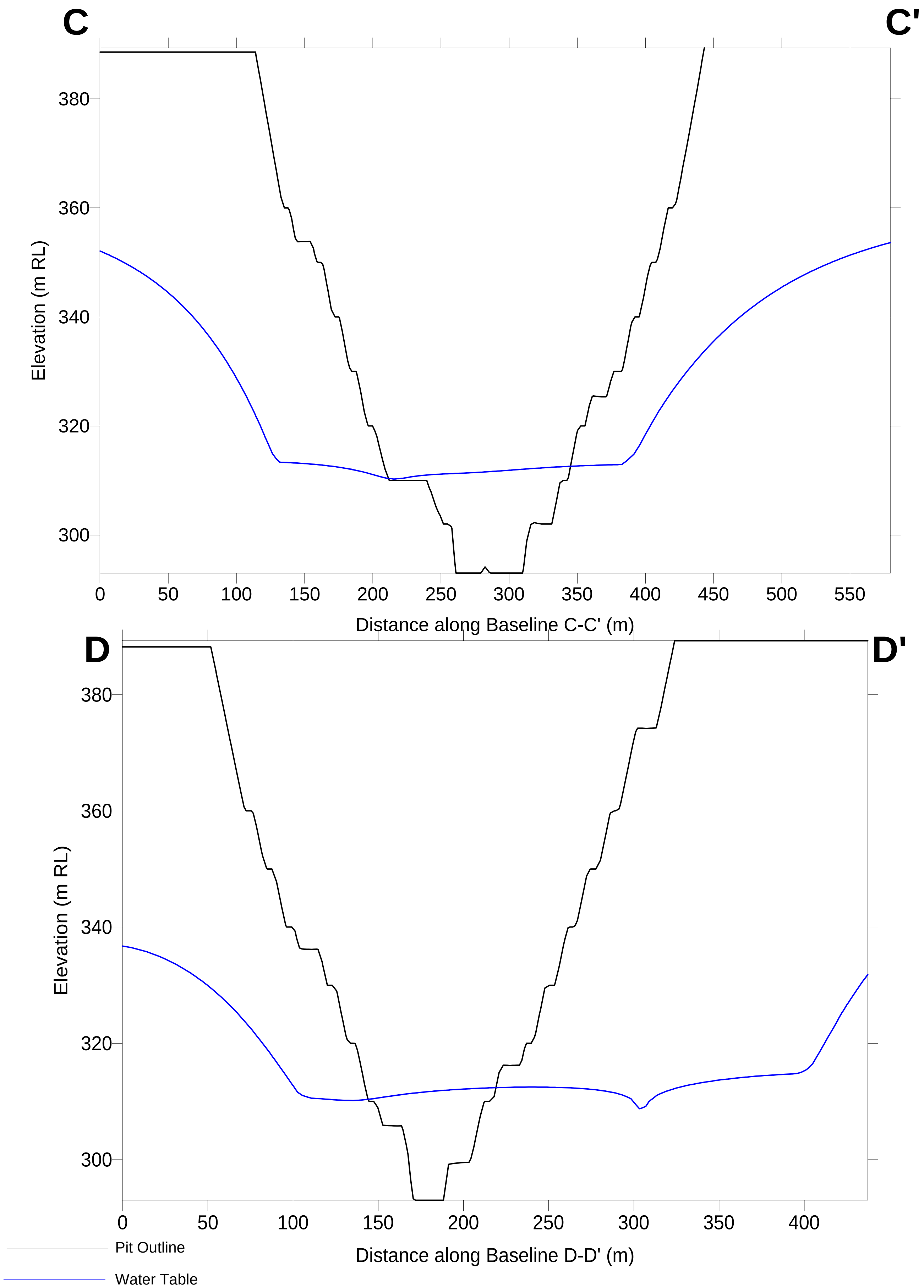
DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 270 DAYS OF DEWATERING - KOOKABURRA

Figure 25c

URS

figure11.srf

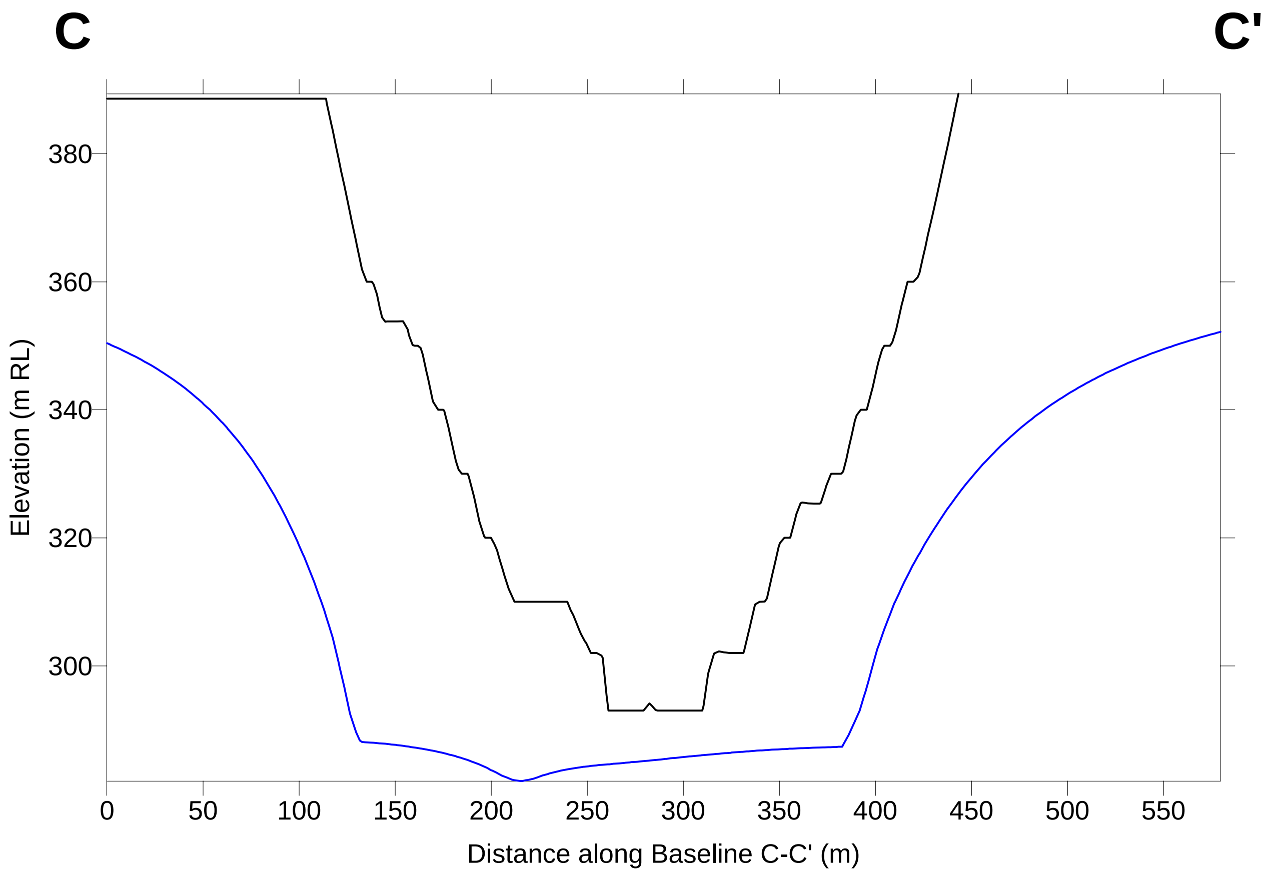


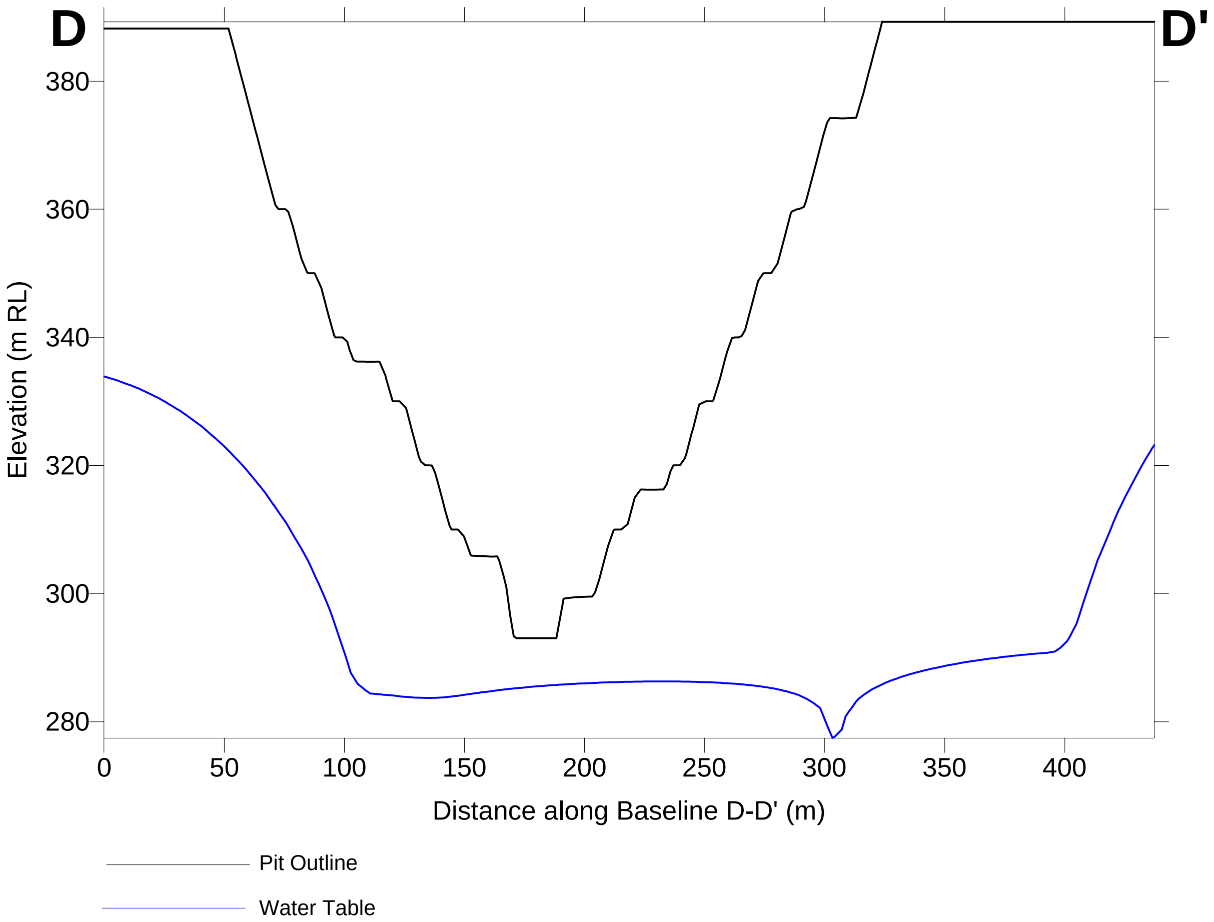
Job No.	53850-002		TANAMI GOLD NL DEWATERING FEASIBILITY INVESTIGATIONS COYOTE AND LARRANGANNI DEPOSITS **CROSS SECTIONS FOR SIMULATED DRAWDOWN AFTER 360 DAYS OF DEWATERING - KOOKABURRA**
Prep. By	AS	28/07/04	
Chk'd By	VW	28/07/04	
Revision No.		0	

Figure 25d

URS

figure11.srf





Job No.	53850-002	
Prep. By	AS	28/07/04
Chk'd By	VW	28/07/04
Revision No.		0

TANAMI GOLD NL

DEWATERING FEASIBILITY INVESTIGATIONS
COYOTE AND LARRANGANNI DEPOSITS

CROSS SECTIONS FOR
SIMULATED DRAWDOWN AFTER 415 DAYS
OF DEWATERING - KOOKABURRA

Figure 25e

URS

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figure11.srf

Appendix 7

Coyote Project Waste Management Plan

Waste and Pollution Management Plan

Coyote Project

TANAMI GOLD NL

January 2006

Table of Contents

1 Introduction

Waste will be produced from various sources throughout the duration of the Coyote Project. Waste will range from inert biodegradable materials to highly toxic and potentially polluting substances.

Tanami Gold will ensure storage facilities, transport and handling techniques meet accepted standards to minimise the potential for pollution of the surrounding environment. Emergency response procedures and appropriate training of personnel will form a vital component of the Environmental Management System.

Due to the remote location of the Project and the subsequent high cost of transportation, waste minimisation and well planned recycling efforts will be important. Waste minimisation will be achieved through education of personnel, purchasing recyclable products and reuse of waste materials where possible.

Tanami intends to develop an industry best practice waste management system with the ultimate goal of recycling or reusing all site waste. The company will engage the assistance of Ruggies Recycling to assist in maximising the efficiency of the recycling program. 50% of the money received in exchange for recyclable products will be donated to Ruggies Recycling (Princess Margaret Hospital Foundation) with the remainder being used for camp and/or local community improvement.

This Management Plan is intended to:

- Identify the types and sources of waste produced;
- Detail the methods of disposal for each identified waste product;
- Outline waste reduction methods;
- Detail monitoring requirements and methods for a number of waste products;
- Outline clean up and remediation techniques for potential spills and leaks of various waste products; and
- Set methods and targets for the reduction of waste production.

Table 1.1 lists the main waste products that will result from the Coyote operation. The potential for the product to pollute the surrounding environment is indicated. Further discussion of the waste products is included in Section 2.

Waste Product	Source	Potential for Pollution
Black water (sewage)	Camp and site toilets	Yes
Grey water	Showers, camp kitchen, crib rooms	Yes
Food waste	Kitchen, crib rooms	No
Biodegradable domestic and office waste (paper, cardboard)	Camp, crib rooms, offices, workshop, plant, stores	No
Non-biodegradable domestic and office waste (glass, aluminium, plastic, printer cartridges)	Camp, crib rooms, offices, workshop, plant, stores	No
Green waste (lawn clippings etc)	Camp	No
Oil and lubricants	Workshop, power station, operational areas.	Yes
Spilled fuel	Workshop, power station, operational areas.	Yes
Spilled chemicals	Plant	Yes
Hydrocarbon-contaminated soil	Fuel farm, power station, operational areas	Yes
Chemical-contaminated soil	Plant	Yes
Coolant	Workshop	Yes
Oil and fuel filters	Workshop	Yes
Used absorbents	Workshop	No
Scrap metals	Workshop, plant	No
Process tailings	Plant, tailings dam	Yes
Tyres	Workshop	Possible
Batteries	Workshop	Yes
Drums and containers (steel and plastic)	Workshop	No
Plastic sample bags	Exploration	Yes
Waste rock	Mining	No
Exhaust gases	Power station, vehicles	Yes

Table 1.1 Expected waste products and potential for pollution.

2 Waste Management

2.1 Black water (sewage)

Key Objective:

To ensure health and environmental issues related to the disposal of sewage waste are eliminated.

Source:

Camp and site ablution facilities.

Potential issues:

- Pathogens (viral and bacterial).
- Increased nitrogen and phosphorous levels.
- Offensive smell.

Management methods:

Biological treatment facilities will be installed at the camp and at the mine site to treat sewage waste. Treated water will be used to irrigate lawns and gardens.

The treated solid material will be removed from the system as required and transferred to the site bioremediation facility. This organic matter will assist in the breakdown of hydrocarbons in the contaminated soil that will be treated here.

2.2 Grey water

Key Objective:

To ensure no adverse environmental effects result from the disposal of grey water.

Source:

Camp and mine site ablution facilities, kitchen and crib rooms.

Potential issues:

- Increase in nitrogen and phosphorous levels in the soil and groundwater.

Management methods:

Grey water will also be directed to the sewage treatment facility. Treated water will be used to irrigate lawns and gardens.

The bore used for drinking water production at the camp will be sampled regularly to monitor the levels of nitrogen and phosphorous, indicating leaching from irrigation water at the surface.

2.3 Food waste

Key Objective:

To dispose of food waste in a manner that ensures the health of personnel and prevents access by animals.

Source:

Camp kitchen and crib rooms.

Potential issues:

- Pathogens.
- Offensive smell.
- Increase in numbers of feral species (i.e. cats) resulting from increased food availability.

Management methods:

In the short term, food waste is to be disposed of in the site landfill facility and will be covered daily to prevent access by animals.

The landfill area will be fenced with a temporary structure to prevent rubbish being blown into the surrounding environment.

In the longer term, food waste from the camp kitchen may be ground and pumped into the sewage treatment facility where it will assist in the biological treatment of sewage waste.

2.4 Biodegradable domestic and office waste

Predominately paper and cardboard.

Key Objective:

To eliminate onsite disposal of paper and cardboard by recycling.

Source:

Camp and offices.

Potential issues:

- Rubbish blowing around the site.
- High volumes of waste material going to landfill.

Management methods:

Waste paper may be disposed of in either of two ways:

1. Shredding and composting with green waste produced on site; and

2. Packaging and removing from site for recycling.

Cardboard will be compressed, packaged and removed from site for recycling.

2.5 Non-biodegradable domestic and office waste

This includes plastic, aluminium, glass, printer cartridges, polystyrene.

Key Objective:

Minimise the quantity of waste produced and ensure where ever possible that non-biodegradable materials used are recyclable.

Source:

Kitchen, wet mess, crib rooms, offices.

Potential issues:

High volumes of non-biodegradable waste material going to landfill.

Management methods:

Ensure that the packaging of purchased items are easily recyclable.

Glass is to be avoided as it is one of the most expensive products to recycle.

Aluminium cans and plastic will be compacted and baled for transport off site.

2.6 Green Waste

Key Objective:

Ensure disposal of non-native green waste, such as lawn clippings, does not result in the spread of potential weed species.

Source:

Primarily lawn.

Potential issues:

- Spread of seeds/cuttings resulting in growth of non-native species in other areas.

Management methods:

Lawn clippings are to be composted at the camp for a minimum of 3 months prior to being used in the camp gardens or disposed of in the bioremediation facility.

Thorough composting will destroy the viability of any seeds present and will produce mulch that can be used in the gardens. If disposed of in the bioremediation facility, the organic material will also assist in the remediation of hydrocarbon-contaminated soil.

2.7 Waste oils and other lubricants

Key Objective:

Prevent contamination of the surrounding environment and maximise recycling or reuse of waste oils.

Source:

Workshop and power station.

Potential issues:

- Soil and water contamination.

Management methods:

Waste oils and other lubricants are to stored in an appropriately bunded facility before being transported off site for recycling by a suitable service provider.

Methods for reusing the materials on site as a source of fuel will be investigated.

2.8 Spilled fuel

Key Objective:

Implement means of minimising the incidences of fuel spillage and ensure rapid and appropriate action is carried out for any fuel spills.

Source:

Primarily from refuelling activity.

Potential issues:

- Soil and groundwater contamination

Management methods:

Spill cleanup equipment will be readily available in all locations where refuelling occurs.

Training will be provided to all personnel in the effective use of the cleanup equipment available.

Most refuelling will be undertaken on a purpose-built concrete apron that will contain spills and direct all waste to the fuel bund.

2.9 Used engine coolant

Key Objective:

Prevent soil and groundwater contamination by ensuring adequate means of storage, handling and offsite disposal.

Source:

Workshop

Potential issues:

- Soil and ground water contamination.

Management methods:

Used engine coolant is to be stored in 205lt drums within an appropriately bunded area until it can be removed from site for treatment by a suitable service provider.

2.10 Oil and fuel filters, hydraulic hoses, used rags

Key Objective:

Ensure appropriate storage and handling of used filters.

Source:

Workshop

Potential issues:

- Hydrocarbon contamination of soil and groundwater.

Management methods:

There are two possible methods for handling of used oil and fuel filters:

1. They are to be drained and then high-temperature incinerated using a Turbo Burner; or

2. They are to be contained within a storage bin before being transported offsite for disposal by a suitable service provider.

Hydraulic hoses and used rags are to be contained within a storage bin before being transported offsite for disposal by a suitable service provider.

Examples of each of these items are pictured below.

Turbo Burner

Oil filter bin

Hydrocarbon disposal bin (rags, hoses etc)

2.11 Used absorbent materials

Key Objective:

Ensure used absorbent materials are suitably stored and treated to prevent pollution of the surrounding environment .

Source:

Workshop, fuel farm, operational areas.

Potential issues:

- Hydrocarbon contamination of soil and groundwater.

Management methods:

Organic and polypropylene absorbents are to be used on site.

Organic absorbents will be disposed of on site using bioremediation techniques. A bioremediation area will be constructed for this purpose.

Used polypropylene absorbents may be disposed of by high-temperature incineration in a Turbo Burner or off-site by a suitable service provider.

“Kitty litter” absorbents will not be permitted as they do not retain hydrocarbons when wet.

2.12 Hydrocarbon-contaminated soil

Key Objective:

Ensure rapid and effective treatment of soils contaminated by hydrocarbon spills .

Source:

Fuel farm, operational areas, wash bay, workshop.

Potential issues:

- Hydrocarbon contamination of soil and groundwater.

Management methods:

Refuelling areas, the workshop and service vehicles will be equipped with spill kits to enable quick response to fuel and oil spills. This will assist in minimising the extent of soil contamination in the event of a spill.

All site personnel will undergo basic training in the use of the materials available on site as part of the environmental induction. More advanced training may be undertaken at a later stage.

Hydrocarbon-contaminated soil is to be removed immediately and transported to the bioremediation area for disposal.

2.13 Chemical contaminated soil

Key Objective:

Ensure rapid, safe and effective treatment of soils contaminated by chemical spills.

Source:

Workshop, plant.

Potential issues:

- Chemical contamination of soil and groundwater.

Management methods:

Any areas where chemicals are to be used, stored or handled are to have suitable spill kits on hand to enable rapid response to spills that may occur.

Chemical contaminated soil is to be removed and disposed of in the tailings dam.

2.14 Scrap metals

Key Objective:

Ensure all scrap metal is recycled or reused.

Source:

Workshop, plant, construction areas.

Potential issues:

- Wasted resources.
- Unnecessary disposal in landfill.

Management methods:

A laydown area is to be designated for the sorting and storage of scrap metals.

Metals are to be sorted into the following groups:

- Aluminium;
- Copper (electrical cable, plumbing/gas fittings);
- Hardened steel (ripper boots, bucket teeth, cutting edges);
- Cast iron/steel (engine blocks, pump housings);
- Chrome magnesium steel (rams, pumps);
- General iron (roof/wall sheeting, construction materials).

Scrap metal is to be removed from site when sufficient quantities are available to make transportation cost effective. Alternatively it could be removed from site gradually as backloads.

2.15 Process tailings

Key Objective:

Ensure transfer and containment facilities are constructed and maintained to minimise the potential for impact on the environment.

Source:

Processing facility, tailings storage facility, vat leaches.

Potential issues:

- Contamination of soil and groundwater.
- Fauna deaths as a result of exposure to toxic substances.

Management methods:

Facilities are to be constructed to meet appropriate best practice standards.

Daily inspections are to be conducted of all transfer and storage facilities.

Cyanide levels in the discharged material are to be monitored to ensure they do not exceed 50ppm.

Groundwater monitoring is to be carried out at regular intervals to enable detection of seepage from the TSF and vats.

Ponding of water on the TSF will be avoided. In areas where ponding is unavoidable animal access is to be prevented (fencing, bird scarers etc).

A daily inspection of the surface of the TSF and vats is to be carried out for trapped animals. A suitable method of egress is to be installed in areas where there is high potential for animals to become trapped.

2.16 Used tyres

Key Objective:

Eliminate onsite disposal.

Source:

Workshop

Potential issues:

- Below ground tyre fires.
- Soil contamination.
- High than necessary levels of waste disposed in landfill.

Management methods:

All used tyres are to be transported offsite for appropriate disposal. It may be possible to arrange for used tyres to be taken by the provider.

2.17 Batteries

Key Objective:

Ensure safe storage of used batteries until such time that they are transported from site for recycling.

Source:

Vehicles and machinery.

Potential issues:

- Short term - Acid seepage from batteries resulting in localised soil contamination.
- Long term - Heavy metal contamination of soil.

Management methods:

Used batteries are to be stored within a suitable bunded area to prevent soil contamination. Concrete facilities are not suitable as acid leaking from batteries will react and eventually degrade the containment area. A variety of acid resistant portable bunds are available for this purpose (pictured below).

Used batteries are to be periodically removed from site for recycling by an appropriate service provider. Pallets of batteries must be plastic wrapped, securely restrained and are to remain bunded during transport.

2.18 Drums and containers

Key Objective:

Recycle drums and containers to eliminate disposal in landfill.

Source:

Workshop, kitchen.

Potential issues:

- High volume of non-biodegradable waste going to landfill.
- Contamination of soil and ground water as a result of seepage from buried containers.

Management methods:

Steel drums can be removed from site whole for recycling or reuse, or crushed and disposed of as scrap metal.

Plastic containers can be removed from site whole for recycling although it may be more economical to crush/shred them prior to transport.

2.19 PVC pipes, polyethylene pipes

Key Objective:

Eliminate disposal of PVC and poly pipes in landfill.

Source:

Construction/demolition, dewatering operations.

Potential issues:

- High volume of non-biodegradable waste going to landfill.

Management methods:

Pipes should be stockpiled for onsite reuse and/or bulk removal from site for recycling.

2.20 Waste rock

Key Objectives:

Ensure waste rock is disposed in a manner that forms a stable landform and enables progressive and effective rehabilitation of the material.

Source:

Open pits.

Potential issues:

- Erosion of the waste rock dump resulting in contamination/siltation of the surrounding area.

Management methods:

The southern and southeastern sides of the waste dump will be rehabilitated within the first few months of mining commencing.

The northern face will progressively cover the vat leaches and sections will be rehabilitated as they become available.

All unfinished surfaces are to be bunded to contain rainfall runoff. Completed areas will be contour ripped to ensure containment of runoff.

2.21 Dust

Key Objectives:

Minimise dust production.

Source:

Open pits, processing plant, roads, cleared areas.

Potential issues:

- Vegetation death.
- Safety issues (visibility).
- Health issues (inspirable dust).

Management methods:

Dust suppression of roads and hardstand areas using a water cart.

Dust suppression system fitted to crushing circuit of plant.

Vegetation retained wherever possible.

Rehabilitation of completed/obsolete areas as quickly as possible.

2.22 Exhaust gases, smoke

Key Objective:

Minimise potential health effects and Greenhouse gas emissions as a result of exhaust gases.

Source:

Vehicles, power station, machinery

Potential issues:

- Greenhouse gas emissions.
- Asphyxiation (in enclosed areas).

Management methods:

Ensure adequate ventilation where machinery operates within enclosed areas.

Burning of rubbish is not permitted.

Where adequate ventilation cannot be provided, confined space entry procedures must be in place prior to entry by personnel.

Greenhouse gas emissions can be minimised by:

- regularly servicing engines to ensure maximum efficiency from engines.
- using energy efficient appliances (i.e. hot water systems, light globes, air conditioners).
- fitting timer switches to eliminate lights, air conditioners etc being in constant use (where appropriate).
- use of low emission fuels and investigate the potential for the use of alternative fuel sources (i.e biodiesel, solar power).

2.23 Saline water

Key Objective:

Ensure the surrounding environment is not adversely impacted by saline groundwater.

Source:

Dust suppression, stand pipe, dewatering bores, transfer to evaporation pond.

Potential issues:

- Vegetation death as a result of overspray during dust suppression or spill during transfer.

Management methods:

Ensure overspray into the surrounding vegetation is avoided dust suppression on roads and hardstand areas. This will be achieved by correctly adjusting the output of the water cart and by educating operators of the effects of saline water on vegetation.

All pipelines are to be contained within a bunded area to enable containment in the event of a failure.

Saline water transfer areas such as standpipes are to be adequately bunded to contain spilled water. Spillage should be directed back to an evaporation pond or sump.

3 Waste Reduction

3.1 Recycling

Tanami aims to establish a culture whereby all waste products are recycled or reused. Ruggies Recycling will assist in development of a recycling program.

Bins for the disposal of recyclable materials will be provided in convenient locations at the camp and mine site.

3.2 Waste minimisation strategies

To assist in minimising the production of waste the following strategies will be implemented early in the Project.

- Crib packs will be supplied which will include several reusable lunch boxes, an insulated mug and a carry bag.
- A limited number of “take away” containers will be provided for short-term contractors (i.e. 4 provided with room key on check in to the camp).
- Disposable cups and plastic bags will not be provided.
- Paper bags will be provided for packing lunches etc.
- Recycling stations will be located around the camp consisting of 4 different coloured bins for the disposal of aluminium, paper, plastic and general waste.
- Education to promote waste reduction and recycling will be an important part of ensuring success of the program.
- Incentives may be offered in the form of camp improvements or social events funded by the proceeds of recycled materials.

4 Bioremediation

Bioremediation will be used for treatment of all hydrocarbon contaminated soils and biodegradable absorbent materials.

A purpose built “land farm” has been constructed for this purpose.

5 Monitoring

5.1 Mine Site Groundwater

Groundwater monitoring around the tailings storage facility, vats and evaporation ponds will be conducted monthly.

Four monitoring bores will be installed to the south and west of the mine site, as shown on Figure 1 (Coyote Mine Site Monitoring Locations).

The object of monitoring will be to determine whether seepage is occurring. Analysis will be conducted to determine levels of:

- pH;
- TDS;
- EC;
- CN (total and wad);
- Pb;
- Ni;
- Cr; and
- AS.

In addition, a full chemical analysis will be conducted annually as a comparison to the baseline data provided by URS (refer to Dewatering Feasibility Investigations, Coyote and Larranganni Deposits, October 2004). Analysis will include determination of levels of:

- pH;
- EC;
- TDS;
- Total alkalinity;
- Fe;
- Al;
- Na;
- K;
- Ca;
- Mg;
- Cl;
- OH;
- CO_3;
- HCO_3;
- Hardness;
- SO_4;
- NO_3;
- NO_2;
- Mn; and
- SiO_2

5.2 Camp Groundwater

The levels of nitrates and phosphates in the ground water near the camp will be of particular interest. Treated waste water will be used for irrigation and could conceivably leach into the water table. Groundwater monitoring will be conducted quarterly to determine Total Nitrogen and Total Phosphorous levels.

Additionally, prior to commissioning of the bore, the quality of the water will be tested as per the Australian Drinking Water Guidelines 2004. Total N and Total P will be included to provide a baseline for comparison.

6 Emergency Preparedness

Emergency response procedures for large fuel or chemical spills will form part of the site Emergency Response Plan. Basic training in the use of the spill control/cleanup equipment on site will be provided as part of the site induction.

Essentially the procedure for both chemical and hydrocarbon spills is:

- Control the spill at the source;
- Contain the spill to prevent it spreading; and
- Clean up the spill, including contaminated soil and other materials.

The materials and methods used for cleanup of each type of spill will vary depending on the nature and quantity of the product. Sufficient materials must be on hand to cater for a plausible “worst case scenario” of each product stored on site.

Safety must be taken into consideration when dealing with chemical or hydrocarbon spills.

Sand will likely be the most readily available material for the initial containment of spills and suitable machinery will be on hand to assist.

Appendix 8

Topsoil Analysis Results (SGS Environmental Laboratories)

LABORATORY REPORT COVERSHEET

DATE:	16 August 2006
TO:	Ecotec Environmental Management 3 Glenunga Way CRAIGIE WA 6025
ATTENTION:	Mr Jeremy Shepherdson
YOUR REFERENCE:	K & S Topsoil July 2006
OUR REFERENCE:	97487
SAMPLES RECEIVED:	31/07/2006
SAMPLES/QUANTITY:	1 Soil

The above samples were received intact and analysed according to your instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

JANICE TRUESDALE
Operations Manager

CLIENT: Ecotec Environmental Management **OUR REFERENCE:** 97487
PROJECT: K & S Topsoil July 2006

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	K & S Top soil/Sub soil 0-40cm July 2006 97487-1 Soil
pH (1:5)	pH Units	6.9
Electrical Conductivity @ 25^{o}C (1:5)	µS/cm	29
Nitrate-Nitrogen, NO_3-N #	mg/kg	<5
Ortho-Phosphorus, PO_4-P	mg/kg	<1

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LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
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pH (1:5)	pH Units	0.1	AN-101
Electrical Conductivity @ 25°C (1:5)	µS/cm	5	AN-106
Nitrate-Nitrogen, NO_3-N #	mg/kg	5	PEI-020
Ortho-Phosphorus, PO_4-P	mg/kg	1	PEI-015

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LABORATORY REPORT

NOTES:
LOR - Limit of Reporting.

This test is not covered by the scope of our NATA accreditation.
SGS terms and conditions are available from www.au.sgs.com

Appendix 9

Vegetation and Fauna Assessment (MBS Environmental)

Coyote and Larranganni Project Areas

Vegetation and Fauna Assessment

Prepared for:

Tanami Gold NL

August 2004

Prepared by:

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MBS ENVIRONMENTAL

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1. EXECUTIVE SUMMARY

Tanami Gold NL is proposing to develop the Coyote and Larranganni deposits in the Tanami Desert of Western Australia. The project will consist of the development of two pits, a waste dump, processing plant, camp, airstrip and supporting infrastructure at Coyote and the development of two pits (Sandpiper and Kookaburra) with waste dumps at Larranganni. Ore from Larranganni will be trucked by a 30-kilometre haul road to Coyote for processing. Tailings from the processing plant will be disposed into the Coyote waste dump.

Vegetation, habitat and fauna assessment was undertaken on the proposed project areas and haul route from 8 to 13 June 2004.

Five vegetation associations - Dunes, Sandplain, Laterite, Calcrete and Rocky hills - were recorded with seven different vegetation units occurring through out the project areas and haul road. They are Shrubland, Heathland, Herbland, Grassland, Rocky Slopes, Closed Grassland and Scrub.

The vegetation units are all common and widespread throughout the Tanami Desert and were mapped and assessed for habitat value.

There are no Declared Rare Flora or Priority species present or expected to be present.

The fauna assessment consisted of a review of available information on fauna of the region and an extended site inspection involving opportunistic trapping, spotlighting and searches within the different habitats identified. The study area lies in a biologically rich and greatly under surveyed region that potentially acts as refugia to a number of threatened species.

The site inspection revealed a diversity of habitats and landforms and enabled some predictions and conclusions to be made regarding fauna.

No amphibians were encountered at the time of the survey, although site personnel reported a number of species after rain. No amphibian species are likely to be of conservation value for this area. The reptile fauna of arid areas is typically rich and diverse. Despite this, few reptiles were encountered during the survey, which may be attributed to the timing of the survey, which was in early winter. The Black-headed Python was identified from photographs taken by site personnel and its presence confirms a range extension of this species. Other reptiles of conservation significance include the Woma Python, *Crytogama aurita* (Dragon lizard) and *Egernia kintorei* (Great Desert Skink).

Some 105 bird species may occur within the project area, of which 44 species were observed during the site inspection and five other species reported by bird watching site personnel. Nine bird species of state and federal listed conservation significance may occur in the project area. Two of these species were recorded during the site visit as Major Mitchell's Cockatoo and the Australian Bustard. In addition to these significant species, a number of the birds are listed under international conservation treaties. These species are migrants that disperse throughout the project area at various times of the year and the proposed mining development is unlikely to impact critical feeding or breeding habitat for any of these species.

A diversity of mammals is expected to occur in the region, although a large number of these are presumed extinct. Much of the mammal diversity is likely to be comprised of a number of native rodents. Few medium sized mammals have survived changed burning regimes and feral predators. Five mammal species of conservation significance that may occur in the project area are listed in the State and Commonwealth Acts. During the site visit, fresh evidence of the Bilby was found in several locations near to and on the two camp site options. There is some evidence, from sightings by site personnel, that the Spectacled Hare-Wallaby may be present in the area.

It is recommended that a detailed follow up fauna survey be undertaken to determine the status of threatened species in the area as well as characterising the faunal community that is present. The survey should be undertaken at the time when most animals are active, and spring (September to October) is recommended.

2. INTRODUCTION

2.1 BACKGROUND

As part of the Environmental Impact Assessment process being carried out for proposed developments by Tanami Gold NL in the Tanami Desert, Western Australia, MBS Environmental was commissioned to undertake a vegetation, habitat and fauna assessment of the project area.

The proposed development can be regarded in four components, namely Coyote project area, Larranganni project area, airstrip and camp infrastructure and a linking haul road.

The Coyote project will consist of one main pit, one shallower adjoining pit and an associated waste rock dump. A Carbon in Pulp (CIP) plant will be constructed and operated at Coyote and tailings will be disposed into the waste rock dump.

The Larranganni project will consist of Sandpiper and Kookaburra pits with an associated waste rock dump. Other prospective deposits at Larranganni include the Hawk and Finch deposits.

An approximately 30-kilometre haul road linking the Larranganni project to the Coyote project will be located within a 200-metre wide corridor. A camp and airstrip will be constructed close to the Coyote area.

2.2 LOCATION

Tanami Gold's Coyote and Larranganni projects are located in the Tanami Desert within the Shire of Halls Creek in Western Australia and are immediately west and adjacent to the Western Australia/Northern Territory border. The Balgo Mission is located approximately 80 kilometres south-west of the tenements. Figure 1 shows the location of the project area in relation to the Tanami road and the Northern Territory Border.

3. OBJECTIVES

The objectives of this study were to:

- Map the various vegetation units likely to be impacted by the Tanami Gold projects.
- Conduct searches of the project area for presence of declared rare and priority flora species and threatened ecological communities.
- Make observations of the habitat values of the vegetation to enable habitat types to be mapped.
- Produce a fauna list, containing both species recorded during the site inspection and species predicted to occur in the project area on the basis of known patterns of distribution and habitats present on the site.
- Identify species of conservation significance that are or may be present.
- Identify significant or sensitive habitats and locations on the site.
- Provide information to Tanami Gold to enable them to design management and mitigation measures to prevent or minimise adverse impacts on flora and fauna.

4. VEGETATION SURVEY

4.1 VEGETATION OF THE WEST TANAMI

This area of the Tanami desert has not been mapped for vegetation at a scale less than 1:1,000,000. The western Tanami region of the project areas is predominately vegetated by mixed shrub steppe on sandplain. In shrub steppe, trees are absent or rare, but there is a prolific growth of shrubs. This vegetation type intersects areas of treeless grass steppe dominated by *Triodia* (Beard and Webb 1974).

Most mixed shrub steppe species have smooth bark and are readily killed by fire and regenerate by reseeding. *Hakea lorea* and *Acacia coriacea* have thick, corky bark and can resist fire. The main groupings of mixed shrub steppe tend to occur and alternate into one another as the soil varies from coarse to light sand to laterite. *Triodia schinzii* replaces *Triodia pungens* on deeper coarser sands. Where sandhills are present, the dominant vegetation is tree steppe association of desert bloodwood and spinifex.

Mackenzie *et al*. (1983) describes the vegetation of Bishop's Dell (70 kilometres from the project areas) as well spaced dunes with an open woodland of bloodwood, over scrub of *Acacia stipuligera* and *Acacia eriopoda* over an open dwarf scrub of *Newcastelia spodiotricha* and *Gompholobium simplicifolia* over *Triodia schinzii* hummock grass. The swales contain occasional open low woodland groves of bloodwood. *Acacia stipuligera* was the dominant shrub, in places as thickets, but usually as open scrub. *Triodia schinzii* hummock grass was widespread.

Recently burnt areas (in the past one to two years) were regenerating as mixed very open herbs (*Dicrostylis exsuccosa*, *Sida* sp., *Halagnia* sp.) low grass (*Aristida browniana*) and open hummock grass (*Triodia schinzii*).

A search of the databases of the Department of Conservation and Land Management (CALM) and the Department of the Environment and Heritage (DEH) did not find any listed recordings of Declared Rare or Priority flora in the region.

4.2 METHODOLOGY

The project areas were mapped with the aid of recent aerial photographs using a combination of vehicle-based searches and foot transects (Figures 2 and 3). Due to the homogeneous nature of the vegetation traversed, it was possible to map the entire width of the 200-metre wide haul road corridor. One six-kilometre section of the haul road was not traversed due to time constraints and thick vegetation.

The vegetation survey was undertaken between 8 and 13 June 2004 by Ms Kate George (Environmental Scientist) of MBS Environmental.

GPS readings (WGS 84) were taken at each major change of vegetation unit. Regular stops were made along the route to identify and record characteristics. Each vegetation unit encountered was traversed by foot, with approximately 30 minutes being spent at each site on the haul road route and up to an hour in the vegetation units of the Coyote and Larranganni deposit areas. The vegetation unit characteristics, dominant species, soil, vegetation structure and an indication of vegetation health were recorded at each site. Samples of unknown taxa were collected, pressed and later identified by botanical taxonomist Dr Eleanor Bennett.

The vegetation survey was conducted at the level of reconnaissance survey targeting the project areas, however, due to the abundance of flowering taxa the collection effort was high and the detail of the vegetation mapping is considered to be higher than that of a reconnaissance survey as specified in EPA Guideline 51 (EPA 2004a).

The conditions for the vegetation survey were favourable due to the rains in the months earlier. A large percentage of the species encountered were in flower or retained fruits or nuts, which made identification easier. While time constraints did not allow for the whole of the 30-kilometre route to be walked, the low canopy of the vegetation and the relative homogeneity of the vegetation associations allowed for a large percentage of the mapping to be undertaken from a vehicle. As between 30 minutes and one hour was spent in each vegetation unit documenting the species present, dominant species, soil type and recording general health of the vegetation unit, the accuracy of the vegetation mapping is considered to be high.

5. VEGETATION RESULTS

A total of 119 species from 38 families and 69 genera were recorded during the survey. The most common families were Mimosaceae (12 taxa) and Poaceae (16 taxa), whilst the most commonly recorded genera was *Acacia* (12 species). There were four collections that could not be identified beyond genus and seven collections that could not be identified due to absence of flower or fruit. A full list of the species observed is contained in Appendix 1.

The native walnut (*Owenia reticulata)* (Plate 12) is of cultural significance to the Aborigines of the area was not observed on the project areas or on the haul road route. Stands of native walnut were observed on the access road to Larranganni that was not mapped. Areas of calcrete on the haul route should be thoroughly searched before clearing.

No weeds were recorded on the haul road route or either of the deposit areas, however weeds such as Gallon's Curse (*Cenchrus biflorus*) are present along the Tanami Road. Therefore, care must be taken to prevent the spread and colonisation of alien species into pristine areas.

5.1 VEGETATION ASSOCIATIONS AND UNITS

The vegetation of the project areas reflects the depth of sand, underlying substrate material, drainage and fire regime. Five main vegetation associations occur which reflect their position in the landscape and the soil type. Each of these vegetation associations is made up of a number of vegetation units.

The five vegetation associations are:

1. Dunes (small sand dunes and rises).
2. Sandplains.
3. Laterite.
4. Calcrete.
5. Rocky hills of chert and quartz.

Seven different vegetation units were recorded throughout the project areas and haul road. They are:

- Shrubland.
- Heathland.
- Herbland.
- Grassland.
- Rocky Slopes Grassland.
- Closed Grassland.
- Scrub.

The vegetation units can be further defined as the following subunits where combinations of the five main vegetation associations occur presumably due to different burning regimes:

- Grassland-Shrubland.
- Grassland-Heathland.
- Mixed Heathland, Herbland, Grassland.
- Grassland-Herbland.
- Herbland-Grassland- Shrubland.

5.1.1 Coyote Project Area

The landscape of the Coyote project area is flat with deep sands. There are no sand dunes in this area. The vegetation of the Coyote project area is predominately Sandplain vegetation association with an *Acacia* dominated Shrubland with scarce emergent *Corymbia opaca*, *Acacia coriacea* and *Eucalyptus gamophylla*. The Shrubland vegetation intercepts with *Triodia schinzii, Acacia orthocarpa* dominated Grassland-Heathland on the deeper sands of the proposed Coyote Waste Rock Dump site (Plate 1). The area appears to be recently burnt and a diverse array of herbaceous species is regenerating.

5.1.1.1 Coyote Deposit

Table 1: Summary of the Vegetation Association and Unit of the Coyote Deposit, Waypoints 81-88

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
81 - 88	Sandplain, Shrubland	Sand	Flat	Fire: <3 years Gridlines
Vegetation description				
Shrubland of *Acacia bivenosa* (3 metres) and *Acacia orthocarpa* (2 metres) over mixed *Triodia*/*Aristida* grassland. Occasional upper storey emergence of *Corymbia opaca*, *Acacia coriacea* and *Eucalyptus gamophylla*. Occasional understorey species include *Hibiscus leptocladus, Dodonaea coriacea*, *Corchorus sidoides, Dicrastylis exsuccosa, Corchorus* sp.				

5.1.1.2 Coyote Waste Rock Dump

Table 2: Summary of the Vegetation Association and Unit of the Proposed Coyote Waste Rock Dump Site, Waypoints 89-98

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
89 - 98	Sandplain, Mixed Heath/Herbland- Grassland	Sand with light laterite	Flat	Fire: <3 years Sample Bag farm Gridlines
Vegetation description				
Triodia schinzii grassland with occasional thick patches of *Jacksonia aculeata* and *Dampiera candicans*				

with a dominant low midstorey of *Acacia orthocarpa*. Occasional mid storey species include *Acacia stipuligera, A. coriacea* and *Eucalyptus kingsmillii*. Sparse emergent upper storey is dominated by *E. brevifolia* and *E. gamophylla* with occasional *Melaleuca acacioides* and *Hakea macrocarpa*. Occasional understorey species include *Acacia adoxa, Ptilotus polystachyus* var. *polystachyus, Halgania solanacea, Calytrix carinata, Schizachyrium fragile, Mollugo molluginis, Aristida contorta, Euphorbia australis, Eriachne melicacea, Senna notabilis Eriachne obtusa, Bulbostylis barbata, Sida arenicola, Dicrastylis exsuccosa, Corchorus sidoides, Ptilotus fusiformis* var. *fusiformis, Brunonia australis, Rhyncharrhena linearis, Heliotropium cunninghamii, Pluchea tetranthera* and *Scaevola parvifolia*.

5.1.2 Airstrip and Camp

The landscape of the airstrip and two camp site options is flat laterite with several slight rises and the vegetation is a predominately laterite association with *Triodia*/*Aristida* Grassland - *Acacia orthocarpa*, *Grevillea wickhamii* Shrubland. Fire regimes appear to have been the cause of thick patches of *Acacia orthocarpa* and *Grevillea wickhamii* occurring in this area. The area appears to be recently burnt leading to patches of herbaceous understorey in between hummocks.

5.1.2.1 Airstrip

Table 3: Summary of the Vegetation Association and Unit of the Proposed Airstrip Site, Waypoints 161-162

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
161b - 162	Laterite Grassland-Shrubland	Lateritic mantle	Slight rise to north	Fire: <3 years Gridlines
Vegetation description				
Triodia/*Aristida* grassland - *Acacia orthocarpa* Shrubland Mixed *Triodia ?pungens*/*Triodia schinzii*/*Aristida* grassland with patches of *Acacia orthocarpa* dominating the mid storey with occasional *Grevillea wickhamii*, *Acacia stipuligera* and *Melaleuca acacioides*. Sparse upper storey is dominated by *Eucalyptus brevifolia* to four metres with occasional *Eucalyptus gamophylla* to three metres. Occasional understorey species include *Aristida contorta*, *Dampiera candicans*, *Acacia adoxa*, *Indigofera monophylla*, *Senna sericea*, *Heliotropium pachyphyllum*, *Sida* sp., *Mirbelia viminalis*, *Stackhousia intermedia* and *Mollugo molluginis.*				

5.1.2.2 Camp Sites

Table 4: Summary of the Vegetation Association and Unit of the Camp Sites, Waypoints 163-165

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
163 - 165	Laterite Grassland-Shrubland	Lateritic mantle	Flat	Fire: <3 years
Vegetation description				
Aristida holathera grassland- *Grevillea wickhamii* shrubland *Aristida holathera* grassland with a thick mid storey patch of *Grevillea wickhamii* regenerating after a				

fire. Occasional mid storey species include *Acacia stipuligera* and *Melaleuca acacioides*. Sparse under storey is dominated by *Corymbia opaca* (4 metres) and *Eucalyptus gamophylla*. Occasional understorey species include *Aristida contorta, Dampiera candicans, Acacia adoxa, Indigofera monophylla, Senna sericea, Heliotropium pachyphyllum, Sida* sp., *Mirbelia viminalis, Stackhousia intermedia Mollugo molluginis.*

5.1.3 Haul Road (South)

The landscape of the haul road south is predominately flat with deep sands. No sand dunes are encountered. The vegetation of the haul road (south) is made up of Laterite and Sandplain vegetation associations. These vegetation associations correspond to the mixed shrub steppe described by Beard and Webb (1974) (Section 4.1). The landscape is flat with few gridlines or tracks. Patches of vegetation have been recently burnt.

Triodia ?pungens grassland with occasional patches of *Acacia orthocarpa* and *Gossypium australe* with scattered emergent *Eucalyptus brevifolia*, *Acacia coriacea*, *Grevillea wickhamii, Acacia stellaticeps* and *Acacia bivenosa* occur in the southern portion of the haul road route.

The laterite is replaced by sandy soils with *Triodia? pungens*/*Triodia schinzii* grassland or *Triodia ?pungens*/*Aristida latifolia* grassland with patches of *Indigofera brevidens*. Several vegetation units of midstorey dominated vegetation are intercepted such as *Grevillea wickhamii* dominated heathland, closed tall scrub of *Acacia lysiphloia,* and Grassland - Heathland of *Jacksonia aculeata*, *Dicrastylis doranii*, *Sida* sp., *Halgania solanacea* and *Triodia schinzii* with emergent *Dolichandrone heterophylla*.

Tables 5 to 16 summarise the vegetation associations and units of the proposed haul road in the southern portion of the proposed route with a description of the vegetation at each surveyed location. Figure 2 shows the location of each vegetation unit corresponding to the waypoint in each table.

Table 5: Laterite Vegetation Association with Grassland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoints 139-141

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
139 - 141	Laterite Grassland	Lateritic mantle	Slight rise - flat	Fire history - recently burnt
Vegetation description				
Triodia ?pungens grassland with occasional patches of *Acacia orthocarpa* and *Gossypium australe*. Scattered occasional emergent upper storey includes *Eucalyptus brevifolia* (4 metres), *Acacia coriacea* (2.5 metres), *Grevillea wickhamii* (1 metre), *Acacia stellaticeps* (0.8 metre) and *Acacia bivenosa* (0.8 metre). Occasional understorey species include *Ptilotus calostachyus, Streptoglossa macrocephala, Solanum diversifolium, Sida arenicola, Indigofera brevidens, Senna notabilis* and *Corchorus sidoides*.				

Table 6: Laterite Vegetation Association with Grassland-Herbland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoints 142-144

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
142 - 144	Laterite Grassland	Less laterite, hard soil	Less laterite, hard soil	Fire history - recently burnt
Vegetation description				
Triodia ?pungens/*Aristida latifolia* grassland with patches of *Indigofera brevidens*. Occasional scattered emergents include *Corymbia opaca* (5 metres). Occasional understorey species include *Eragrostis setifolia, Ptilotus polystachyus* var. *polystachyus, Ptilotus gomphrenoides* ssp. *conglomerates*.				

Table 7: Sandplain Vegetation Association with Grassland-Shrubland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoints 145-148

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
145 - 148	Sandplain Grassland-Shrubland	Sandy (no laterite)	Small rise - flat	None
Vegetation description				
Grassland of juvenile *Triodia schinzii*, *Triodia ?pungens*, *Jacksonia aculeate* with *Acacia bivenosa* dominating in patches only. Occasional emergent species include *Corymbia opaca* and *Acacia coriacea* ssp. *sericophylla* and *Hakea lorea* ssp. *lorea*. Occasional understorey species include *Aristida latifolia, Spermacoce auriculata Eragrostis setifolia, Hibiscus leptocladus* and *Halgania solanacea.*				

Table 8: Sandplain Vegetation Association with Grassland-Shrubland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoints 149-150

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
149 - 150	Sandplain Grassland-Shrubland	Sandy	Flat	None
Vegetation description				
Mixed grassland of *Eriachne meliacea*, *Triodia schinzii* and *Aristida latifolia* grassland with patches of *Jacksonia aculeata* and *Acacia bivenosa. Corymbia opaca* (5 metres) is the dominant emergent with occasional *Grevillea wickhamii*, *Hakea macrocarpa* and *Acacia coriacea* ssp. *sericophylla*.				

Table 9: Sandplain Vegetation Association with Grassland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoints 151-152

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
151 - 152	Sandplain Grassland	Sandy	Flat	None
Vegetation description				
Triodia schinzii dominated grassland with scattered *Corymbia opaca* (6 metres) and occasional *Hakea lorea* ssp. *lorea*, *Acacia coriacea* ssp. *sericophylla*, *Hakea macrocarpa* and *Acacia stipuligera*. Includes patches of *Acacia bivenosa* dominated mid storey and *Grevillea wickhamii* dominated mid storey.				

Table 10: Sandplain Vegetation Association with Grassland-Heathland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoints 153-154

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
153 - 154	Sandplain Grassland-Heathland	Sandy	Flat	None
Vegetation description				
Triodia? pungens/*Triodia schinzii* grassland with patches of dominant low *Jacksonia aculeata* with emergent *Corymbia opaca* and *Acacia coriacea* ssp. *sericophylla*.				

Table 11: Sandplain Vegetation Association with Heathland-Grassland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoints 155-156

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
155 - 156	Sandplain Heathland- Grassland	Sandy	Flat	None
Vegetation description				
Grevillea wickhamii (1.5 metres) dominated heathland over a mixed grassland (*Triodia schinzii*, *Triodia pungens* and *Eriachne meliacea*) with patches of *Acacia bivenosa* dominating the mid storey in places. Occasional mid storey includes low *Corymbia opaca*, *Hakea lorea* ssp. *lorea*, *Hakea macrocarpa*, *Eucalyptus kingsmillii*, *Grevillea eriostachya* and *Grevillea refracta*. Emergent species include *Acacia coriacea* with occasional *Eucalyptus gamophylla*. Occasional understorey species include *Aristida contorta, Jacksonia aculeata, Streptoglossa macrocephala, Dicrastylis* ex*succosa, Byblis filifolia* and *Sida* sp.				

Table 12: Sandplain Vegetation Association with Heathland-Grassland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoint 157

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
157	Sandplain Heathland-Grassland	Sandy	Flat	None
Vegetation description				
Grevillea wickhamii (1.5 metres) dominated heathland over a mixed grassland (*Triodia*? *pungens* and *Eriachne meliacea*) with occasional midstorey of *Grevillea eriostachya, Acacia orthocarpa and Grevillea refracta*. Occasional understorey species include *Jacksonia aculeata, Dampiera candicans,* and *Ptilotus calostachyus*.				

Table 13: Sandplain Vegetation Association with Grassland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoint 158

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
158	Sandplain Grassland	Sandy	Flat	None
Vegetation description				
Triodia ?pungens/*Eriachne meliacea* dominated grassland with occasional tall *Corymbia opaca* (8 metres) and occasional *Eucalyptus gamophylla*, *Acacia coriacea* ssp. *sericophylla* and *Grevillea wickhamii*.				

Table 14: Sandplain Vegetation Association with Closed Tall Scrubland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoint 159

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
159	Sandplain Closed Tall Scrubland	Sandy	Flat	None
Vegetation description				
Closed tall scrub of *Acacia lysiphloia* with occasional understorey of *Triodia ?pungens*.				

Table 15: Sandplain Vegetation Association with Grassland-Shrubland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoint 160a

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
160a	Sandplain Grassland-Shrubland	Sandy	Flat	None
Vegetation description				
Triodia? pungens/*Eriachne meliacea* dominated grassland with patches of *Acacia lysiphloia* with occasional tall *Corymbia opaca* and occasional *Eucalyptus gamophylla*, *Acacia coriacea* ssp. *sericophylla* and *Grevillea wickhamii*.				

Table 16: Sandplain Vegetation Association with Heathland-Grassland Vegetation Unit of the Proposed Haul Road, Southern Section, Waypoint 160b

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
160b	Sandplain Heathland-Grassland	Sandy	Flat	None
Vegetation description				
Heathland of *Jacksonia aculeata*, *Dicrastylis doranii*, *Sida* sp., *Halgania solanacea* and *Triodia schinzii* grassland with emergent *Dolichandrone heterophylla* and occasional *Acacia coriacea* ssp. *sericophylla*, *Gyrosteman tepperi* and *Acacia stellaticeps*.				

5.1.4 Haul Road (North)

The landscape of the haul road (north) is predominately flat in between occasional sand dunes. The vegetation of the haul road (north) is made up of predominately Sandplain, Calcrete and Sand Dune associations. Treeless *Triodia schinzii* dominated Closed Grassland in the northern portion of the haul road route corresponds to Beard and Web's (1974) grass steppe vegetation type (Section 4.1) (Plate 13). As the haul road route runs to the south, shrubs and small trees intrude into the vegetation and the grassland changes to mixed *Acacia* Shrubland-Heathland - mixed *Triodia/Eriachne melicacea* grassland.

Two low Sand Dune associations are traversed and the vegetation is characterised by Grassland-Herbland vegetation units with *Triodia schinzii*/*Newcastelia spodiotricha* co-dominated understorey. The Calcrete vegetation association is characterised by the vegetation units Grassland and Grassland-Heathland with *Triodia* grassland with stunted upperstory of *Acacia stipuligera*, *Grevillea wickhamii*, *Hakea macrocarpa* and patches of low *Indigofera brevidens*. The Lemonwood *Dolichandrone heterophylla* was recorded growing on top of these rises.

Tables 17 to 23 summarise the vegetation associations and units of the proposed haul road in the northern portion of the proposed route with a description of the vegetation at each surveyed location. Figure 3 shows the location of each vegetation unit corresponding to waypoint each table.

Table 17: Sandplain Vegetation Association with Closed Grassland Unit of the Proposed Haul Road, Northern Section, Waypoint 120-125

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
120 - 125	Sandplain Closed Grassland	Sandy	Flat	None
Vegetation description				
Triodia schinzii dominated closed grassland with rare mid storey and occasional sparse low (less than 2 metres) emergence species. Occasional small patches of *Acacia orthocarpa* co-dominate with *Triodia schinzii*. Occasional understorey species include *Eriachne ciliata, Eragrostis cumingii, Sporobolus australasicus, Flaveria australasica, Corchorus sidoides, Mimulus uvedaliae var. uvedaliae, Trianthema triquetra, Portulaca oleracea* and *Gossypium australe*.				

Table 18: Sandplain Vegetation Association with Tall Shrubland Unit of the Proposed Haul Road, Northern Section, Waypoint 126-127

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
126 - 127	Sandplain Tall Shrubland	Sandy	Flat	None
Vegetation description				
Acacia coriacea, *Acacia stipuligera* tall shrubland over *Triodia schinzii* with occasional *Melaleuca acacioides* and *Acacia translucens*.				

Table 19: Sandplain Vegetation Association with Grassland-Shrubland Unit of the Proposed Haul Road, Northern Section, Waypoint 128

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
128	Sandplain Grassland-Shrubland	Sandy	Flat	None
Vegetation description				
Mixed *Triodia ?pungens*/*Triodia schinzii* grassland with thick patches of *Acacia lysiphloia* shrubland with occasional *Grevillea wickhamii* and *Melaleuca acacioides*. Occasional understorey species include *Acacia translucens*, *Jacksonia aculeata, Streptoglossa macrocephala*.				

Table 20: Calcrete Vegetation Association with Grassland Unit of the Proposed Haul Road, Northern Section, Waypoints 129-131

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
129 - 131	Calcrete Grassland	Hard soil	Sloping	None
Vegetation description				
Triodia pungens/*Triodia schinzii* grassland with occasional *Acacia stipuligera*, *Grevillea wickhamii* and *Hakea macrocarpa*. Occasional understorey species include *Flaveria australasica Streptoglossa macrocephala, Acacia translucens*.				

Table 21: Calcrete Vegetation Association with Grassland-Heathland Unit of the Proposed Haul Road, Northern Section, Waypoints 132-133

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
132 - 133	Calcrete Grassland-Heathland	Rock outcrop (calcrete?), hard soil	Rise	Black cryptogamic crust in inter-patches. Large termite mounds
Vegetation description				
Triodia schinzii grassland with low *Acacia stellaticeps* (80 centimetres) and low *Acacia coriacea* ssp. *sericophylla* (1 metre).				

Table 22: Sand Dune Vegetation Association with Grassland-Herbland Unit of the Proposed Haul Road, Northern Section, Waypoints 134-136

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
134 - 136	Sand Dune Grassland-Heathland	Sandy	Top of sand dune	None
Vegetation description				
Grassland-Herbland with *Triodia schinzii*/*Newcastelia spodiotricha* co-dominated under storey. Occasional mid storey of *Acacia bivenosa* and *Grevillea wickhamii* with scattered emergent *Grevillea eriostachya* and *Acacia coriacea* ssp. *sericophylla*. Occasional understorey species include *Stylidium inaequipetalum*, *Acacia wiseana*, and *Byblis filifolia*.				

Table 23: Calcrete Vegetation Association with Herbland-Grassland-Shrubland Unit of the Proposed Haul Road, Northern Section, Waypoints 137-138

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
137 - 138	Calcrete Herbland-Grassland-Shrubland	Rock outcrop (calcrete)	Sloping	None
Vegetation description				
Open Herbland of *Indigofera brevidens* over *Triodia schinzii* with occasional low emergence of *Acacia coriacea* ssp. *sericophylla* (1 metre), *Hakea macrocarpa* (2 metres), *Corymbia opaca* (1 metre). Occasional patches of *Acacia stipuligera* and *Acacia stellaticeps*. Scattered *Dolichandrone heterophylla* grows on the top of the rise. Occasional understorey species include *Ptilotus arthrolasius*.				

One six-kilometre section of the haul route between waypoints 138 and 160b was not traversed due to time constraints and thick vegetation. Interpretation from the aerial photograph defines this unit as Sandplain, Grassland, Heathland on a Sand Plain vegetation association.

5.1.5 Larranganni Project Area

The landscape of the Larranganni project area is flat sandplain with outcropping rocky hills. In general, the vegetation of the Larranganni project area is made up of predominately Rocky Hills, Sandplain and a small area of Laterite association. Table 24 to 26 summarise the vegetation associations and units of the two deposits and waste rock dump (Figure 3).

5.1.5.1 Kookaburra

The Rocky Hill association at the Kookaburra deposit is characterised by the Grassland Rocky Slopes vegetation unit. *Triodia ?pungens* grassland dominates with very occasional emergent *Eucalyptus brevifolia* (Plate 4). Occasional understorey species occur in the inter-patches. The Kookaburra deposit area has been disturbed by gridlines.

Table 24: Summary of the Vegetation Association and Unit of the Kookaburra Deposit, Waypoints 114-116

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
114 - 116	Rocky Hills Grassland Rocky Slopes	Lateritic mantle	Rocky outcropping rise	Gridlines
Vegetation description				
Triodia? pungens grassland with very occasional emergent *Eucalyptus brevifolia*. Occasional under storey species occurring in the inter-patches include *Portulaca oleracea*, *Pterocaulon sphacelatum*, *Eragrostis setifolia*, *Sida fibulifera*, *Ptilotus exaltatus*, *Mollugo molluginis*, *Schizachyrium fragile* and *Bulbostylis barbata*.				

5.1.5.2 Larranganni Waste Rock Dump

The combination of the Sandplain-Laterite vegetation association on the Larranganni Waste Rock Dump site is characterised by the Herbland-Grassland vegetation unit. *Triodia pungens* dominated grassland with thick patches of *Tephrosia uniovulata* dominates the area (Plate 5). The Larranganni Waste Rock Dump area has been disturbed by gridlines.

Table 25: Summary of the Vegetation Association and Unit of the Proposed Larranganni Waste Rock Dump Site, Waypoints 117-119

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
117 - 119	Sandplain - Laterite plain Herbland-Grassland	Light lateritic mantle	Flat	Gridlines
Vegetation description				
Triodia pungens dominated grassland with thick patches of *Tephrosia uniovulata* (up to 80%) to 1.2 metres. Under storey diversity is limited in the *Triodia* dominated areas. Diversity is higher in *Tephrosia* patches with species such as *Mollugo molluginis*, *Acacia orthocarpa*, *Eragrostis setifolia*, *Ptilotus calostachyus*, *Ptilotus fusiformis* var. *fusiformis*, *Polycarpaea corymbose* var. *corymbose*, *Digitaria brownii* and *Bulbostylis barbata*.				

5.1.5.3 Sandpiper Deposit

The Sandplain vegetation association of the Sandpiper deposit is dominated by the Open Shrubland vegetation unit. This vegetation unit is characterised by tall to low open *Acacia lysiphloia* Shrubland over *Triodia ?pungens* understorey with sparse emergence of *Eucalyptus brevifolia* (Plate 6). The Sandpiper area has been disturbed by gridlines (Plate 7).

Table 26: Summary of the Vegetation Association and Unit of the Sandpiper Deposit, Waypoints 110-113

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
110 - 113	Sandplain Open Shrubland	Sandy	Flat	Gridlines
Vegetation description				
Tall to low open *Acacia lysiphloia* shrubland over *Triodia? pungens* under storey with sparse emergence of *Eucalyptus brevifolia*. Occasional under storey species include *Gossypium australe*, *Ptilotus calostachyus*, *Aristida latifolia*, *Mollugo molluginis*, *Cymbopogon bombycinus*, *Acacia adoxa*, *Sporobolus australasicus*, *Polycarpaea corymbose* var. *corymbose*, *Hybanthus enneaspermus*, *Eriachne ciliata*, *Digitaria brownii*, *Acacia orthocarpa*, *Sida fibulifera*, *Ptilotus fusiformis* var. *fusiformis*, *Corchorus sidoides*, *Tephrosia* sp. Bungaroo Creek, *Goodenia microptera*, *Halgania solanacea*, *Solanum diversifolium* and *Dampiera candicans*. Areas of bare soil are present.				

5.1.6 Hawke Hill Prospect

The Rocky Hills vegetation association on the Hawke Hill prospect is characterised by the Grassland Rocky Slopes vegetation unit (Table 27). This vegetation unit differs from Kookaburra as it is *Triodia intermedia* dominated with very occasional *Acacia adsurgens* and

Acacia victoriae on upper and mid-slopes respectively (Plates 8 and 9). The Hawke Hill area has been disturbed by gridlines.

Table 27: Summary of the Vegetation Association and Unit of the Hawke Hill Deposit, Waypoints 99-107

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
99 - 107	Rocky Hills Grassland Rocky Slopes	Outcropping chert and quartz	Hill	Gridlines
Vegetation description				
Grassland of *Triodia intermedia* dominated rocky hill with very occasional *Acacia adsurgens* and *Acacia victoriae* on upper and mid-slopes respectively. On the lower slopes, within the inter-patches between *Triodia intermedia* clumps of various understorey species occur such as *Fimbristylis? microcarya*, *Sporobolus australasicus*, *Aristida contorta*, *Polycarpaea corymbosa* var. *corymbosa*, *Fimbristylis simulans* and *Enneapogon polyphyllus.* These species predominately occur in the patches on the lower slope, with few understorey species in the patches between the spinifex clumps. Occasional emergents include *Grevillea wickhamii* (3 metres), *Acacia bivenosa* (2.5 metres) and *Eucalyptus brevifolia*. Occasional understorey species include *Portulaca oleracea, Trianthema oxycalyptra* ssp *oxycalyptra, Enneapogon polyphyllus, Trianthema triquetra, Sclerolaena cornishiana, Sida fibulifera, Dodonaea coriacea, Pluchea tetranthera, Pterocaulon serrulatum, Mollugo molluginis,* and *Maireana georgei.*				

5.1.7 Finch Prospect

The Sandplain vegetation association on the Finch prospect is characterised by the Closed Grassland vegetation unit (Table 28). This area is dominated *Triodia schinzii* grassland with no trees or shrubs and large termite mounds (Plate 10). The Finch area has been disturbed by gridlines.

Table 28: Summary of the Vegetation Association and Unit of the Finch Deposit, Waypoint 121

Waypoint	Vegetation Association and Unit	Soil	Aspect	Disturbance
121	Sandplain Closed Grassland	Sand with mantle.	Flat	None
Vegetation description				
Closed *Triodia schinzii* grassland (80-100% cover) with occasional under storey species in rare inter-patches such as *Flaveria australasica*. No emergence or mid storey.				

6. FAUNA ASSESSMENT

6.1 METHODOLOGY

The fauna assessment consisted of a review of available information on fauna of the region and an external site visit undertaken between 8 and 13 June 2004 by Mr Robert Davis (Zoologist) of Western Wildlife and Ms Kate George (Environmental Scientist) of MBS Environmental. Fauna work carried out in the field included:

- Opportunistic trapping for mammals and reptiles was undertaken at three sites.
- Bird surveys undertaken at all sites.
- Intensive searching for tracks, scats, burrows, diggings and other evidence of vertebrate fauna.
- Spotlighting for nocturnal reptiles, birds and mammals.
- Use of an ultra-sonic detector to record the calls of bats.
- Searching for reptiles, under dead spinifex, in sand piles, under leaf litter and in fallen timber.
- The keeping of opportunistic records at all times.

The fauna assessment was conducted at the level of reconnaissance survey targeting the proposed project areas as specified in EPA Guideline 56 (EPA 2004b). The study sites are listed in Table 29 and locations (Site Codes 1 to 19) are shown in Figure 2.

6.1.1 Opportunistic Trapping for Reptiles and Mammals

Cage and Elliott traps were set opportunistically at three study sites for one night. The trap effort at the three sites is summarised in Table 30.

All traps were baited with universal bait (a mixture of rolled oats, peanut butter and sardines) and cages were covered with a hessian bag for shelter. The results of this trapping exercise are provided in Table 2.1 of Appendix 2. As there are few specimen records from the Tanami and the taxonomy of some species in the area is in doubt, a single specimen of each species captured was lodged with the WA Museum for verification. All trapping and collection was carried out under a Licence to Take Fauna for Scientific Purposes (SF004581) issued to Zoologist Robert Davis.

Table 29: Location and Description of Study Sites

Site	Site Code	Description	Latitude & Longitude
Coyote Waste Rock Dump	1	Spinifex grassland with occasional thick patches of *Jacksonia* sp. and *Dampiera sp.* with a dominant low midstorey of *Acacia.*	S19°53.5455' E128°49.9448'
Coyote Pit	2	Spinifex understorey with *Acacia* to two metres and emergent *Eucalyptus* spp. Regrowing from recent fire (last three years). Some dense *Acacia* and *Grevillea wickhami* (flowering) thickets	S19°53.9521' E128°49.9382'
Hawk Hill	3	A small, open stony hill with dense spinifex, and sparse *Acacia*. Drainage line with some small Eucalypts.	S19°34.6105' E128°51.7681'
Finch Prospect	4	Open Spinifex sandplain with termite mounds. No trees.	S19°37.3802' E128°51.6612'
Larranganni Camp	5	Spinifex with emergent mature *Eucalyptus* and thickets of peas to 1.5 metres.	S19°34.7804' E128°52.0977'
Larranganni Access Road 1	6	Emergent *Corymbia* (with hollows), medium shrubs over Spinifex with a small calcrete ridge with loose rocks	S19°47.6715' E128°33.2197'
Larranganni Access Road 2	7	Scattered shrubs and *Corymbia* over Spinifex.	S19°44.4234' E128°36.3993'
Haul Road North 1	8	Open Spinifex sandplain with termite mounds. No trees.	S19°39.2337' E128°53.0362'
Haul Road North 2	9	Small sand ridge with *G. wickhamii* and dense shrubs over spinifex	S19°40.1797' E128°53.2855'
Haul Road Centre	10	Chenopod-like shrubs over Spinifex with four metre tall open woodland	S19°43.6076' E128°54.5078'
Haul Road South 1	11	Scattered shrubs and *Eucalyptus* over Spinifex.	S19°36.6422' E128°51.6872'
Haul Road South 2	12	Recently burnt and dead shrubland with one metre high thickets of red flowering peas	S19°52.0936' E128°50.9381'
Haul Road South 3	13	*Acacia thicket on sandplain,* recently burnt with dead branches and 1.5 meter high thicket of *Gossypium*.	S19°51.8345' E128°51.0373'
Haul Road South 4	14	*Acacia* thicket on sandplain, recently burnt with dead branches and 1.5 meter high thicket of Gossypium.	S19°51.6392' E128°51.1029'
Haul Road South 5	15	Dense thickets of *G. wickhamii* and *Acacia* with tall mature *Corymbia* and *Eucalyptus* spp.	S19°50.7699' E128°51.2821'
Preferred Campsite	16	Dense thickets of *G. wickhamii* to 1.5 metres, few termite mounds, deep red sands and mature Eucalyptus spp.	S19°53.7764' E128°51.3905'

Site	Site Code	Description	Latitude & Longitude
Alternative Campsite	17	Dense thickets of *G. wickhamii* to three meters, few termite mounds, deep red sands	S19°53.8795' E128°51.8469'
Existing Balwina Camp	18	Set amongst shrubland on Spinifex with mature Eucalyptus emergent	S19.90548 E128.75617
Airstrip	19	Stony plain with Spinifex, low Acacia shrubs and emergent *Eucalyptus* and *Corymbia*. Small subtle rises with pockets of deep red sands.	S19°53.4592' E128°51.5316'

It should be recognised that this trapping exercise was entirely opportunistic and does not constitute a comprehensive fauna survey. However, despite its limitations, it did result in the capture of three mammal species that may not have otherwise been recorded during the site inspection.

Table 30: Trap Effort on the Tanami Gold Project Areas

Date	Location	#Elliott traps	# Cage traps	# trap-nights
8/6/04	Coyote Waste Rock Dump	25	5	30
9/6/04	Hawk Hill	25	0	25
9/6/04	Finch Prospect	25	2	27

6.1.2 Bird Surveys

Bird surveys were undertaken at each site visited (Table 31). Survey duration ranged from one to approximately four hours dependent on the size of the site. During surveys, all habitat types within the study area were traversed on foot and all bird species encountered were recorded.

Table 31: Bird Survey Dates and Times

Site	Survey Date	Survey Time
1	8/6/04	0935-1340
2	9/6/04	0640-1100
3	10/6/04	1030-1330
4	10/6/04	1510-1645
5	9/6/04 - 10/6/04	Opportunistic
6	9/6/04	1400-1440
7	11/6/04	1600-1620
8	11/6/04	1100-1120
9	11/6/04	1410-1440
10	12/6/04	1500-1530
11	12/6/04	0800-0840
12	12/6/04	0920-0940
13	12/6/04	0955-1025
14	12/6/04	1030-1120
15	12/6/04	1220-1300
16	13/6/04	0855-0915
17	13/6/04	No survey
18	7/6-13/6/04	Opportunistic
19	13/6/04	0734-0834

6.1.3 Spotlighting

Spotlighting for vertebrate fauna was undertaken at or in the vicinity of most study areas. Spotlighting was undertaken from a slow moving vehicle travelling at approximately 10 kilometres per hour. In addition, areas at Coyote and Larranganni were traversed on foot with a headtorch to look for nocturnal fauna. The results of spotlighting are listed in Table 2.2 of Appendix 2.

6.1.4 Bat Surveys

Bats were surveyed on 9 June 2004 at Larranganni with a hand-held Anabat II ultrasonic bat detector. Ultrasonic calls of a bat heard through the detector were recorded for later analysis in the hope that the species could be identified.

6.1.5 Searching for Reptiles

Due to the time of year, reptile activity was low. Intensive searching for reptiles was undertaken. This primarily focussed on dead spinifex along the edges of tracks, as a lot of reptile species shelter under spinifex, whilst the clumps of spinifex along the sides of tracks provide good shelter for reptiles and are readily accessible. Mounds of loose sand and pieces of wood also provided a focus for reptile searches. Hand searching for reptiles was carried out opportunistically in all areas and any active reptiles were hand-captured.

6.1.6 Opportunistic Surveys

At all times, observations of fauna were noted when they contributed to the accumulation of information on the fauna of the area. These included such casual observations as birds seen while we were travelling between sites.

6.1.7 Sources of Information

As a site inspection cannot be expected to record all species present in an area, particularly when it takes places in only one season, the observations were supplemented with records from a number of sources. These included publications that provide information on general patterns of distribution of amphibians (Tyler *et al.* 2000), reptiles (Storr *et al.* 1983, 1990 and 1999, 2002), birds (Johnstone and Storr 1998) and mammals (Strahan 1995). In addition, specimen records of frogs, reptiles and mammals held by the Western Australian Museum were obtained for the region bounded by 19^{o} 00' to 20^{o} 30'S, and 128^{o} 00' to 129^{o} 30'E. Birds Australia's Atlas database was also searched for the area 19^{o} 00' to 20^{o} 00' S and 128^{o} 00' to 129^{o} 00' E.

For additional information and records on threatened species, the DEH protected matters search tool and the threatened fauna database maintained by CALM were searched.

These sources of information were used to create lists of species expected to occur at the site. As far as possible, expected species are those that are likely to utilise the project area, and such lists exclude species that have been recorded in the general region as vagrants or for which suitable habitat is absent. Particularly among the birds, for example, vagrants can be recorded almost anywhere.

Taxonomy and nomenclature for fauna species used in this report generally follow the Western Australian Museum (2001) for amphibians, reptiles and mammals, and Christidis and Boles (1994) for birds.

For the determination of conservation significance, the conservation status of fauna species is assessed under Federal and State Acts such as the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) and the Western Australian Wildlife Conservation Act 1950. These use levels of significance recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN) and reviewed by Mace and Stuart (1994), although the Western Australian Act also has a category of "Other Specially Protected Fauna" that has no equivalent IUCN level. In addition, the DEH has supported the publication of reports on the conservation status of reptiles (Cogger *et al.* 1993) and birds (Garnett and Crowley 2000), while the Threatened Species and Communities Section of Environment Australia has produced a list of Threatened Australian Fauna (DEH 2004). These publications also use the IUCN categories, although those used by Cogger e*t al.* (1993) differ in some respects as this report pre-dates Mace and Stuart's review.

In Western Australia, CALM has produced a supplementary list of Priority fauna, being species that are not considered Threatened under the IUCN categories but for which the Department feels there is cause for concern.

In addition to the assessment of fauna under the CALM Priority list and the IUCN categories, some fauna are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA) and the Japan Australia Migratory Bird Agreement (JAMBA). Species listed under these agreements are mostly migrants that spend part of the year in each country, although some of the species are non-migrants but occur in both countries. Species that are not listed under any of the above categories can be considered of regional significance if they are at the limit of their distribution or are common but within a very restricted range.

6.2 HABITATS

In terms of fauna habitat, a great diversity of landforms and vegetation types were observed. Most importantly for fauna, no ranges, large hills or caves were located directly in the study area.

The primary fauna habitats observed at a landscape level were:

- *Triodia* (Spinifex) dominated sandplains with high densities of termite mounds to three metres (Finch prospect).
- *Acacia* and *Grevillea* dominated sandplain with thickets to three metres high and emergent *Eucalyptus* spp. (proposed camp site, Coyote).
- Small sand ridges with a dense cover of *Acacia*, *Grevillea* and *Triodia* (haul road).
- *Triodia* sandplain with patches of *Corymbia* woodland (haul road and road to Larranganni).
- Small stony rises dominated by *Eucalyptus* and *Corymbia* (airstrip).

Each of these major habitat types was visited during the site inspection.

6.3 FAUNA RESULTS

The fauna species expected or observed to occur within the general region of the Tanami study area, based on general patterns of distribution, are listed in Appendix 2 (Table 2.3 Amphibians, Table 2.4 Reptiles, Table 2.5 Birds and Table 2.6 Mammals) and indicate those recorded by the Western Australian Museum, Birds Australia (birds only) and those that were recorded during the June 2004 site inspection. A list of species that previously occurred in the area, but are now locally or regionally extinct is also included in Appendix 2 (Table 2.7).

6.3.1 Amphibians

Although there is no perennial source of surface water in the study area, a number of rainfall-responsive (explosive breeding) amphibians may be present after summer rainfall events

(Table 2.3 of Appendix 2). The majority of frogs present are likely to be burrowing species such as *Cyclorana*, that spend the dry months encased in a protective cocoon below ground, emerging only after significant rainfall. Others such as the Bilingual Froglet are usually found around damp areas and shelter under logs, rocks and leaf litter during the dry season. Species such as the Bilingual Froglet and Desert Treefrog may persist around areas of human habitation where water collects (eg. dams near campsite). The majority of species can only be accurately surveyed when they emerge to breed in roadside pools or puddles that form after rainfall events.

No amphibians were encountered during surveys due to the absence of pooled surface water, although accounts from Tanami Exploration personnel (Mr Jim Anderson of Balwina Base Camp) indicate that there are a number of frog species present after rain. Although no amphibian species present are likely to be of conservation concern, the area is poorly surveyed for amphibia and new species or range extensions may easily occur (J D Roberts, pers. comm.).

6.3.2 Reptiles

The reptile fauna of arid areas is typically rich and diverse (Table 2.2 of Appendix 2). Most habitats in the study area are likely to be equally diverse in reptiles, with species diversity being closely associated with microhabitat type. Primary habitat for reptiles in this region will comprise Spinifex tussocks, deep sands for burrowing species, rocky areas and tree hollows and bark for geckos such as the Tree Delta. A number of reptile species such as the Spotted Gecko (*Gehyra punctata*) may occur around rocky areas in the region, but these have been excluded due to the absence of major rock outcrops in the study areas.

The site survey was undertaken during early winter and consequently, few reptiles were encountered, with the exception of two Sandplain Geckoes, a common species that was spotlit near Larranganni and vouchered with the Western Australian Museum (Table 2.4 of Appendix 2) Additionally, a dragon (*Ctenophorus nuchalis*) was hand-captured at Balwina camp and was observed to be common in most areas surveyed. The Dragon lizard *Diporiphora lalliae* was also observed and captured around Larranganni (Museum number R157731) and also at the site of the proposed airstrip and several other localities.

An interesting report was that of Black-headed Pythons inhabiting the Larranganni area. There were several sightings by Tanami exploration personnel, with the most recent occurring at Larranganni on 11 June 2004 by project geologist Mr Luc English and other Tanami Gold personnel working at Larranganni. Tanami Gold personnel including Mr English described the sighting to Zoologist Mr Rob Davis and Environmental Scientist Ms Kate George who were elsewhere on the project area undertaking the vegetation and fauna assessment. Photographs taken of the python by Mr English were later submitted to Mr Davis who confirmed the individual as a Black-headed Python. The photographs have been accepted by the Western Australian Museum as an official record on Fauna Base. Plates 19 and 20 show the Black-headed python observed at Larranganni. Whilst these pythons are known to occur in the southern Kimberley and Pilbara, there have been no records from the Western Australian Tanami region and confirmation of their presence is a range extension for this species.

A number of reptiles of conservation significance may occur in the study areas namely:

- The Woma Python is listed as "Specially Protected Fauna" under the *Western Wildlife Act* 1950. It is a resident of arid grasslands and is likely to occur in the study area.
- *Cryptogama aurita* is a dragon lizard listed as Priority One by CALM, defined as "Taxa with few, poorly known populations on threatened lands". This species is poorly collected with its distribution centred on the Tanami.
- The Great Desert Skink is listed as Vulnerable under both State and Federal legislation. This species was presumed extinct until recent decades and is now known to occur at a number of localities in the arid centre of WA, NT and SA where it inhabits sandy areas in small colonies. The study area may provide suitable habitat for this species.

Reptiles can only adequately be surveyed at the time when they are most active, which is usually in spring or autumn (M. Bamford, pers. comm.). Such a survey would provide a better understanding of the distribution and relative abundance of species in the project area and the likely impact of the proposed mine on them.

6.3.3 Birds

In total, 105 species of bird are expected to occur in the study area (Table 2.5 of Appendix 2) of which 44 species were observed during the site inspection (Table 32). Waterbirds that rely on freestanding water for breeding and feeding have been excluded although it should be noted that they might occur after heavy rainfall events when local flooding occurs.

Several species not recorded on the survey were known to be present from discussions with birdwatcher Jim Andersen of Tanami Gold. These include Galah, Royal Spoonbill, Barn Owl and Spiny-cheeked Honeyeater. A road-killed Southern Boobook was also found on the Tanami Track, approximately 100 kilometres west of the mine. The expected list includes some species that may only visit the project area occasionally, while a number of other species are regular migrants. Many of these migrants are present only in the wet season whilst others such as the Pallid Cuckoo and Rainbow Bee-eater observed during this survey, are present only in the dry season.

Due to the aridity and subsequent resource limitation experienced by birds in the study area, many species may occur as irruptive visitors following good rainfall. The positive impact of a wet summer was evident from the lush growth and prolific flowering observed during site surveys. Very high densities of Grey-headed, Brown and Singing Honeyeaters were observed at most sites where they were feeding in dense *Grevillea wickhamii* and *Acacia* thickets. Species such as Black and Pied Honeyeaters are desert nomads that follow the flowering of arid-zone *Grevillea* and *Eremophila* (Readers Digest 1997). Both species were present along the haul route and Black Honeyeaters occurred in most places where *Grevillea wickhamii* occurred such as the two potential camp sites. It is likely that one or both species were breeding in the area as evidenced by predator distraction displays and the presence of recently fledged young. The preceding rainfall and lush growth and flowering may also have had a positive effect on the numbers of insectivores such as the Grey-shrike Thrush, Rufous Whistler and Black-faced and Masked Woodswallows, which were present in high densities in most study areas. A flock of over 100 Masked Woodswallows was observed in the centre of the haul road route (Site Code 10). The Mistletoebird was also particularly abundant around

Coyote and was observed along the haul road. Their presence was also likely linked to the flowering of mistletoes that comprise their primary food source. The Zebra Finch was also present in noticeably large flocks throughout the region although only small flocks of Budgerigars were observed.

Sandplain areas such as Finch (Site Code 4) were generally more depauperate for birds as they offered no trees or other shelter. These areas did, however, host a large number of family groups of White-winged Fairy-wrens and several pairs of Rufous-crowned Emu-wrens, both of which have an affinity for open areas with dense ground cover.

A number of the bird species recorded or expected are of conservation significance as follows:

- Peregrine Falcon (Other Specially Protected Fauna under the WA Wildlife Conservation Act but Least Concern according to Garnett and Crowley 2000). If present in the Project Area, the Peregrine Falcon is likely to forage widely, but nesting sites, most likely on cliffs, would be significant. Suitable nest sites may be present at Larranganni Bluff and the Killi Killi Hills.
- Major Mitchell's Cockatoo (Other Specially Protected Fauna under the WA Wildlife Conservation Act) were seen in pairs, on several occasions, twice on the Larranganni access road and once at the proposed airstrip site. This species is scarce and patchily distributed in WA and has a core range around the north-eastern Tanami area. A pair was observed mutually preening and inspecting a nest hollow in a *Corymbia* along the Larranganni access road and this species is likely to be breeding in the area.
- Grey Falcon (Priority 4 according to CALM and Near-Threatened according to Garnett and Crowley 2000). While this species could be present anywhere within the Project Area, Garnett and Crowley (2000) note that it favours plains with *Acacia* shrubland and tree-lined watercourses. There are no tree-lined watercourses in the study areas, but a number of shrublands such as Coyote may comprise suitable foraging habitat.
- Australian Bustard (Priority 4 CALM and Near-Threatened according to Garnett and Crowley 2000). This species was locally common with seven individuals observed during the survey (Table 2.5 of Appendix 2, Plate 14). The presence of this species in the area is likely due to an abundance of grassland and open plains that are its favoured habitat. Hunting is a threat to this species in the region and any increase in human activity is likely to lead to an increase in hunting pressure. The species is clumsy when taking off and is vulnerable to colliding with vehicles and overhead powerlines.
- Bush Stone-curlew (Priority 4 according to CALM and listed as Near-Threatened by Garnett and Crowley 2000). Not recorded from the project area, but may be present where there is open ground such as along tracks and woodland areas. The main threatening processes listed by Garnett and Crowley (2000) for this species are loss of habitat and predation by Foxes.
- Flock Bronzewing (Priority 4 CALM, Near-Threatened according to Garnett and Crowley 2000). An irruptive species that responds to rainfall, the Flock Bronzewing may occasionally occur in the region (Johnstone and Storr 1998).
- Night Parrot (Critically Endangered under the WA Wildlife Conservation Act and according to Garnett and Crowley 2000; Endangered under the EPBC Act). An enigmatic species about which little is known, but it has been recorded in the eastern Pilbara and Canning Stock Route historically and is sometimes associated with spinifex

grassland. Little can be concluded about the status of this species in the Project Area, but any sightings or suspected sightings should be reported to CALM.

- Princess Parrot (Priority 4 CALM, Vulnerable EPBC). A nomadic and rare species, the Princess Parrot is usually associated with the arid woodlands of the Canning Stock Route. It is unpredictable and poorly known and may occur in the study area.
- Pictorella Mannikin (Priority 4, CALM). This species is poorly known and thought to be declining in the Kimberly. It is usually associated with wooded watercourses, but can also inhabit spinifex grasslands and thus has the potential to occur in the study area.

In addition to these significant species, a number of the birds are listed under international conservation treaties such as the China-Australia Migratory Bird Agreement (CAMBA) and Japan-Australia Migratory Bird Agreement (JAMBA) and are recognised under the EPBC Act. These species are migrants such as the Rainbow Bee-eater and a number of waders such as the Oriental Plover, Oriental Pratincole and Little Curlew that may utilise the area after rain. These species may disperse throughout the project area at various times of the year and the development is unlikely to impact critical feeding or breeding habitat for any migratory species.

Table 32: Results of Bird Surveys (Table 29 describes the site codes)

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Black Kite																			
Black-breasted Buzzard												X							
Wedge-tailed Eagle			X																
Spotted Harrier																			X
Brown Falcon				X	X*	X													
Nankeen Kestrel								X											
Australian Bustard				T	T									X					T
Little Button-Quail		X										X				X			
Diamond Dove	X	X	X		X		X												
Crested Pigeon	X	X																X	
Major Mitchell's Cockatoo						X													X
Australian Ringneck	X	X																X	
Budgerigar	X	X			X	X								X				X	
Pallid Cuckoo	X																		
Horsfield's Bronze-Cuckoo		X							X	X					X	X			
Red-backed Kingfisher	X												X						
Rainbow Bee-eater	X																		
Variegated Fairy-wren									X		X								
White-winged Fairy-wren				X				X											X
Rufous-crowned Emu-wren								X											
Red-browed Pardalote	X															X		X	
Yellow-throated Miner	X	X		X		X	X				X			X				X	X
Singing Honeyeater		X					X	X	X		X	X	X	X	X				X

Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Grey-headed Honeyeater	X	X	X		X		X		X		X	X	X	X				X	X
Black-chinned Honeyeater															X*				
Black Honeyeater												X	X		X	X			X
Pied Honeyeater												X							
Brown Honeyeater	X	X		X			X		X		X			X	X	X			X
Crested Bellbird	X	X	X				X		X						X	X		X	X
Rufous Whistler	X	X							X						X				
Grey Shrike-thrush	X	X	X						X		X		X	X				X	
Willie Wagtail	X														X			X	
Black-faced Cuckoo-shrike	X	X			X	X													
White-winged Triller											X				X				
Masked Woodswallow	X									X									X
Black-faced Woodswallow	X					X							X		X			X	X
Pied Butcherbird		X			X	X												X	
Magpie-lark																		X	
Australian Magpie																			
Torresian Crow			X		X													X	X
Singing Bushlark																			
Zebra Finch	X		X												X			X	X
Mistletoebird	X									X									
Brown Songlark		X													X				

Numbers represent site codes described in Table 1. Dates and times of surveys can be found in Table 31.
X indicates sightings of birds whilst T indicates tracks observed. * = nesting

6.3.4 Mammals

A diversity of mammal species (Table 2.4 of Appendix 2) is expected to occur in the region although a large number of these are now presumed extinct (Table 2.5 of Appendix 2).

Much of the mammal diversity is likely to be comprised of a number of native rodents such as the Desert Mouse, Sandy Inland Mouse and Spinifex Hopping Mouse (Plate 16). Small native dasyurids such as the Kultarr and Mulgara may also occur. The area has been poorly surveyed for mammals and the Desert Mouse, Delicate Mouse and Fat-tailed Antechinus captured at Finch and lodged with the WA Museum were all new records for the region. All species were captured on the sandplain at Finch. The native rodents are likely to be in high numbers following the good rainfall and abundance of seed and grasses. The fat-tailed Antechinus is usually associated with rocky slopes and was a surprising capture. Its presence was most likely due to the large termite mounds on the sandplains that may provide shelter.

Few medium sized mammals have survived changed burning regimes and feral predators, but there remains the possibility that Spectacled Hare Wallabies persist, especially as Tanami Exploration personnel described small rat-kangaroos observed at a nearby hill. This interesting record needs further verification and would be a significant find for the area. The Bilby still exists in the study area and evidence of its presence at the proposed campsites was found in the form of many fresh diggings and tracks. The conservation significance of mammals in the study area is further outlined below.

A number of the mammal species recorded or expected within the Project Area are of conservation significance. These include:

- Bilby (Vulnerable under the WA Wildlife Conservation Act and the EPBC Act). Generally associated with sandy soils, the Bilby is known to persist in the area. Evidence of fresh tracks and diggings was found in several locations near and on the proposed and alternative campsites (Plates 15, 17 and 18).
- Spectacled Hare-Wallaby (Priority 3 according to CALM). This species is declining due to extensive fires and predation by Feral Cats. There is some evidence of this species being present in the area due to a convincing sighting by Tanami Exploration personnel.
- Ghost Bat (Priority 4 according to CALM). Although possibly present in the area, this species roosts in caves or old mine shafts and is thus likely to only use the study area for foraging habitat.
- Orange Leaf-nose Bat (Vulnerable under the WA Wildlife Conservation Act and EPBC). This bat roosts in caves but as there are none in the study area, it may use the area for foraging.
- Mulgara (Vulnerable EPBC Act and WA Wildlife Conservation Act). This native carnivore is threatened across its range by feral predators and changed fire regimes. Suitable habitat is present in the study area although no burrows were recorded during site surveys.

6.4 CONCLUSIONS

The study area lies in a biologically rich and greatly under surveyed region that potentially acts as a refugia to a number of threatened species. The site inspection revealed a diversity of habitats and landforms and enabled some predictions and conclusions to be made regarding fauna.

It is recommended that a detailed follow up fauna survey be undertaken to determine the status of threatened species in the area as well as characterising the faunal community that is present. This survey would target expected or observed species, such as the Bilby (evidence found that it exists), Spectacled Hare-Wallaby (convincing sighting reported by Tanami Exploration personnel) and Mulgara (suitable habitat is present). The survey should be undertaken at the time when most animals are active, and spring (September to October) is recommended.

Several specific recommendations are offered:

- Avoid or minimise disturbance of mature trees with nest hollows as they are scarce in this landscape and provide important nesting and roosting habitat.
- Increased human activity associated with the mine may lead to illegal hunting of species such as of the Australian Bustard, and an increase in fires. Fires *per se* are not the problem so much as the potential for very extensive or frequent fires. Changed fire regimes, particularly an increase in the frequency and intensity of burning have been implicated as a primary cause in the decline of arid zone mammal species. Threatened species that are present such as the Bilby may even benefit from a programme of mosaic burning around the mine infrastructure to reduce the risk of extensive fires. Expertise in this area should be sought.
- Mining operations in remote areas sometimes result in an increase in feral animals. Feral animals should not be encouraged, even inadvertently and control measures could be examined, particularly for cats.
- Another impact of mining operations in remote areas can be increased recreational activity in surrounding areas. Such activities tend to focus on significant features such as waterholes or ranges. Education of personnel and even management of recreational locations may be necessary. The collection of firewood for “recreational” campfires can also result in impacts, as the sort of timber that is collected often includes hollow limbs that are important shelter for some animals.

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PLATES

Plate 1: Coyote Waste Rock Dump site

Plate 2: North Haul Road dune crest

Plate 3: *Grevillea wickhamii* dominated vegetation unit on South Haul Road route

Plate 4: Larranganni prospect, Kookaburra deposit

Plate 5: Larranganni Waste Rock Dump site

Plate 6: Larranganni prospect, Sandpiper deposit

Plate 7: Sandpiper deposit, intersected with gridlines

Plate 8: Larranganni prospect, Hawke Hill prospect

Plate 9: Larranganni prospect, Hawke Hill prospect

Plate 10: Larranganni prospect, Finch prospect

Plate 11: Killi Killi Hills on South Haul Road route

Plate 12: Native walnut grows on calcrete areas but was not encountered on Haul Road route

Plate 13: Larranganni bluff closed grassland vegetation unit on North Haul Road route

Plate 14: Bustard tracks

Plate 15: Large Bilby digging near the airstrip and camp sites

Plate 16: Small mammal tracks

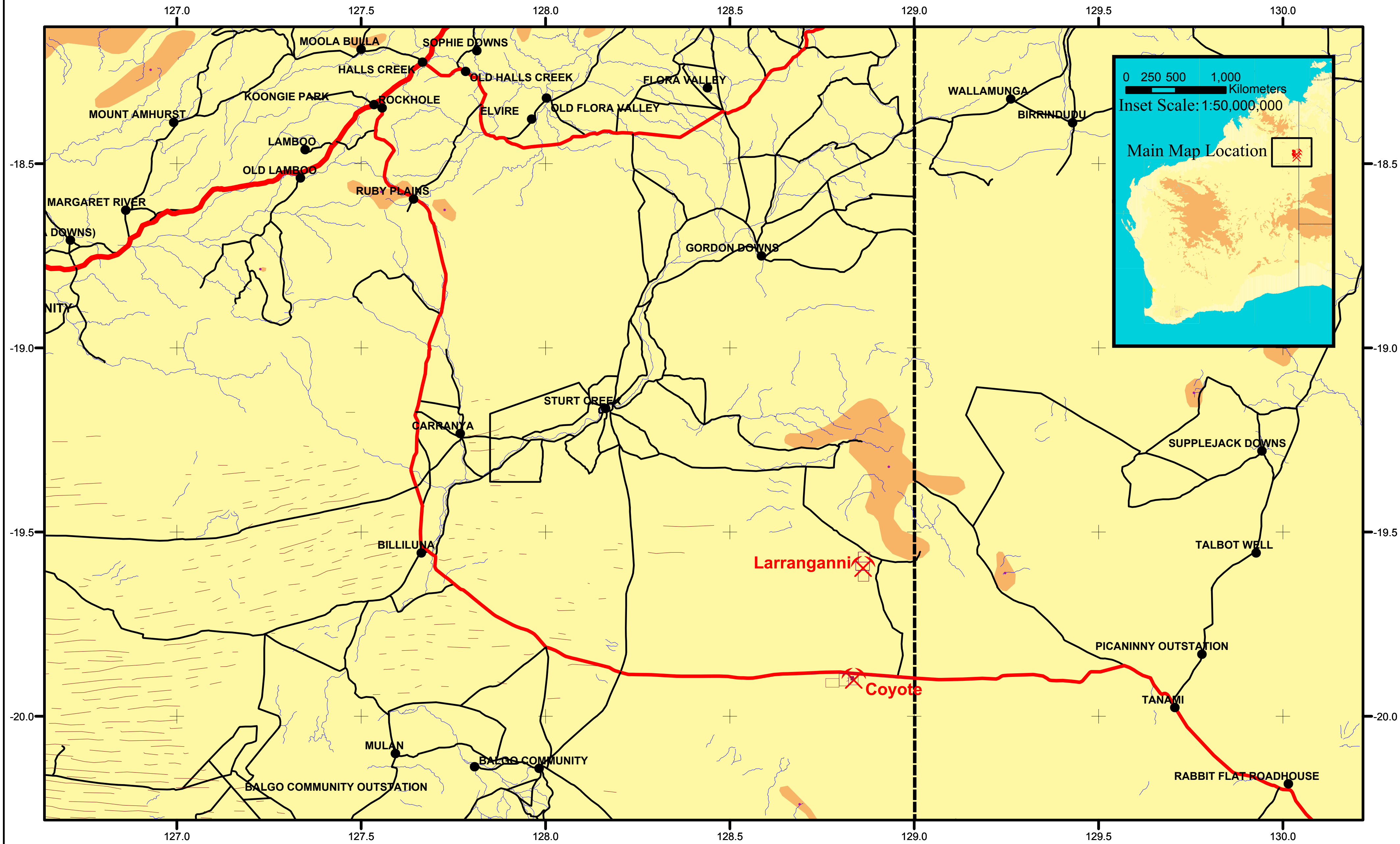
Plate 17: Bilby tracks to digging

Plate 18: Close up of Bilby tracks

Plate 19: Black-headed python observed close to the Larranganni camp site

Plate 20: Black-headed python observed close to the Larranganni camp site

FIGURES



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Scale: 1:1,500,000

0 5 10 20 30 40 50 60 70 80 90 100 Kilometers

Orig Size: A4 Date:30/07/04 Drawn by M. Dufty

Tanami Gold

Coyote Project

Location Plan

Figure 1

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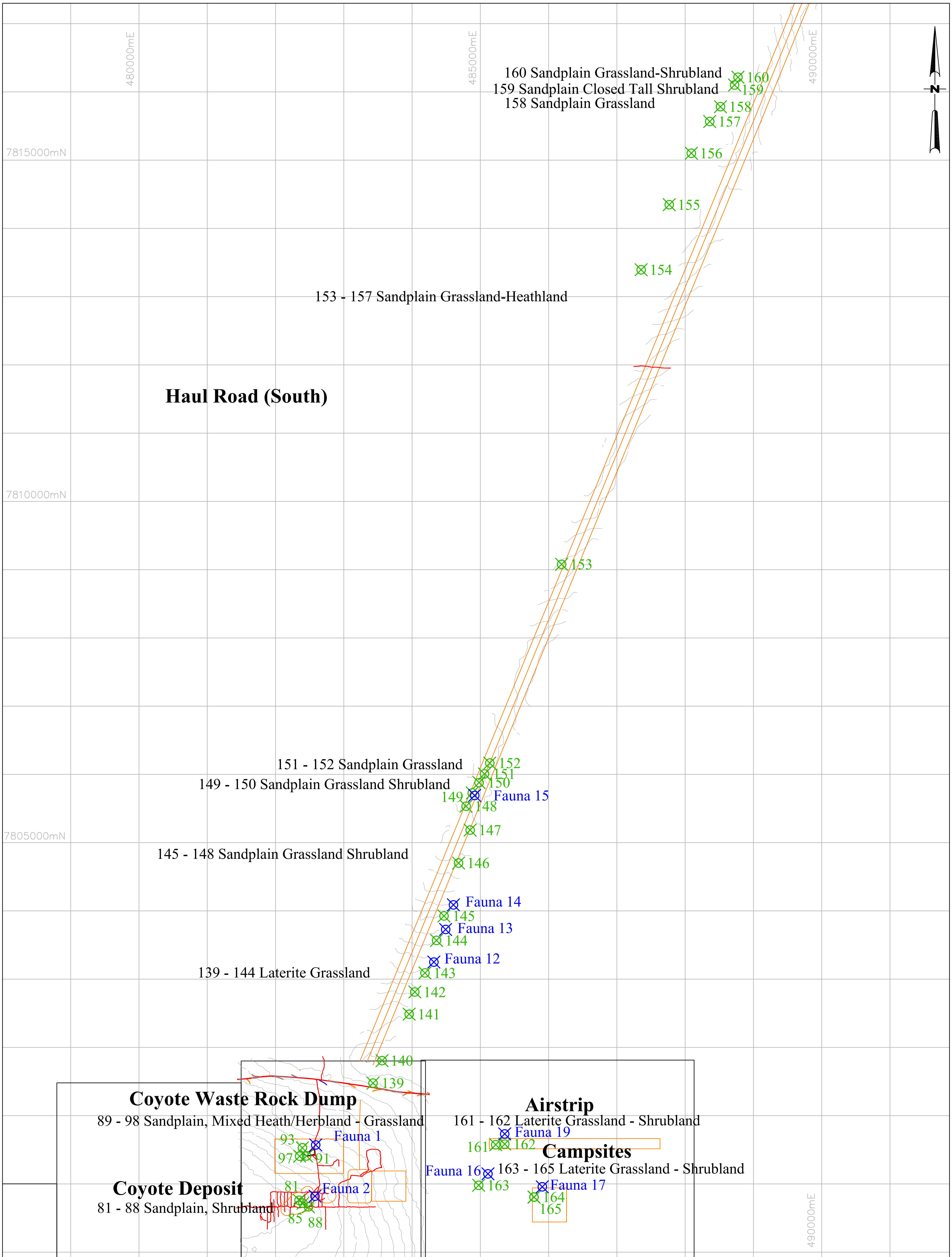

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LEGEND

Scale 1:50,000

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Grid - MGA (GDA 94)

Fauna Study Sites

Vegetation Mapping Waypoints

Orig. Size: A3 Date:30/07/2004 Drawn by: M Dufty

Tanami Gold
Coyote Project

Vegetation Mapping and Fauna Sites - Coyote and Haul Road South

Figure 2

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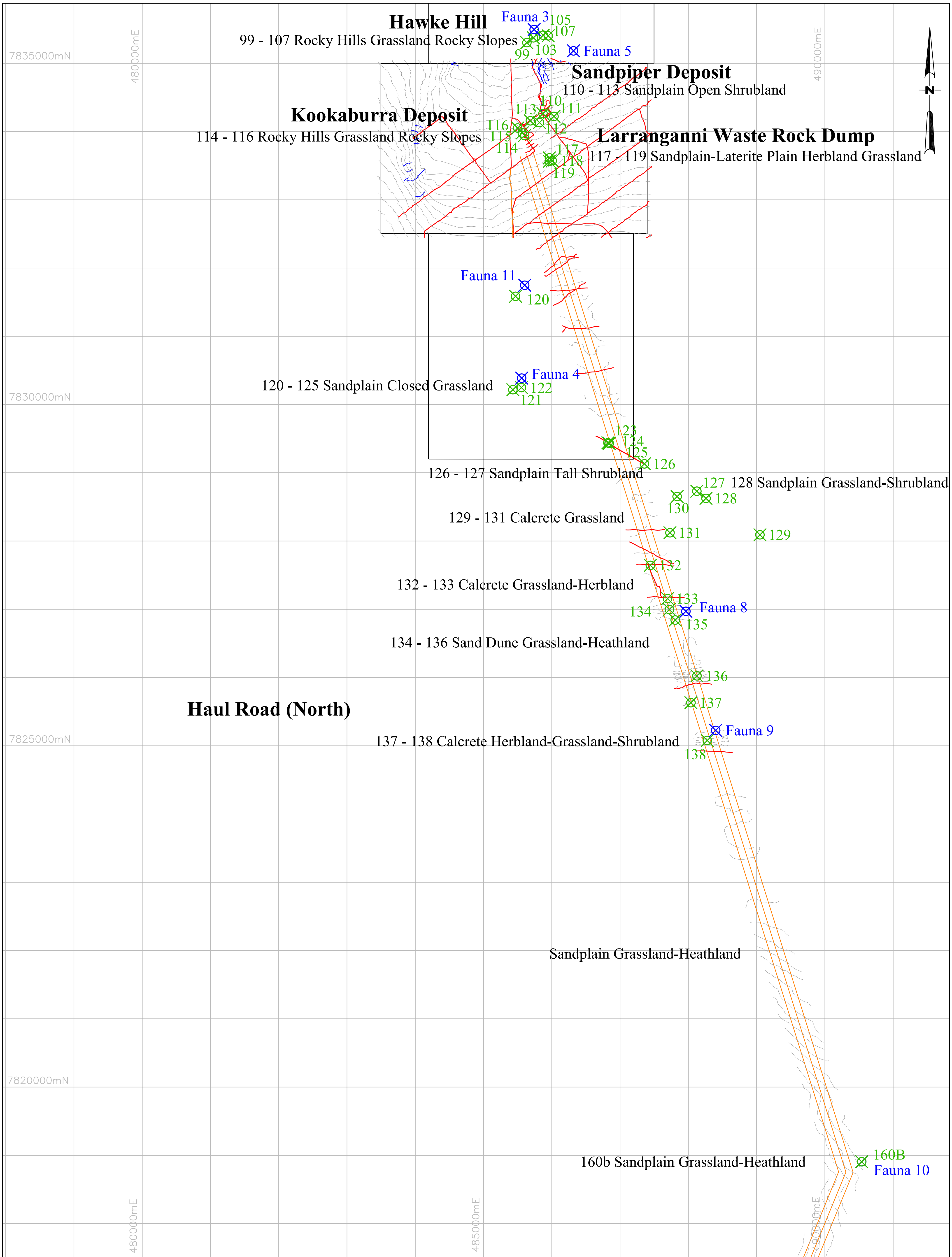

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LEGEND

Scale 1:50,000

0m 1km 2km

Grid - MGA (GDA 94)

Fauna Study Sites

Vegetation Mapping Waypoints

Orig. Size: A3 Date:30/07/2004 Drawn by: M Dufty

Tanami Gold
Coyote Project

Vegetation Mapping and Fauna Sites - Larranganni and Haul Road North

Figure 3

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APPENDICES

APPENDIX 1

Flora Species Observed During June 2004 Survey

Family	Species
Poaceae	
	Aristida contorta
	Aristida holathera
	Aristida latifolia
	Aristida sp.
	Cymbopogon bombycinus
	Digitaria brownii
	Enneapogon polyphyllus
	Eragrostis cumingii
	Eragrostis setifolia
	Eriachne aristidea
	Eriachne ciliata
	Eriachne melicacea
	Eriachne obtusa
	Schizachyrium fragile
	Sporobolus australasicus
	Triodia intermedia
	Triodia ? pungens
	Triodia schinzii
Cyperaceae	
	Bulbostylis barbata
	Fimbristylis ?microcarya
	Fimbristylis simulans
Proteaceae	
	Grevillea eriostachya
	Grevillea refracta
	Hakea lorea subsp. *lorea*
	Hakea macrocarpa
Loranthaceae	
	Lysiana spathulata
Chenopodiaceae	
	Maireana georgei
	Salsola tragus
	Sclerolaena cornishiana
Amaranthaceae	
	Ptilotus arthrolasius
	Ptilotus astrolasius var. astrolasius
	Ptilotus calostachyus
	Ptilotus exaltatus
	Ptilotus fusiformis var. fusiformis

Family	Species
	Ptilotus gomphrenoides subsp. *conglomeratus*
	Ptilotus polystachyus var. *polystachyus*
Aizoaceae	
	Trianthema oxycalyptra subsp. *oxycalyptra*
	Trianthema pilosa
	Trianthema triquetra
Molluginaceae	
	Mollugo molluginis
Portulacaceae	
	Portulaca oleracea
Caryophyllaceae	
	Polycarpaea corymbosa var. corymbosa
Lauraceae	
	Cassytha capillaris
Byblidaceae	
	Byblis filifolia
Mimosaceae	
	Acacia adoxa
	Acacia adsurgens
	Acacia ancistrocarpa
	Acacia bivenosa
	Acacia coriacea
	Acacia coriacea subsp. *sericophylla*
	Acacia lysiphloia
	Acacia orthocarpa
	Acacia stellaticeps
	Acacia stipuligera
	Acacia victoriae
	Acacia wiseana
Caesalpiniaceae	
	Senna artemisioides subsp. *oligophylla*
	Senna costata
	Senna notabilis
	Senna sericea
Papilionaceae	
	Crotalaria medicaginea
	Indigofera brevidens
	Indigofera colutea
	Indigofera monophylla
	Jacksonia aculeata
	Leptosema anomalum
	Mirbelia viminalis

Family	Species
	Tephrosia sp. Bungaroo Creek (M.E.Trudgen 11601)
	Tephrosia uniovulata
Zygophyllaceae	
	Tribulus occidentalis
Meliaceae	
	Owenia reticulata
Euphorbiaceae	
	Euphorbia australis
Stackhousiaceae	
	Macgregoria racemigera
	Stackhousia intermedia
Sapindaceae	
	Dodonaea coriacea
Tiliaceae	
	Corchorus sidoides
	Corchorus sp.
Malvaceae	
	Abutilon macrum
	Abutilon otocarpum
	Gossypium australe
	Hibiscus leptocladus
	Sida arenicola
	Sida fibulifera
	Sida ? fibulifera
	Sida sp.
Sterculiaceae	
	Keraudrenia nephrosperma
	Melhania oblongifolia
Violaceae	
	Hybanthus aurantiacus
	Hybanthus enneaspermus
Myrtaceae	
	Calytrix carinata
	Corymbia opaca
	Eucalyptus brevifolia
	Eucalyptus gamophylla
	Eucalyptus gamophylla

Family	Species
	Eucalyptus kingsmillii
	Melaleuca acacioides
Apocynaceae	
	Carissa lanceolata
Asclepiadaceae	
	Rhyncharrhena linearis
Convolvulaceae	
	Evolvulus alsinoides
	Ipomoea costata
Boraginaceae	
	Halgania solanacea
	Heliotropium cunninghamii
	Heliotropium pachyphyllum
Lamiaceae	
	Dicrastylis doranii
	Dicrastylis exsuccosa
	Newcastelia spodiotricha
Solanaceae	
	Solanum diversiflorum
Scrophulariaceae	
	Mimulus uvedaliae var. *uvedaliae*
Bignoniaceae	
	Dolichandrone heterophylla
Myoporaceae	
	Eremophila latrobei subsp. *filiformis* ms
Rubiaceae	
	Spermacoce auriculata
Goodeniaceae	
	Brunonia austalis
	Dampiera candicans
	Goodenia azurea
	Goodenia microptera
	Scaevola parvifolia
Stylidiaceae	
	Stylidium inaequipetalum
Asteraceae	
	Flaveria australasica
	Pluchea tetranthera
	Pterocaulon serrulatum
	Pterocaulon sphacelatum

APPENDIX 2

Fauna Species Expected to Occur and Recorded at Tanami Gold

Table 2.1: Results of Opportunistic Trapping Including Museum Accession Numbers for Species Vouchered

Night	Site	Species	Museum Number
8/6/04	Coyote Waste Rock Dump	Nil	N/A
9/6/04	Finch Sandplain	*Pseudomys delicatulus*	M56500
		Pseudomys desertor	M55295
		Pseudantechnus macdonnellensis	M56501
9/6/04	Hawk Hill Prospect	Nil	N/A

Table 2.2: Results of Spotlighting

Date	Route	Distance	Species
7/6/04	Balwina Base Camp to Coyote	16 km	Sandy Inland Mouse, Northern Nailtail Wallaby, White-striped Mastiff-Bat
8/6/04	Coyote Waste Rock Dump to main road and camp	20 km	Nil
9/6/04	Larranganni camp to sandplain beyond Finch	26 km	Sandplain Gecko (R157731), Spotted Nightjar, 2 x *Pseudomys* species
10/6/04	Larranganni to Finch turnoff	18 km	Sandplain Gecko (R157732)
10/6/04	Larranganni Waste-dump and Kookaburra Ridge	2 km (on foot)	Nil

Numbers in brackets are museum specimen numbers for species vouchered.

Table 2.3: Amphibians recorded (+) or expected to occur on the Tanami Gold proposed development areas

Species		Status	Expected or Recorded
Myobatrachidae (ground frogs)			
Bilingual Froglet	*Crinia bilingua*		
Ornate Frog	*Limnodynastes ornatus*		
	Neobatrachus aquilonius		
Desert Spadefoot	*Notaden nichollsi*		WAM
Northern Toadlet	*Uperoleia borealis*		WAM
Tanami Toadlet	*Uperoleia micromeles*		WAM
Hylidae (tree frogs)			
Giant Frog	*Cyclorana australis*		WAM
Long-footed Frog	*Cyclorana longipes*		
Desert Tree Frog	*Litoria rubella*		WAM
	Total Expected	**9**	
	Observed	**0**	

The status column indicates conservation status as: VU = vulnerable, EN = endangered, CR = critically endangered, P1 = Priority 1, SP = Specially protected fauna. Listings are based on the Wildlife Conservation Act of the Department of Conservation and Land Management (CALM) or the Environment Protection and Biodiversity Conservation Act of the Department of Environment and Heritage (DEH). Recorded column includes the source of specimen records as the Western Australian Museum (WAM) or the protected matters search tool of DEH.

Table 2.4: Reptiles recorded (+) or expected to occur on the Tanami Gold proposed development areas

Species		Status	Expected or Recorded	
Gekkonidae (geckoes)				
Clawless Gecko	*Crenadactylus ocellatus*			
Northern Spiny-tailed Gecko	*Diplodactylus ciliaris*			WAM
Fat-tailed Gecko	*Diplodactylus conspicillatus*			
Sandplain Gecko	*Diplodactylus stenodactylus*		+	WAM
	Gehyra australis			WAM
Pilbara Delta	*Gehyra pilbara*			WAM
	Gehyra purpurascens			WAM
Tree Delta	*Gehyra variegata*			WAM
Bynoe's Gecko	*Heteronotia binoei*			WAM
	Nephurus levis			WAM
	Rhynchoedura ornata			WAM
	Strophurus elderi			
	Strophurus jeanae			WAM
Pygopodidae (legless lizards)				
	Delma borea			WAM
	Delma nasuta			
Burton's Legless Lizard	*Lialis burtonis*			WAM
Hooded Scaleyfoot	*Pygopus nigriceps*			WAM
Agamidae (dragon lizards)				
	Amphibolurus gilberti			WAM
	Cryptagama aurita	P1: CALM		
	Ctenophorus caudicinctus			WAM
	Ctenophorus isolepis			WAM
	Ctenophorus nuchalis		+	WAM
	Diporiphora arnhemica			
	Diporiphora bennettii			
	Diporiphora bilineata			
	Diporiphora lalliae		+	WAM
	Diporiphora winneckei			WAM
	Lophognathus longirostris			WAM
Thorny Devil	*Moloch horridus*			
	Tympanocryptis lineata			
Varanidae (monitors or goannas)				
Spiny-tailed Goanna	*Varanus acanthurus*			WAM
	Varanus eremius			WAM

Species		Status	Expected or Recorded
	Varanus gilleni		WAM
Gould's Goanna	*Varanus gouldii*		
	Varanus kingorum		
	Varanus mertensi		
	Varanus storri		
Black-tailed Monitor	*Varanus tristis*		WAM
Scincidae (skink lizards)			
Fence Skink	*Cryptoblepharus plagiocephalus*		WAM
	Ctenotus helenae		WAM
	Ctenotus inornatus		WAM
	Ctenotus leonhardii		WAM
	Ctenotus pantherinus		WAM
	Ctenotus piankai		
	Ctenotus saxatilis		WAM
	Cyclodomorphus melanops		
	Great Desert Skink	VUL:CALM & EPBC	DEH
	Egernia striata		WAM
	Eremiascincus fasciolatus		WAM
	Lerista bipes		
	Lerista greeri		WAM
	Lerista taeniata		
Dwarf Skink	*Menetia greyii*		
	Morethia ruficauda		WAM
	Notoscincus ornatus		
Central Bluetongue	*Tiliqua multifasciata*		WAM
Boidae (pythons)			
Children's Python	*Antaresia childreni*		
Black-headed Python	*Aspidites melanocephalus*		+Sighting confirmed from photographic evidence
Woma	*Aspidites ramsayi*	SP: CALM	WAM
Typhlopidae (blind snakes)			
	Ramphotyphlops diversus		
	Ramphotyphlops guentheri		
Elapidae (front-fanged snakes)			
Desert Death Adder	*Acanthophis pyrrhus*		

Species		Status	Expected or Recorded
Olive Whip Snake	*Demansia olivacea*		WAM
Moon Snake	*Furina ornata*		
Mulga Snake	*Pseudechis australis*		WAM
Ringed Brown Snake	*Pseudonaja modesta*		
Gwardar	*Pseudonaja nuchalis*		
Spotted Snake	*Suta punctata*		WAM
	Total Expected	**68**	
	Observed	**4**	
	Geckoes	13	
	Pygopods	4	
	Dragons	13	
	Goannas	8	
	Skinks	18	
	Snakes	12	

The status column indicates conservation status as: VU = vulnerable, EN = endangered, CR = critically endangered, P1 = Priority 1, SP = Specially protected fauna. Listings are based on the Wildlife Conservation Act of the Department of Conservation and Land Management (CALM) or the Environment Protection and Biodiversity Conservation Act of the Department of the Environment and Heritage (DEH). Recorded column includes the source of specimen records as the Western Australian Museum (WAM) or the protected matters search tool of DEH.

Table 2.5: Birds recorded (+) or expected to occur on the Tanami Gold proposed development areas

Species		Status	Expected or Recorded
Dromaiidae (emus)			
Emu	*Dromaius novaehollandiae*		BA
Phasianidae (pheasants and quails)			
Brown Quail	*Coturnix ypsilophora*		BA
Accipitridae (kites, hawks and eagles)			
Black-shouldered Kite	*Elanus notatus*		WAM
Square-tailed Kite	*Lophoictinia isura*		
Black-breasted Buzzard	*Hamirostra melanosternon*		+ BA WAM
Black Kite	*Milvus migrans*		+ BA
Whistling Kite	*Haliastur sphenurus*		BA WAM
Spotted Harrier	*Circus assimilis*		+ BA
Brown Goshawk	*Accipiter fasciatus*		WAM
Collared Sparrowhawk	*Accipiter cirrhocephalus*		BA WAM
Wedge-tailed Eagle	*Aquila audax*		BA
Little Eagle	*Hieraaetus morphnoides*		WAM
Falconidae (falcons)			
Black Falcon	*Falco subniger*		BA WAM
Peregrine Falcon	*Falco peregrinus*	SP:CALM	
Australian Hobby	*Falco longipennis*		
Grey Falcon	*Falco hypoleucos*	P4:CALM	BA
Brown Falcon	*Falco berigora*		+ BA
Nankeen Kestrel	*Falco cenchroides*		+ BA WAM
Turnicidae (button-quails)			
Little Button-quail	*Turnix velox*		+ BA WAM
Otidae (bustards)			
Australian Bustard	*Ardeotis australis*		+ BA
Burhinidae (stone-curlews)			
Bush Stone-curlew	*Burhinus grallarius*	P4:CALM	WAM
Glareolidae (pratincoles)			
Oriental Pratincole	*Glareola maldivarum*	MIG:EPBC	
Australian Pratincole	*Stiltia isabella*		
Charadriidae (plovers and dotterels)			
Masked Lapwing	*Vanellus miles*		WAM
Banded Lapwing	*Charadrius tricolor*		BA
Columbidae (pigeons and doves)			

Species		Status	Expected or Recorded
Peaceful Dove	*Geopelia placida*		WAM
Common Bronzewing	*Phaps chalcoptera*		
Flock Bronzewing	*Phaps histrionica*	P4:CALM	
Crested Pigeon	*Ocyphaps lophotes*		+ BA
Spinifex Pigeon	*Geophaps plumifera*		BA WAM
Diamond Dove	*Geopelia cuneata*		+ BA WAM
Cacatuidae (cockatoos)			
Major Mitchell's Cockatoo	*Cacatua leadbeateri*	SP:CALM	+ BA WAM
Galah	*Cacatua roseicapilla*		BA WAM
Little Corella	*Cacatua sanguinea*		BA WAM
Psittacidae (lorikeets and parrots)			
Cockatiel	*Nymphicus hollandicus*		+
Budgerigar	*Melopsittacus undulatus*		+ BA
Princess Parrot	*Polytelis alexandrae*	VUL:EPBC P4:CALM	
Australian Ringneck	*Barnardius zonarius*		+ BA WAM
Night Parrot	*Pezoporus occidentalis*	EN:CALM CR:CALM	
Cuculidae (cuckoos)			
Pallid Cuckoo	*Cuculus pallidus*		+ BA WAM
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*		+ BA WAM
Black-eared Cuckoo	*Chrysococcyx osculans*		
Channel-billed Cuckoo	*Scythrops novaehollandiae*		BA
Strigidae (hawk-owls)			
Southern Boobook Owl	*Ninox novaeseelandiae*		BA WAM
Tytonidae (barn owls)			
Barn Owl	*Tyto alba*		WAM
Podargidae (frogmouths)			
Tawny Frogmouth	*Podargus strigoides*		BA WAM
Aegothelidae (owlet-nightjars)			
Australian Owlet-nightjar	*Aegotheles cristatus*		BA WAM
Caprimulgidae (nightjars)			
Spotted Nightjar	*Eurostopodus argus*		+ BA WAM
Apodidae (swifts)			
Fork-tailed Swift	*Apus pacificus*	MIG:EPBC	
Halcyonidae (forest kingfishers)			
Red-backed Kingfisher	*Todiramphus pyrrhopygia*		+ BA WAM
Sacred Kingfisher	*Todiramphus sanctus*		BA WAM

Species		Status	Expected or Recorded
Meropidae (bee-eaters)			
Rainbow Bee-eater	*Merops ornatus*	MIG:EPBC	BA WAM
Maluridae (fairy-wrens)			
Variegated Fairy-wren	*Malurus lamberti*		+ BA WAM
White-winged Fairy-wren	*Malurus leucopterus*		+ BA WAM
Rufous-crowned Emu-wren	*Stipiturus ruficeps*		+ BA WAM
Striated Grasswren	*Amytornis striatus*	P4:CALM	
Pardalotidae (pardalotes)			
Western Gerygone	*Gerygone fusca*		BA WAM
Red-browed Pardalote	*Pardalotus rubricatus*		+ WAM
Striated Pardalote	*Pardalotus striatus*		BA WAM
Weebill	*Smicrornis brevirostris*		BA WAM
Meliphagidae (honeyeaters)			
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*		BA WAM
Yellow-throated Miner	*Manorina flavigula*		+ BA WAM
Singing Honeyeater	*Lichenostomus virescens*		+ BA WAM
Grey-headed Honeyeater	*Lichenostomus keartlandi*		+ BA WAM
Grey-fronted Honeyeater	*Lichenostomus plumulus*		BA WAM
White-plumed Honeyeater	*Lichenostomus penicillatus*		BA WAM
Black-chinned honeyeater	*Melithreptus gularis*		+ BA WAM
Brown Honeyeater	*Lichmera indistincta*		+ BA WAM
Black Honeyeater	*Certhionyx niger*		+ BA WAM
Pied Honeyeater	*Certhionyx variegatus*		+ BA WAM
White-fronted Honeyeater	*Phylidonyris albifrons*		WAM
Crimson Chat	*Epthianura tricolor*		BA WAM
Petroicidae (Australian robins)			
Red-capped Robin	*Petroica goodenovii*		BA
Hooded Robin	*Melanodryas cucullata*		
Pomatostomidae (Australian babblers)			
Grey-crowned Babbler	*Pomatostomus temporalis*		BA WAM
Pachycephalidae (whistlers)			
Crested Bellbird	*Oreoica gutturalis*		+ BA WAM
Rufous Whistler	*Pachycephala rufiventris*		+ BA WAM
Grey Shrike-thrush	*Colluricincla harmonica*		+ BA WAM
Dicruridae (flycatchers)			
Magpie-lark	*Grallina cyanoleuca*		+ BA
Restless Flycatcher	*Myiagra inquieta*		BA
Willie Wagtail	*Rhipidura leucophrys*		+ BA WAM

Species		Status	Expected or Recorded
Campephagidae (cuckoo-shrikes)			
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*		+ BA WAM
White-winged Triller	*Lalage sueurii*		+ BA WAM
Artamidae (woodswallows)			
White-breasted Woodswallow	*Artamus leucorhynchus*		BA
Masked Woodswallow	*Artamus personatus*		+ BA
Black-faced Woodswallow	*Artamus cinereus*		+ BA WAM
Little Woodswallow	*Artamus minor*		BA
White-browed Woodswallow	*Artamus superciliosus*		BA
Pied Butcherbird	*Cracticus nigrogularis*		+ BA WAM
Australian Magpie	*Gymnorhina tibicen*		+ BA
Corvidae (ravens and crows)			
Little Crow	*Corvus bennetti*		BA
Torresian Crow	*Corvus orru*		+ WAM
Alaudidae (larks)			
Singing Bushlark	*Mirafra javanica*		+ BA WAM
Motacillidae (pipits and true wagtails)			
Richard's Pipit	*Anthus australis*		BA WAM
Passeridae (finches and allies)			
Painted Firetail	*Emblema picta*		WAM
Pictorella Mannikin	*Heteromunia pectoralis*	P4:CALM	
Zebra Finch	*Taeniopygia guttata*		+ BA
Dicaeidae (flower-peckers)			
Mistletoebird	*Dicaeum hirundinaceum*		+ BA WAM
Hirundinidae (swallows)			
White-backed Swallow	*Cheramoeca leucosternus*		BA
Tree Martin	*Hirundo nigricans*		BA WAM
Fairy Martin	*Hirundo ariel*		BA WAM
Sylviidae (Old World warblers)			
Spinifexbird	*Eremiornis carteri*		BA WAM
Rufous Songlark	*Cincloramphus mathewsi*		BA WAM
Brown Songlark	*Cincloramphus cruralis*		+ BA WAM
Golden-headed Cisticola	*Cisticola exilis*		BA
	Total Expected	**105**	
	Observed	**44**	

The status column indicates conservation status as: VU = vulnerable, EN = endangered, CR = critically endangered, P4 = Priority 4, SP = Specially protected fauna or MIG=migratory species. Listings are based on the Wildlife Conservation Act of the Department of Conservation and Land Management (CALM) or the Environment Protection and Biodiversity Conservation Act of the

Department of the Environment and Heritage (DEH). Recorded column includes the source of specimen records as the Western Australian Museum (WAM) or the protected matters search tool of DEH.

Table 2.6: Mammals recorded (+) or expected to occur on the Tanami Gold proposed development areas

Species		Status	Expected or Recorded
Tachyglossidae (echidnas)			
Echidna	*Tachyglossus aculeatus*		
Dasyuridae			
Mulgara	*Dasycercus cristicauda*	VUL:EPBC & CALM	WAM
Fat-tailed False Antechinus	*Pseudantechinus macdonnellensis*		+
Stripe-faced Dunnart	*Sminthopsis macroura*		WAM
Thylacomyidae (bilbies or rabbit-eared bandicoots)			
Greater Bilby, Dalgyte or Walpiri	*Macrotis lagotis*	VUL:EPBC & CALM	+ Diggings and tracks recorded WAM
Macropodidae (kangaroos and wallabies)			
Spectacled Hare-Wallaby	*Lagorchestes conspicillatus*	P3:CALM	WAM
Euro	*Macropus robustus*		
Red Kangaroo	*Macropus rufus*		+
Northern Nailtail Wallaby	*Onychogalea unguifera*		+
Megadermatidae (false vampire bats)			
Ghost Bat	*Megaderma gigas*	P4:CALM	
Hipposideridae (leaf-nose bats)			
Orange Leaf-nose Bat	*Rhinonicteris aurantius*	VUL:EPBC & CALM	
Emballonuridae (sheathtail bats)			
Yellow-bellied Sheathtail Bat	*Saccolaimus flaviventris*		WAM
Common Sheathtail Bat	*Taphozous georgianus*		
Mollosidae (mastiff bats)			
Beccari's Freetail Bat	*Mormopterus beccarii*		
Vespertilionidae (vesper bats)			
Gould's Wattled Bat	*Chalinolobus gouldii*		WAM
Inland Cave Bat	*Vespadelus finlaysoni*		WAM
Lesser Long-eared Bat	*Nyctophilus geoffroyi*		WAM
Inland Broad-nosed Bat	*Scotorepens balstoni*		
Little Broad-nosed Bat	*Scotorepens greyii*		WAM
White-striped Mastiff-Bat	*Tadarida australis*		+

Species		Status	Expected or	Recorded
Muridae (rats and mice)				
House Mouse	*Mus musculus*	Int.		WAM
Tarrkawarra or Spinifex Hopping-Mouse	*Notomys alexis*		+	
Delicate Mouse	*Pseudomys delicatulus*		+	
Desert Mouse	*Pseudomys desertor*		+	WAM
Sandy Inland Mouse	*Pseudomys hermannsburgensis*		+	WAM
Kimberley Pebble-mound Mouse	*Pseudomys laborifex*			WAM
Western Chestnut Mouse	*Pseudomys nanus*			
	Pseudomys sp. nov.			WAM
Canidae (foxes and dogs)				
Dingo	*Canis lupus dingo*		+	
European Red Fox	*Vulpes vulpes*	Int.		
Felidae (cats)				
Feral Cat	*Felis catus*	Int.	+	WAM
Equidae (horses and donkeys)				
Feral Donkey	*Equus asinus*	Int.		
Feral Horse (Brumby)	*Equus caballus*			
Bovidae (horned ruminants)				
Camel	*Camelus dromidarius*	Int.	+	
	Total Expected	**34**		
	Observed	**12**		

The status column indicates conservation status as: VU = vulnerable, EN = endangered, CR = critically endangered, P3 = Priority 3, SP = Specially protected fauna or int.=introduced. Listings are based on the Wildlife Conservation Act of the Department of Conservation and Land Management (CALM) or the Environment Protection and Biodiversity Conservation Act of the Department of the Environment and Heritage (DEH). Recorded column includes the source of specimen records as the Western Australian Museum (WAM) or the protected matters search tool of DEH.

Table 2.7: Mammal species that probably once occurred in the area, but are now extinct or regionally extinct

Species		Status	Expected or Recorded
Dasyuridae			
Chuditch	*Dasyurus geoffroii*	VUL:EPBC & CALM	Extinct in 1930's
Northern Quoll	*Dasyurus hallucatus*		Locally Extinct
Red-tailed Phascogale	*Phascogale calura*	EN:CALM & EPBC	Captured by Lipfert: east Canning Stock Route, 1931
Peramelidae (bandicoots)			
Pig-footed Bandicoot	*Chaeropus ecaudatus*	EX	Last record: 1950s
Golden Bandicoot	*Isoodon auratus*	VUL:EPBC & CALM	Last recorded at the Granites in 1952
Desert Bandicoot	*Perameles eremiana*	EX	Last record: 1943
Thylacomyidae (bilbies or rabbit-eared bandicoots)			
Lesser Bilby	*Macrotis leucrura*	EX	Last Record: 1960's
Phalangeridae (possums)			
Brushtail Possum	*Trichosurus vulpecula arnhemnsis*		Presumed extinct in central deserts
Potoroidae (potoroos and bettongs)			
Burrowing Bettong (Boodie)	*Bettongia lesueur*	VUL:EPBC & CALM	Last record: 1930's
Woylie	*Bettongia penicillata*	P4:CALM	Extinct except SW
Macropodidae (kangaroos and wallabies)			
Central Hare Wallaby	*Lagorchestes asomatus*	EX	Extinct in Tanami late 1940's
Mala (Rufous Hare Wallaby) Mainland form	*Lagorchestes hirsutus*	EN:EPBC & EX CALM	Extinct on mainland since 19992
Crescent Nailtail Wallaby	*Onychogalea lunata*	Extinct	Last record: 1956

Species		Status	Expected or Recorded
Muridae (rats and mice)			
Long-tailed Hopping Mouse	*Notomys longicaudatus*	Extinct	Last Record: Granites in 1977
Pale Field-Rat	*Rattus tunneyi*		
Long-haired Rat	*Rattus villosisimus*		
	Total	**16**	

The status column indicates current conservation status as: EX = Extinct, VUL = vulnerable, EN = endangered, CR = critically endangered, SP = Specially protected fauna or int.=introduced. Listings are based on the Wildlife Conservation Act of the Department of Conservation and Land Management (CALM) or the Environment Protection and Biodiversity Conservation Act of the Department of the Environment and Heritage (DEH).

Appendix 10

Flora observed in the Western Tanami Region

TANAMI GOLD NL

Flora Observed in the Western Tanami Region

August 2004 to August 2006

1 Introduction

The following lists the flora observed in the region surrounding the Coyote Project. The list is a compilation of information obtained from a survey by MBS Environmental in 2004 and from incidental sightings and surveys by Ecotec (WA) Pty Ltd during 2006.

Family	Genus	Species
Aizoaceae		
	Trianthema	*oxycalyptra*
	Trianthema	*pilosa*
	Trianthema	*portulacastrum*^*
	Trianthema	*triquetra*
	Zaleya	*galericulata**
Amaranthaceae		
	Ptilotus	*arthrolasius*
	Ptilotus	*astrolasius var. astrolasius*
	Ptilotus	*calostachyus*
	Ptilotus	*exaltatus*
	Ptilotus	*fusiformis*
	Ptilotus	*gomphrenoides subsp. conglomeratus*
	Ptilotus	*polystachyus*
	Ptilotus	*sp**
Apocynaceae		
	Carissa	*lanceolata*
Ascelepiadaceae		
	Rhyncharrhena	*linearis*
	Marsdenia	*australis*
Asteraceae		
	Flaveria	*australasica*
	Pluchea	*tetranthera*
	Pterocaulon	*serrulatum*
	Pterocaulon	*sphacelatum*
Bignoniaceae		
	Dolichandrone	*heterophylla*
Boraginaceae		
	Halgania	*solanacea*

Family	Genus	Species
	Heliotropium	*cunninghamii*
	Heliotropium	*pachyphyllum*
Byblidaceae		
	Byblis	*filifolia*
Caesalpiniaceae		
	Chamaecrista	*symonii**
	Petalostylis	*cassioides**
	Senna	*artemisioides subsp. oligophylla*
	Senna	*costata*
	Senna	*notabilis*
	Senna	*sericea*
Capparaceae		
	Cleome	*viscose**
Chenopodiaceae		
	Maireana	*georgei*
	Salsoa	*tragus*
	Sclerolaena	*cornishiana*
Convolvulaceae		
	Evolvulus	*alsinoides*
	Ipomoea	*costata*
Cyperaceae		
	Bulbostylis	*barbata*
	Fimbristylis	*microcarya*
	Fimbristylis	*simulans*
Droseraceae		
	Drosera	*sp**
Euphorbiaceae		
	Euphorbia	*australis*
Goodeniaceae		
	Brunonia	*austalis*
	Dampiera	*candicans*
	Goodenia	*azurea*
	Goodenia	*microptera*

Family	Genus	Species
	Scaevola	*parvifolia*
Lamiaceae		
	Dicrastylis	*doranii*
	Dicrastylis	*exsuccosa*
	Lysiana	*spathulata**
	Newcastelia	*spodiotricha*
Lauraceae		
	Cassytha	*capillaries*
Loranthaceae		
	Lysiana	*spathulata*
Malvaceae		
	Abutilon	*macrum*
	Abutilon	*octocarpum*
	Gossypium	*australe*
	Hibiscus	*leptocladus*
	Sida	*arenicola*
	Sida	*fibulifera*
Meliaceae		
	Owenia	*reticulata*
Mimosaceae		
	Acacia	*adoxa*
	Acacia	*adsurgens*
	Acacia	*ancistrocarpa*
	Acacia	*bivenosa*
	Acacia	*coriacea*
	Acacia	*hilliana**
	Acacia	*lysiphloia*
	Acacia	*orthocarpa*
	Acacia	*stellaticeps*
	Acacia	*stipuligera*
	Acacia	*victoriae*
	Acacia	*wiseana*
Molluginaceae		

Family	Genus	Species
	Mollugo	*molluginis*
Myoporaceae		
	Eremophila	*latrobei*
	Eremophila	*longifolia*
Myrtaceae		
	Calytrix	*carinata*
	Corymbia	*opaca* (formerly *E. terminalis*)
	Eucalyptus	*aspera**
	Eucalyptus	*brevifolia*
	Eucalyptus	*gamophylla*
	Eucalyptus	*odontocarpa**
	Eucalyptus	*pachyphylla**
	Eucalyptus	*pruinosa**
	Eucalyptus	sp. (several hybrids)
	Melaleuca	*accacioides*
Papilionaceae		
	Aenictophyton	*reconditum**
	Crotalaria	*medicaginea*
	Indigofera	*brevidens*
	Indigofera	*colutea*
	Indigofera	*monophylla*
	Jacksonia	*aculeta*
	Leptosema	*anomalum*
	Mirbelia	*viminalis*
	Tephrosia	*uniovulata*
Poaceae		
	Aristida	*contorta*
	Aristida	*holathera*
	Aristida	*latifolia*
	Aristida	sp.
	Cenchrus	*biflorus*^*
	Cenchrus	*ciliaris*^*
	Chloris	*inflata*^*

Family	Genus	Species
	Cymbopogon	*bombycinus*
	Cynodon	*dactylon*^*
	Digitaria	*brownii*
	Enneapogon	*caerulescens**
	Enneapogon	*polyphyllus*
	Enneapogon	*purpurascens**
	Eragrosits	*cumingii*
	Eragrostis	*eriopoda**
	Eragrostis	*setifolia*
	Eriachne	*aristidea*
	Eriachne	*ciliata*
	Eriachne	*melicacea*
	Eriachne	*obtusa*
	Schizachyrium	*fragile*
	Sporobolus	*australasicus*
	Triodia	*basedowii**
	Triodia	*intermedia*
	Triodia	*pungens*
	Triodia	*schinzii*
Portulacaceae		
	Portulaca	*oleracea*
Proteaceae		
	Hakea	*lorea*
	Hakea	*macrocarpa*
	Hakea	*suberea**
	Grevillea	*eriostachya*
	Grevillea	*refracta*
	Grevillea	*stenobotrya**
	Grevillea	*wickhamii**
Rubiaceae		
	Spermacoce	*auriculata*
Sapindaceae		
	Dodonaea	*coriacea*

Family	Genus	Species
Scrophulariaceae		
	Mimulus	*uvedaliae* var. *uvedaliae*
Solanaceae		
	Solanum	*chippendalei**
	Solanum	*diversiflorum*
	Physalis	*angulata**^
Stackhousiaceae		
	Macgregoria	*racemigera*
	Stackhousia	*intermedia*
Sterculiaceae		
	Keraudrenia	*nephrosperma*
	Melhania	*oblongifolia*
Stylidiaceae		
	Stylidium	*inaequipetalum*
Thymelaeaceae		
	Pimelea	*ammocharis**
Tiliaceae		
	Corchorus	*sidoides*
Violaceae		
	Hybanthus	*aurantiacus*
	Hybanthus	*enneaspermus*
Zygophyllaceae		
145	*Tribulus*	*occidentalis*

*Additional flora species found during 2006 surveys.

^Introduced flora species.

Appendix 11

Fauna Survey of the Coyote and Larranganni Gold Projects (Biota)

Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project Area (Coyote and Larranganni Deposits)

Tanami Gold NL

Fauna Habitat and Fauna Assemblage Survey

January 2005

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Fauna Habitat and Fauna Assemblage Survey of the Western Tanami Project Area

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Introduction

Tanami Gold NL proposes to mine the Coyote and Larranganni Gold Deposits at the Western Tanami Project, located 30 km from the WA border along the Tanami Track. The Coyote Deposit will be mined using conventional open pit and underground mining methods, while the Larranganni Deposit will be mined using open pit methods from two adjacent pits (Kookaburra and Sandpiper). Ore from both deposits will be transported 30 km by road train for processing at a carbon-in-leach treatment plant at Coyote to produce gold bullion. Tailings from the treatment plant will be disposed of into a paddock-style tailings storage facility at Coyote. Waste rock will be retained in dumps at both operations.

Biota Environmental Sciences was commissioned to undertake a fauna habitat and fauna assemblage survey of the Coyote and Larranganni Deposits and an associated haul road in September 2005.

Results

Fauna habitat classification was developed on the basis of the dominant landform and vegetation type. It does not cover all habitats available to the entire assemblage of invertebrate and vertebrate fauna, as this would be difficult to resolve and logistically impracticable to sample. Rather, the classifications provide a convenient framework within which to summarise species occurrence in the annotated lists and associated tables.

Six primary habitats were identified within the project area and these are largely based on vegetation structure and landforms as follows:

- savanna – Open *Eucalyptus* woodland over open *Acacia* over *Triodia* and grasses in unburnt/disturbed areas on red-brown clayey-loam (TN01).
- *Triodia* hillslope - Scattered *Eucalyptus* over mixed *Acacia* low shrubland/*Triodia* hummock grassland on laterite gravelly sandy-loam (TN02, TN07, TN11).
- *Triodia* sandplain – Dense but patchy *Acacia* and *Grevillea* over a *Triodia* hummock grassland (or tussock grasses in recently burnt areas) on red-brown loamy sand (TN03, TN06).
- *Triodia* flat – Dense ground layer of *Triodia* interspersed with scattered large termite mounds and essentially no overstorey on dark brown loamy clay (TN05, TN09, TN10).
- minor drainage line – Scattered eucalypts over *Melaleuca*, *Acacia* and *Grevillea* over a relatively dense ground layer of *Triodia longiceps* on red-brown loamy sand (TN04, TN12).
- *Triodia* dune – Scattered *Acacia* and *Grevillea* over a dense ground layer of *Triodia* and herbs (which became more open on the dune crest) on red-brown sand (TN08).

The field survey recorded a combined total of 102 vertebrate species including 44 species of bird, 12 native mammals, three introduced mammals, 40 reptiles, one frog and two bats.

The survey recorded 701 individuals of 44 bird species in the combined study area of the Coyote and Larranganni Deposits and the haul road. This included 41 individuals of 14 species of non-passerine and 660 individuals of 30 species of passerine. The most speciose families were the Meliphagidae (8 species), Columbidae (3 species), Psittacidae (3 species), Maluridae (3 species), Pachycephalidae (3 species) and Sylviidae (3 species).

The survey recorded 12 native and three introduced species of mammals, comprising four dasyurids (carnivorous marsupials), one thylacomyid (bilbies), one macropod (kangaroos

and wallabies), five native and one introduced murid rodents (mice), one canid (dogs), one felid (cat) and one camelid (camel).

One frog and 40 reptile species were recorded from the trapping sites established during the Tanami survey. These comprised one myobatrachid frog (Australasian ground frogs), nine gekkonids (geckos), three pygopodids (legless lizards), six agamids (dragons), 14 scincids (skinks), three varanids (goannas), two typhlopids (blind snakes), and three elapids (front-fanged snakes).

The survey recorded four species of conservation significance.

Species	State Level	Federal Level
Mulgara *Dasycercus cristicauda*	Schedule 1	Vulnerable
Bilby *Macrotis lagotis*	Schedule 1	Vulnerable
Major Mitchell's Cockatoo *Cacatua leadbeateri*	Schedule 4	-
Australian Bustard *Ardeotis australis*	Priority 4	-

In addition, the survey recorded three mygalomorph spiders that may have narrow ranges.

<u>Recommendations</u>
The following recommendations arise from the fauna survey of the Western Tanami study area:

- Tanami Gold has already commissioned a systematic fauna survey of their site and defined the key habitats for Bilby and Mulgara within the lease. These areas will be identified as control areas to be left undisturbed as far as practicable within the context of developing the mine and associated infrastructure.

- An additional seasonal fauna survey of the ground disturbance areas will be carried out. This will focus on Mulgara and Bilby habitat utilisation.

- An exploration Management Plan should be developed to ameliorate potential impacts to either Bilbies or Mulgaras and their habitat arising from proposed future exploration activities.

- Lateritic surfaces as defined by the geological survey map will be ground-truthed to determine concordance with potential Bilby habitat as understood by Ric Southgate.

- All members of the work force on site will be provided with an environmental induction to ensure they are familiarised with the presence of Bilby and Mulgara in the area. This will include driving speed restrictions, ensuring that off-road driving is minimised and fire risk minimisation.

- Prior to completion of the project, airstrip and camp lateritic areas (Bilby habitat) will be subject to an investigation to determine specific fauna habitat reconstruction methodologies to maximise the potential for future use by Bilbies.

- Tanami Gold, in collaboration with relevant agencies (eg CALM) will communicate the findings of the Bilby habitat study to other stakeholders in the Tanami region. This is currently poorly understood (Ric Southgate, pers. comm.), and will assist in the wider conservation of this species.

1.0 Introduction

1.1 Project Background

Tanami Gold NL proposes to mine the Coyote and Larranganni Gold Deposits (Figure 1.1). The Coyote Deposit will be mined using conventional open pit and underground mining methods, while the Larranganni Deposit will be mined using open pit methods from two adjacent pits (Kookaburra and Sandpiper). Ore from both deposits will be transported 30 km by road train for processing at a carbon-in-leach treatment plant at Coyote to produce gold bullion. Tailings from the treatment plant will be disposed of into a paddock-style tailings storage facility at Coyote. Waste rock will be retained in dumps at both operations.

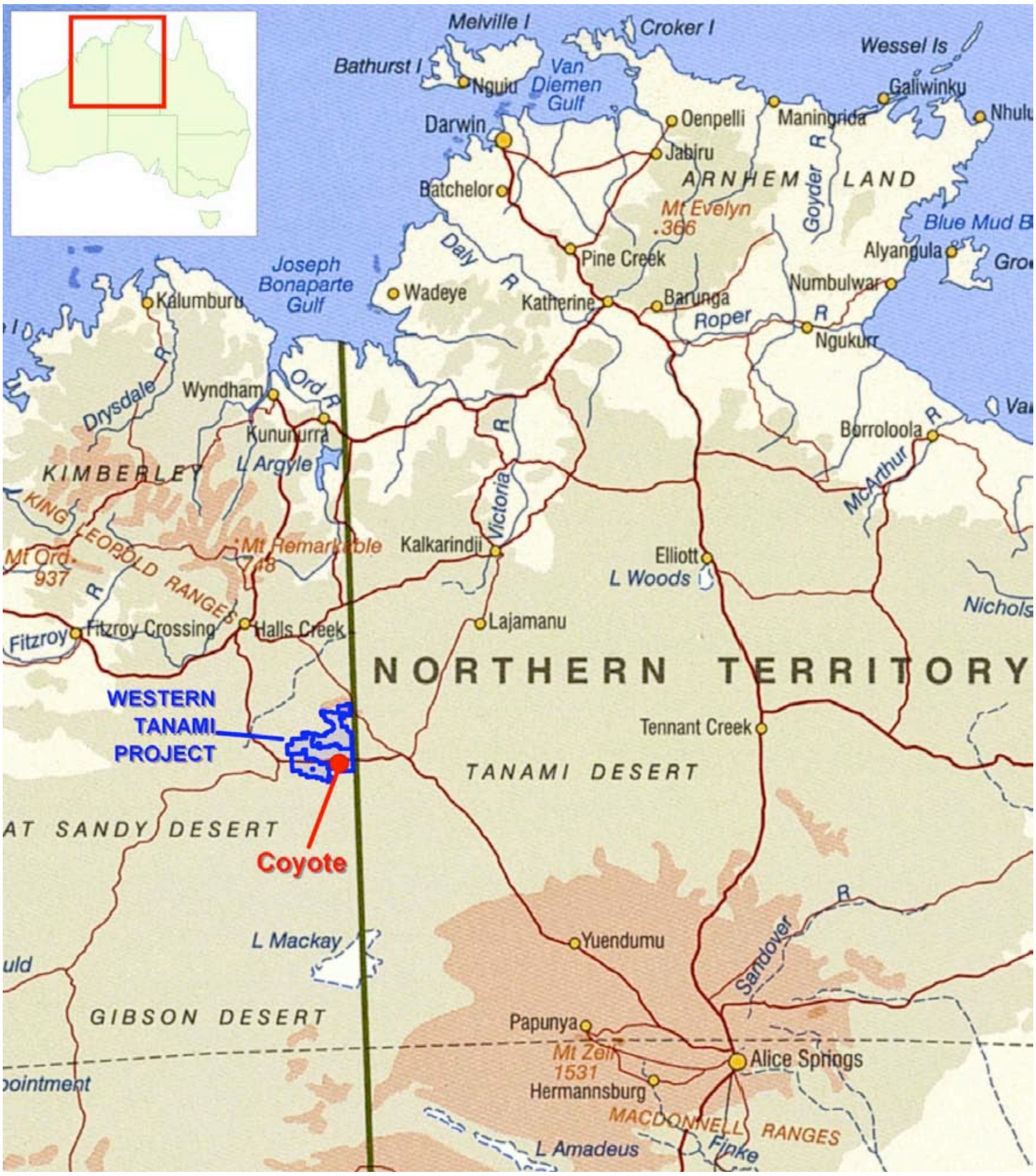

Figure 1.1: Locality figure showing the Western Tanami project.

1.2 Aims

This document describes a survey of the fauna assemblage and fauna habitats of the Western Tanami study area undertaken by Biota Environmental Sciences in 2004, and is intended as a supporting document to the Notice of Intent being prepared for the project. It contains baseline information regarding habitat types and fauna species occurring within the study area, and includes an assessment of the conservation significance of both.

The primary aims of the survey were to:

- Collect information on the presence of vertebrate fauna and selected invertebrate taxa (short range endemics);
- Document the occurrence of Threatened taxa particularly the Bilby and Mulgara;
- Document the relative abundance of species;
- Document the components of the physical environment (ie. the fauna habitats); and
- Document existing levels of disturbance.

2.0 Survey Methodology

2.1 Survey Timing and Weather

The survey was conducted over a 10-day period between the 27/9/04 – 6/10/04.

Weather was hot during this period, with maximum temperatures between 34.0°C - 40.0°C and minimum temperatures between 18.5°C – 25.0°C (as measured at the Balgo Hills recording station). There was 6.4 mm of rainfall during this period, which occurred during the 24hrs to 9 a.m. on the 4/10/04 (Table 2.1). The mean maximum temperature for October 2004 (38.8°C) was slightly higher than that in previous years (36.9°C) (Table 2.2). The mean minimum temperature (23.5°C) was also slightly higher than in previous years (22.2°C).

2.2 Survey Team

The vertebrate fauna sampling for this survey was conducted under "Licence To Take Fauna For Scientific Purposes" No. SF004664 (Appendix 1) issued to RJ Teale. Ethics approval was granted under the Western Australian Museum (Department of Conservation and Land Management) Animal Ethics Committee, which covers Mr Roy Teale as a Research Associate with the WA Museum. The Fauna survey team comprised Mr Roy Teale (Biota Environmental Sciences), Dr Mike Craig (Biota Environmental Sciences), Ms Zoë Hamilton (Biota Environmental Sciences) and Mr Greg Harold (consultant).

Vertebrate species that were to be lodged with the Western Australian Museum were imported from the Northern Territory back into Western Australia under "Licence To Import Skins Of Fauna (Or Other Dead Fauna)" No. IS000187 (Appendix 2) issued to Mr Roy Teale (Biota Environmental Sciences).

Analysis of bat recordings was completed by Mr Lee Mould (Biota Environmental Sciences).

Invertebrate identification was undertaken by Mr Dan Kamien (Biota Environmental Sciences). The WA Museum, in particular Dr Volker Fromenau and Dr Mark Harvey, provided assistance with final invertebrate identification and information.

Also acknowledged is Mr Brad Maryan (WA Museum) for assistance with confirmation of herpetofauna identifications, and Ms Norah Cooper (WA Museum) for assistance with mammal identifications.

2.3 Systematic Censusing

Systematic censusing focused on the Coyote, Larranganni and Haul Road study sites. The central component of the systematic censusing consisted of 12 trapping grids, each located within a defined habitat. Each trapping grid consisted of a single row of six pitfall traps (alternating 20 litre buckets and PVC tubes) spaced at approximately 8m intervals and connected with a single length of 30 cm high flywire fence. At selected sites (see Table 2.3), two lines of 5 or 10 medium-sized Elliott traps and one or two cage traps were established. In addition, a suspected Mulgara burrow complex was surrounded by a number of Elliott traps for three nights.

Table 2.1: Daily Meteorological Observations for Balgo Hills for 26/9/04 – 8/10/04 (data provided by the Western Australian Bureau of Meteorology).

Date	Maximum Temperature (°C)	Minimum Temperature (°C)	Temperature at 9am (°C)	Temperature at 3pm (°C)	Rainfall 24 hrs to 9am (mm)
27/9/04	36.1	23.6	31.0	35.3	0
28/9/04	35.1	23.2	31.9	34.0	0
29/9/04	35.7	22.2	30.1	34.9	0
30/9/04	36.7	24.9	31.4	35.4	0
1/10/04	37.5	22.9	32.5	36.6	0
2/10/04	39.0	23.5	34.3	36.8	0
3/10/04	36.3	23.2	30.6	35.6	0
4/10/04	34.0	18.5	27.2	32.7	6.4
5/10/04	37.5	21.5	33.7	36.6	0
6/10/04	40.0	25.0	36.3	39.2	0

Table 2.2: Climatological Summary for Balgo Hills using data from 1940 to 2004 (data provided by the Western Australian Bureau of Meteorology).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean Daily Maximum Temperature (°C)	38.6	36.9	36.8	34.0	29.2	26.3	26.4	28.8	33.6	36.9	38.5	38.7	
Mean Daily Minimum Temperature (°C)	25.2	24.1	23.1	20.3	15.6	12.6	11.9	14.0	18.4	22.2	24.3	25.1	
Mean Total Monthly Rainfall (mm)	67.9	86.2	41.9	19.2	16.0	9.6	8.4	2.4	2.8	11.0	20.7	55.8	341.9
Mean Maximum Air Temperature 2004 (°C)	38.2	33.4	35.3	34.4	27.1	26.2	26.9	28.4	31.4	38.8	38.8	40.6	
Mean Minimum Air Temperature 2004 (°C)	25.1	23.4	23.7	20.7	16.6	13.3	12.7	13.6	16.4	23.5	24.4	25.8	
Total Monthly Rainfall 2004 (mm)	135.3	257.5	33.1	4.0	42.5	0.3	0	0	0	8.7	13.5	24.8	519.7

Table 2.3: Site location and trap effort for the Tanami Gold proposal.

Site	Location (WGS 84)	Trap Type	Date Opened	Date Closed	Nights Open	No. of Traps	Total Effort
TN01	481903mE 7799594mN	Elliott	28/9/04	5/10/04	7	20	140
		Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	1	7
TN02	485351mE 7800754mN	Elliott	28/9/04	5/10/04	7	10	70
		Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	1	7
TN03	485974mE 7799699mN	Elliott	28/9/04	5/10/04	7	20	140
		Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	2	14
TN04	484092mE 7804316mN	Elliott	28/9/04	5/10/04	7	10	70
		Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	1	7
TN05	486919mE 7829218mN	Elliott	29/9/04	5/10/04	6	10	60
		Pit	29/9/04	5/10/04	6	6	36
		Cage	29/9/04	5/10/04	6	1	6
TN06	483899mE 7803272mN	Elliott	30/9/04	6/10/04	6	10	60
		Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN07	488050mE 7825593mN	Elliott	30/9/04	6/10/04	6	10	60
		Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN08	487799mE 7825992mN	Elliott	30/9/04	6/10/04	6	10	60
		Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN09	486409mE 7833993mN	Elliott	30/9/04	6/10/04	6	10	60
		Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN10	485447mE 7833496mN	Elliott	30/9/04	6/10/04	6	10	60
		Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	-	0	0
TN11	485839mE 7834983mN	Elliott	1/10/04	6/10/04	-	0	0
		Pit	1/10/04	6/10/04	5	6	30
		Cage	1/10/04	6/10/04	-	0	0
TN12	485359mE 7833943mN	Elliott	1/10/04	6/10/04	-	0	0
		Pit	1/10/04	6/10/04	5	6	30
		Cage	1/10/04	6/10/04	-	0	0
						Elliott nights	780
						Pit nights	444
						Cage nights	65

2.3.1 Avifauna Sampling

The avifauna of the project area was sampled using a combination of techniques, which included:

- unbounded area searches conducted at the systematic sampling grids;
- unbounded area searches conducted at opportunistic locations containing habitats or microhabitats likely to support previously unrecorded species; and
- opportunistic observation of birds recorded while driving around the study area.

Twenty-eight 40 minute and one 30 minute avifauna censuses were conducted across the 12 sites during the survey (Table 2.4). Censuses were started as early as possible in the day (from 5:40 am) and lasted until 11:30am at the latest. Individual censuses were confined to discrete habitat types corresponding to vegetation types. The number varied due both to logistical constraints brought about by rainfall and poor road access, and the degree to which habitats were likely to yield previously unrecorded species. In addition, opportunistic records were made of species that were either not recorded during the censuses or that were uncommon.

Table 2.4: Systematic avifauna censuses undertaken at each of the fauna sites.

Site	1/10/04	2/10/04	3/10/04	4/10/04	5/10/04
TN01	06:06-06:40	09:03-09:43	10:00-10:40		
TN02	07:04-07:44	08:10-08:50	09:04-09:44		
TN03	07:52-08:32	07:09-07:49	08:22-09:02		
TN04	09:55-10:35	05:58-06:38	05:37-06:17		
TN05		08:33-09:13			06:37-07:17
TN06	09:08-09:48		07:23-08:03		
TN07		06:45-07:25		07:48-08:28	
TN08		07:16-07:56		07:07-07:47	07:33-08:13
TN09		09:05-09:45			09:13-09:43
TN10		10:50-11:30		09:43-10:23	
TN11			07:58-08:38	08:52-09:32	
TN12			06:25-07:05		09:53-10:33

2.3.2 Bats

Bats were sampled by recording echolocation calls only. A comprehensive survey of bats, which would include trapping to determine the presence of bats not readily recorded by microphones, was not undertaken during this survey.

Echolocation calls were recorded with an Anabat II bat detector, which detects and transforms the ultrasonic echolocation that bats emit whilst foraging. On all occasions a delay switch was connected to the detector to maximise the time that calls could be collected. The calls were stored on a compact flash card after being processed by an Anabat CF ZCAIM.

Sampling was undertaken on two nights (30/09/04 and 01/10/04) at two sites (TN02 and TN04). Two surveyors arrived on site before dark and placed Anabat detectors and the linked time delay units at two specific locations that appeared suitable for bat foraging and commuting. These locations were the grid trapping areas TN02 (485351 mE, 7800754 mN) and TN04 (484092 mE, 7804316 mN) surveyed for vertebrate fauna as part of the overall fauna survey works. These were *Triodia* hillslope and minor drainage line sites respectively. The habitat within these areas is described in more detail in Table 2.5.

One unit was situated at each location for the duration of the night on the 30/09/04 and 01/10/04. The units were retrieved at first light whilst undertaking fauna trap emptying activities. Information from these units was later downloaded to a personal computer for analysis using the associated Analook software.

Calls were visualised on Analook 4.3f software. Identifications were made by comparing values of minimum frequency (measured directly from Analook) with those in Fullard et al. (1991), Bullen and McKenzie (2002) and Bullen (2003). Only sequences containing good quality search phase calls were considered for identification.

2.3.3 Invertebrate Sampling

Targeted invertebrate groups were sampled through opportunistic and systematic collections during the survey. Prior to field work, WA Museum staff were consulted to confirm invertebrate groups of interest and to identify any specific curation methods (eg. the preservation of Wolf Spiders for DNA analyses).

Invertebrate groups targeted during the survey included:

- Araneae (Spiders, in particular Trapdoor and Wolf Spiders);
- Pseudoscorpionida (Pseudoscorpions);
- Scorpionida (Scorpions);
- Diplopoda (Millipedes); and
- Pulmonata (Land Snails)

Trapdoor and Wolf Spiders were preserved in 70% ethanol, with one or two legs removed and placed in 100% ethanol for future molecular studies.

Hand foraging was undertaken for pseudoscorpions, involving peeling bark and lifting rocks. The latter technique was also used to search for scorpions, with additional specimens collected from pit traps. The remaining two groups (millipedes and land snails) were searched for whilst raking leaf litter and other debris. Representatives of other invertebrates from pit traps were collected, placed in 70% ethanol and lodged with the WA Museum.

2.3.4 Non-systematic Sampling

A range of non-systematic fauna survey activities was undertaken by the survey team to supplement the trapping and investigate additional habitats identified during the course of the survey. These included:

- Habitat specific searches for Schedule and Priority listed fauna species;
- Searching (including head-torching) of microhabitats for reptile, frog and small mammal species;
- Opportunistic sightings and records;
- Identification of road kills and other animal remains; and
- Recording and identification of secondary signs (where possible) including tracks, scats and diggings.

2.4 Vegetation Types and Fauna Habitat Classification at each Survey Site

Six primary habitats were identified within the project area. These were largely based on vegetation structure and soil types as depicted in Table 2.5.

Table 2.5: Habitat, vegetation and soil descriptions for each of the sites within the Western Tanami project area.

Site	Habitat	Vegetation Description	Soils Description
TN01	savanna	Open *Eucalyptus* woodland over open *Acacia* over *Triodia* and grasses in unburnt/disturbed areas	Red-brown clayey loam
TN02	*Triodia* hillslope	Scattered *Eucalyptus* over mixed *Acacia* low shrubland/*Triodia* hummock grassland	Laterite gravelly sandy loam
TN03	*Triodia* sandplain	Dense but patchy *Acacia* and *Grevillea* over a *Triodia* hummock grassland	Red-brown loamy sand
TN04	minor drainage line	Scattered eucalypts over *Melaleuca*, *Acacia* and *Grevillea* over a relatively dense ground layer of *Triodia longiceps*	Red-brown loamy sand
TN05	*Triodia* flat	Dense ground layer of *Triodia* interspersed with scattered large termite mounds and essentially no overstorey	Dark brown loamy clay
TN06	*Triodia* sandplain	Recently burnt site with a ground layer dominated by tussock grasses and a midstorey of *Acacia* and *Grevillea* (mostly dead) and a very scattered overstorey of eucalypts	Red-brown loamy sand
TN07	*Triodia* hillslope	Relatively open ground layer of *Triodia* with an open overstorey of *Acacia*	Pale brown clayey loam with much calcrete in the profile
TN08	*Triodia* dune	Scattered *Acacia* and *Grevillea* over a dense ground layer of *Triodia* and herbs which became more open on the dune crest	Red-brown sand
TN09	*Triodia* flat	Open overstorey of scattered eucalypts with a midstorey of *Acacia* and an open ground layer of *Triodia*	Red-brown loamy sand
TN10	*Triodia* flat	Relatively dense ground layer of *Triodia* with an open midstorey of *Acacia* and *Grevillea* and a very open overstorey of eucalypts	Red-brown sandy loam
TN11	*Triodia* hillslope	Ground layer of *Triodia* with an open overstorey of eucalypts, primarily in the minor drainage lines	Red-brown loam with numerous small rocks on the surface and in the profile
TN12	minor drainage line	Dense thicket of *Acacia* long a drainage line. There were occasional scattered eucalypts in the overstorey and the ground layer was sparse and consisted primarily of *Triodia*	Red-brown sandy loam

2.5 Survey Limitations

Sampling was targeted around the mine areas and the nominal centerline of the proposed haul road as indicated by Tanami Gold NL at the time of survey.

Parts of the proposed haul road were remote from access tracks that would have permitted regular checking of fauna traps. Though the entire haul road was traversed by vehicle, remote areas were not systematically trapped.

Systematic fauna sampling, the primary component of the study, was completed on the basis of trapping grid installation in habitats considered to be representative of the range of units present within the study area. Not all sections of the study area were therefore ground-truthed or equally sampled for fauna.

The frequent threat of rain meant that bat detectors could be deployed on only a few nights. This meant that some species could have been missed.

Sampling of the study area reported in this document comprised a single survey phase (a second is proposed for 2005) and it is likely that additional fauna species would be recorded if the sites were revisited at other times of the year.

Terrestrial invertebrate sampling was targeted at specific groups, and was otherwise largely opportunistic. As the WA Museum is currently undergoing relocation, it was not possible to complete identifications of the collected invertebrates in the timeframe for finalising this report.

3.0 Vertebrate Fauna Inventory Survey

3.1 Background

The survey of the Western Tanami project area recorded a total of 102 vertebrate species. Table 3.1 provides a summary of the number of species recorded from each major vertebrate group during the survey.

Table 3.1: Number of species recorded from the Western Tanami project area.

Fauna Group	Total
Avifauna	44
Introduced mammals	3
Native mammals	12
Bats	2
Reptiles	40
Amphibians	1
Total	102

3.2 Birds

Assemblage
A total of 44 species of birds was recorded during the current survey. This total comprised 22 families and included 14 non-passerine and 30 passerine species (Table 3.2).

The most abundant and widespread species was the Grey-headed Honeyeater, with 196 records representing 27.9% of all avifauna records for the survey. The next most abundant species was the Zebra Finch, with 105 records representing 14.9% of all records. The most speciose group of birds were the honeyeaters (Meliphagidae), with eight species representing 46% of all species recorded for the survey. The richest habitats were the minor drainage line at TN04 (18 species), the savanna at TN01 (17 species), and the *Triodia* flat at TN10 (15 species). The sites poorest in species were the *Triodia* flat at TN05 and the *Triodia* dune at TN08, both with only eight species recorded.

Annotated List
Table 3.2 presents data for all bird species recorded from each habitat unit. Each species is discussed individually in the following annotated list.

ACCIPITRIDAE

Black-shouldered Kite – *Elanus caeruleus axillaris*
Recorded from just one individual from the *Triodia* flat at TN05.

FALCONIDAE

Brown Falcon – *Falco berigora berigora*
Eight records from the project area during the survey; three from the savanna at TN01, three from *Triodia* hillslopes at TN02 (n=1) and TN11 (n=2), one from the *Triodia* sandplain at TN06, and one from the *Triodia* flat at TN09.

Australian Kestrel – *Falco cenchroides cenchroides*
Recorded from a single individual from the *Triodia* sandplain at TN06.

OTIDIDAE

Australian Bustard – *Ardeotis australis*
Recorded from five individuals from the *Triodia* hillslopes at TN02 (n=2) and TN07 (n=1), the *Triodia* sandplain at TN03 (n=1) and the *Triodia* flat at TN05 (n=1).

TURNICIDAE

Little Button-quail – *Turnix velox*
Recorded on two occasions from sightings on the *Triodia* sandplain at TN06.

CHARADRIIDAE

Oriental Plover – *Charadrius veredus*
A pair of individuals was seen on a track within the project area west of the Coyote deposit.

COLUMBIDAE

Crested Pigeon – *Ocyphaps lophotes*
Three single individuals were recorded from the savanna at TN01 (n=1), the *Triodia* sandplain at TN06 (n=1), and the *Triodia* hillslope at TN07 (n=1).

Spinifex Pigeon – *Geophaps plumifera*
Two individuals sighted at the *Triodia* dune (TN08).

Diamond Dove – *Geopelia cuneata*
Recorded from a single individual from the *Triodia* hillslope at TN11.

PSITTACIDAE

Little Corella – *Cacatua sanguinea*
A pair was observed at the *Triodia* hillslope (TN11).

Major Mitchell's Cockatoo – *Cacatua leadbeateri*
A pair was sighted on the *Triodia* flat at TN09.

Australian Ringneck – *Platycercus zonarius zonarius*
Six individuals recorded; three pairs from the savanna (TN01).

CUCULIDAE

Horsfield's Bronze Cuckoo - *Chrysococcyx basalis*
Four individuals sighted; recorded from the *Triodia* hillslope at TN07 (n=1) and *Triodia* dune at TN08 (n=3).

HALCYONIDAE

Red-backed Kingfisher – *Todiramphus pyrrhopygia*
Two individuals recorded from the savanna at TN01.

MALURIDAE

Variegated Fairy-wren – *Malurus lamberti assimilis*
The fifth most commonly recorded species (n=44). Typically recorded as sightings, but also as calls. Recorded from the minor Drainage lines at TN12 (n=15) and TN04 (n=4), the *Triodia* sandplain at TN03 (n=18) and TN06 (n=4), and the *Triodia* flat at TN10 (n=3).

White-winged Fairy-wren – *Malurus leucopterus leucopterus*
Moderately common, recorded on 25 occasions both as sightings and calls. Recorded from the *Triodia* hillslope at TN02 (n=1) and TN07 (n=3), the *Triodia* sandplain at TN03 (n=4) and TN06 (n=4), and the *Triodia* flat at TN05 (n=6) and TN10 (n=7).

Rufous-crowned Emu-wren – *Stipiturus ruficeps ruficeps*
Recorded on 15 occasions from the *Triodia* flat at TN05 (n=3) and TN10 (n=3), the *Triodia* hillslopes at TN07 (n=2) and TN11 (n=1), and the *Triodia* dune at TN08 (n=6).

PARDALOTIDAE

Red-browed Pardalote – *Pardalotus rubricatus*
Recorded on eight occasions from the savanna at TN01 (n=4), the minor drainage lines at TN03 (n=1) and TN12 (n=1), and the *Triodia* flat at TN09 (n=1) and TN10 (n=1).

Striated Pardalote – *Pardalotus striatus uropygialis*
Recorded on just four occasions, all from calls, from the savanna at TN01 (n=2), the *Triodia* hillslope at TN02 (n=1) and the minor drainage line at TN04 (n=1).

MELIPHAGIDAE

Brown Honeyeater – *Lichmera indistincta indistincta*
Moderately common, with 24 records. Recorded mostly from the minor drainage lines at TN04 (n=12) and TN12 (n=2); also recorded from the *Triodia* dune at TN08 (n=7), the *Triodia* flat at TN10 (n=2), and the *Triodia* hillslope at TN11 (n=1).

Black Honeyeater – *Certhionyx niger*
Only recorded on two occasions, from a call at the minor drainage line at TN04 (n=1) and a sighting from the *Triodia* flat at TN09 (n=1).

Singing Honeyeater – *Lichenostomus virescens*
The fourth most commonly recorded species (n=48). Recorded as both calls and sightings, most commonly from the *Triodia* dune at TN08 (n=21). Also recorded from the *Triodia* hillslope at TN02 (n=2) and TN07 (n=10), the *Triodia* sandplain at TN03 (n=7) and TN06 (n=2), the *Triodia* flat at TN05 (n=2), and the minor drainage line at TN04 (n=4).

Grey-headed Honeyeater – *Lichenostomus keartlandi*
The most commonly recorded species in the area with 196 records. Recorded from every site except the *Triodia* flat at TN05.

White-plumed Honeyeater – *Lichenostomus penicillatus*
Recorded as a pair and two singles from the savanna at TN01 (n=4).

Black-chinned Honeyeater – *Melithreptus gularis laetior*
Moderately common, with 25 records. Recorded from all except four sites (TN03, TN05, TN09, and TN12).

Yellow-throated Miner – *Manorina flavigula*
Recorded mainly as singles but also as a group of five. Recorded from the savanna at TN01 (n=12), the *Triodia* hillslope at TN02 (n=2), the minor drainage line at TN04 (n=2), and the *Triodia* flats at TN09 (n=1) and TN10 (n=2).

Spiny-cheeked Honeyeater – *Acanthagenys rufogularis*
Only recorded from the minor drainage lines at TN04 (n=2) and TN12 (n=3).

PACHYCEPHALIDAE

Crested Bellbird – *Oreoica gutturalis*
Recorded on eleven occasions as singles from the savanna at TN01 (n=2), the minor drainage line at TN04 (n=2), the *Triodia* flat at TN05 (n=1) and TN10 (n=2), the *Triodia* hillslope at TN07 (n=2), and the *Triodia* dune at TN08 (n=2).

Rufous Whistler – *Pachycephala rufiventris rufiventris*
Only recorded from the minor drainage line at TN04 (n=2).

Grey Shrike-thrush – *Colluricincla harmonica brunnea*
Recorded on nine occasions from the savanna at TN01 (n=1), the *Triodia* sandplain at TN03 (n=1), the minor drainage lines at TN04 (n=2) and TN12 (n=2), the *Triodia* flat at TN10 (n=2) and the *Triodia* hillslope at TN11 (n=1).

DICRURIDAE

Willie Wagtail – *Rhipidura leucophrys leucophrys*
Only recorded on four occasions from the *Triodia* sandplain at TN03 (n=3) and the *Triodia* hillslope at TN11 (n=1).

Magpie-lark – *Grallina cyanoleuca*
Just two records from the savanna at TN01.

CAMPEPHAGIDAE

Black-faced Cuckoo-shrike – *Coracina novaehollandiae subpallida*
Recorded on three occasions from the *Triodia* flat at TN09 (n=1) and the *Triodia* hillslope at TN11 (n=2).

White-winged Triller – *Lalage tricolor*
Ten records, most from the minor drainage line at TN04 (n=8), but also from the *Triodia* sandplain at TN06 (n=1) and the *Triodia* hillslope at TN07 (n=1).

ARTAMIDAE

Black-faced Woodswallow – *Artamus cinereus melanops*
This was the third most commonly recorded species with 63 records. Recorded from all except three sites (TN07, TN08 and TN12).

Little Woodswallow – *Artamus minor*
Only observed on two occasions, both as pairs, from the *Triodia* flat at TN10 and the minor drainage line at TN12.

CRACTICIDAE

Pied Butcherbird – *Cracticus nigrogularis*
Recorded on six occasions, all as singles, from the savanna at TN01 (n=3), the minor drainage line at TN04 (n=1), the *Triodia* flat at TN10 (n=1), and the *Triodia* hillslope at TN11 (n=1).

CORVIDAE

Little Crow – *Corvus bennetti*
Recorded from a single individual from the *Triodia* sandplain at TN03.

SYLVIIDAE

Spinifex-bird – *Eremiornis carteri*
Recorded on six occasions, mostly as sightings from the *Triodia* sandplain at TN03 (n=2) and the minor drainage line at TN12 (n=4).

Rufous Songlark – *Cincloramphus mathewsi*
Only one pair recorded from the savanna at TN01.

Golden-headed Cisticola – *Cisticola exilis exilis*
A single individual recorded from the *Triodia* flat at TN05.

ALAUDIDAE

Singing Bushlark – *Mirafra javanica horsfieldii*
Five individuals recorded, typically as singles, but one pair also noted. Records from the *Triodia* hillslope at TN02 (n=3), the *Triodia* sandplain at TN06 (n=1) and the *Triodia* flat at TN10 (n=1).

DICAEIDAE

Mistletoebird – *Dicaeum hirundinaceum hirundinaceum*
Recorded on seven occasions, mostly as singles from the savanna at TN01 (n=4), the minor drainage line at TN04 (n=1), the *Triodia* hillslope at TN07 (n=1) and the *Triodia* flat at TN09 (n=1).

PASSERIDAE

Zebra Finch – *Taeniopygia guttata castanotis*
This was the second most commonly recorded bird species with 105 records. Recorded from the minor drainage lines at TN04 (n=1) and TN12 (n=42), the *Triodia* flat at TN10 (n=19), and the *Triodia* hillslope at TN11 (n=43).

Discussion

The survey recorded 44 species of avifauna from the survey area. This compares with 43 species recorded during the site inspection (MBS Environmental 2004). When both datasets are combined a total of 55 species have been recorded from the Western Tanami project area.

Many species were recorded during the site inspection, but not during the fauna survey, because the site inspection was conducted at a cooler, wetter time of the year when more nomadic species were present (eg. the Pied Honeyeater). The fauna survey recorded many species not seen during the site inspection, probably because it was conducted over a longer time period and thus was more likely to detect low-density resident species.

Of particular note are the sightings of Striated Pardalote and Golden-headed Cisticola. The Striated Pardalote records represent a southerly range extension of the northern race *melanocephalus*. Other subspecies are found to the south and east of the study area in other parts of the arid zone and southern Australia. The Golden-headed Cisticola sighting represents a southerly range extension of this Kimberley species. Neither species is considered to be of conservation significance.

Regional Endemism and Restricted Taxa

Schodde and Mason (1999) discuss proposed historic geographic boundaries that have initiated ultrataxa (ie. subspecies) differentiation in Australian perching birds. The Tanami bioregion is geographically distant from any boundaries and, as a result, no taxa or ultrataxa are confined to this bioregion.

Conservation Significant Taxa

Two species of conservation significance were recorded from the Western Tanami project area; the Australian Bustard *Ardeotis australis* and Major Mitchell's Cockatoo *Cacatua leadbeateri.* A total of five Australian Bustards were seen in a variety of habitats (Table 3.2) and two Major Mitchell's Cockatoos were seen on a *Triodia* flat (TN09). Although these were the only species of conservation significance recorded, several other species may occur (see Section 5.1).

Table 3.2: Avifauna records from the Western Tanami survey area.

Species Name	Common Name	TN01	TN02	TN03	TN04	TN05	TN06	TN07	TN08	TN09	TN10	TN11	TN12	Opportunistic	Total
Elanus caeruleus axillaris	Black-shouldered Kite					1									1
Falco berigora berigora	Brown Falcon	3	1				1			1		2			8
Falco cenchroides cenchroides	Australian Kestrel						1								1
Ardeotis australis	Australian Bustard		2	1		1		1							5
Turnix velox	Little Button-quail						2								2
Charadrius veredus	Oriental Plover													2	2
Ocyphaps lophotes	Crested Pigeon	1					1	1							3
Geophaps plumifera	Spinifex Pigeon								2						2
Geopelia cuneata	Diamond Dove											1			1
Cacatua sanguinea	Little Corella											2			2
Cacatua leadbeateri	Major Mitchell's Cockatoo									2					2
Platycercus zonarius zonarius	Australian Ringneck	6													6
Chrysococcyx basalis	Horsfield's Bronze Cuckoo							1	3						4
Todiramphus pyrrhopygia	Red-backed Kingfisher	2													2
Malurus lamberti assimilis	Variegated Fairy-wren			18	4		4				3		15		44
Malurus leucopterus leuconotus	White-winged Fairy-wren		1	4		6	4	3			7				25
Stipiturus ruficeps ruficeps	Rufous-crowned Emu-wren					3		2	6		3	1			15
Pardalotus rubricatus	Red-browed Pardalote	4			1					1	1		1		8
Pardalotus striatus uropygialis	Striated Pardalote	2	1		1										4
Lichmera indistincta indistincta	Brown Honeyeater				12				7		2	1	2		24
Certhionyx niger	Black Honeyeater				1					1					2
Lichenostomus virescens	Singing Honeyeater		2	7	4	2	2	10	21						48
Lichenostomus keartlandi	Grey-headed Honeyeater	18	20	17	50		12	3	18	18	25	10	5		196
Lichenostomus penicillatus	White-plumed Honeyeater	4													4
Melithreptus gularis laetior	Black-chinned Honeyeater	2	2		7		3	2	3		5	1			25
Manorina flavigula	Yellow-throated Miner	12	2		2					1	2				19
Acanthagenys rufogularis	Spiny-cheeked Honeyeater				2								3		5
Oreoica gutturalis	Crested Bellbird	2			2	1		2	2		2				11
Pachycephala rufiventris rufiventris	Rufous Whistler				2										2
Colluricincla harmonica brunnea	Grey Shrike-thrush	1		1	2						2	1	2		9
Rhipidura leucophrys leucophrys	Willie Wagtail			3								1			4

Species Name	Common Name	TN01	TN02	TN03	TN04	TN05	TN06	TN07	TN08	TN09	TN10	TN11	TN12	Opportunistic	Total
Grallina cyanoleuca	Magpie-lark	2													2
Coracina novaehollandiae subpallida	Black-faced Cuckoo-shrike									1		2			3
Lalage tricolor	White-winged Triller				8		1	1							10
Artamus cinereus melanops	Black-faced Woodswallow	3	15	8	9	2	6			8	11	1			63
Artamus minor	Little Woodswallow										2		2		4
Cracticus nigrogularis	Pied Butcherbird	3			1						1	1			6
Corvus bennetti	Little Crow			1											1
Eremiornis carteri	Spinifex-bird			2									4		6
Cincloramphus mathewsi	Rufous Songlark	2													2
Cisticola exilis exilis	Golden-headed Cisticola					1									1
Mirafra javanica horsfieldii	Singing Bushlark		3				1				1				5
Dicaeum hirundinaceum hirundinaceum	Mistletoebird	4			1			1		1					7
Taeniopygia guttata castanotis	Zebra Finch				1						19	43	42		105

3.3 Mammals

Assemblage
The survey recorded twelve native and three introduced species of mammals, comprising four dasyurids (carnivorous marsupials), one thylacomyid (bilbies), one macropod (kangaroos and wallabies), five native and one introduced murid rodents (mice), one canid (dogs), one felid (cats) and one camelid (camels).

Annotated List
Table 3.3 contains the mammal records from each site. The species are discussed individually in the following annotated list. Voucher specimen numbers (M numbers) are provided for all specimens lodged with the WA Museum.

DASYURIDAE

Forty individuals of four species were recorded from this family during the current survey.

Ningaui ridei
Recorded from two individuals, one each from the savanna site at TN01 (specimen lodged with the WA Museum, M number pending) and the *Triodia* dune site at TN08 (M56123).

Sminthopsis macroura
Recorded from a single individual pit-trapped from the *Triodia* flat at TN05 (M56144).

Sminthopsis youngsoni
This species was recorded on 11 occasions, all from pit-traps. Recorded from the *Triodia* sandplain at TN03 (n=1) (M56115), the minor drainage lines at TN04 (n=1) (M56109) and TN12 (n=1) (M56128), the *Triodia* flat at TN05 (n=1), the *Triodia* hillslope at TN07 (n=6) (M56119, M56120, M56122, M56126), and the *Triodia* dune site at TN08 (n=1).

Dasycercus cristicauda
All 26 records of this species were from diggings, burrows or scats. All were opportunistic records, mostly found by surveying the suitable habitats on foot. Records were scattered across three locations.

THYLACOMYIDAE

One species from this family was recorded during the current survey.

Macrotis lagotis
Recorded from the *Triodia* sandplain at TN03, where a number of diggings and an inactive burrow were observed. Also recorded from the proposed airstrip, where a number of diggings and an active burrow were located.

MACROPODIDAE

A single individual from one species was recorded from this family during the current survey.

Macropus rufus
Recorded from only one sighting from the *Triodia* sandplain at TN06.

MURIDAE

A total of 54 individuals of six species were recorded from this family during the current survey.

Mus musculus
This species was recorded on 11 occasions, from the savanna site TN01 (n=4, all from Elliott traps) (M56111, M56130), the *Triodia* hillslope at TN02 (n=1, also from an Elliott

trap) (M56106), TN04 (n=2) (M56103), the *Triodia* flat at TN05 (n=1) (M56117), and the *Triodia* sandplain at TN06 (n=3) (M56116, M56139).

Notomys alexis
Recorded on 10 occasions from the *Triodia* hillslope at TN02 (n=1) (M56102), the *Triodia* sandplains at TN03 (n=4)(M56096, M56112, M56113) and TN06 (n=3) (M56108, M56134), and two individuals recorded opportunistically.

Pseudomys desertor
This species was also recorded on 10 occasions, from both pit-traps and Elliott traps, from the savanna at TN01 (n=3) (M56105, M56138), the *Triodia* sandplain at TN03 (n=3) (M56097, M56101, M56133), the *Triodia* dune at TN08 (n=3) (M56118, M56129, M56132) and the *Triodia* hillslope at TN11 (n=1) (M56131).

Pseudomys ?hermannsburgensis
This was the second most commonly recorded mammal species with 17 records from the savanna at TN01 (n=2) (M56107), the *Triodia* hillslopes at TN02 (n=6) (M56098 – M56100, M56125, M56145) and TN07 (n=2) (M56143), the *Triodia* sandplain at TN03 (n=1), the minor drainage line at TN04 (n=1) (M56114), the *Triodia* flats at TN05 (n=2) (M56142) and TN09 (n=2) (M56121), and one individual caught at an opportunistic site (M56141).

Pseudomys nanus
Recorded from a single individual from the savanna at TN01 from an Elliott trap (specimen lodged with the WA Museum, M number pending).

Pseudomys ?laborifex
Recorded on five occasions from the savanna at TN01 (n=1) (M56140), the *Triodia* hillslope TN02 (n=2) (specimen lodged with the WA Museum, M number pending), the *Triodia* sandplain at TN03 (n=1) (M56146) and from an opportunistic site (n=1) (specimen lodged with the WA Museum, M number pending).

CANIDAE

A single individual from one species was recorded from this family during the current survey.

Canis lupus dingo
One individual was observed at the savanna site TN01.

FELIDAE

A single individual from one species was recorded from this family during the current survey.

Felis catus
Recorded from one observation at the savanna site TN01.

CAMELIDAE

Seven individuals from one species were recorded from this family during the current survey.

Camelus dromedarius
This species was recorded on seven occasions from the *Triodia* hillslopes at TN02 (n=1), TN07 (n=1) and TN11 (n=1), the *Triodia* sandplain at TN03 (n=2), the minor drainage line at TN04 (n=1), and the *Triodia* flat at TN05 (n=1).

Discussion
The tally of twelve native and three introduced species of mammals included two species, *Pseudomys laborifex* and *P. nanus,* for which the records extended southwards the documented distribution for these species (FaunaBase; Strahan 1995). The range

extension for *P. laborifex* appears quite substantial when current distribution maps are reviewed (Strahan 1995), as these suggest that this taxon is confined to the Northern Kimberley. However, there is an undated or pre-1850 record for an area just to the north of the Tanami Desert on the WA Museum's FaunaBase. This species is poorly represented in the museums of Australia, with only 42 specimens lodged. *Pseudomys nanus*, on the other hand, is represented by more than 430 specimens in collections across Australia.

The study area lies close to the southern extent of the tropical zone of northern Australia. This is reflected in the mammal assemblage with some species (eg. *Pseudomys laborifex* and *P. nanus*) displaying a mostly tropical distribution, and others (such as *Ningaui ridei*, *Dasycercus cristicauda*, *Notomys alexis* and *Pseudomys hermannsburgensis*) displaying a predominantly arid zone distribution.

It should be noted that we are waiting on final confirmation of the identity of the *Pseudomys ?hermannsburgensis* and *P. ?laborifex* specimens lodged with the WA Museum.

Regional Endemism and Restricted Taxa

None of the mammal species recorded during the current survey are considered endemic to the Tanami desert, nor to the State, though *Pseudomys laborifex* is nearly so.

Unresolved Species Complexes

Sminthopsis macroura is a widespread species across arid WA and according to Ms. Norah Cooper (WA Museum, pers. comm. 2004) may be a species complex of at least two taxa and possibly three, although this work is unresolved.

Pseudomys hermannsburgensis also appears to comprise a species complex, with potentially two taxa within the Pilbara *P. hermannsburgensis* (Ms Norah Cooper pers comm.). Mr Mark Cowan (CALM Kalgoorlie, pers. comm. 2005) also suspects two taxa at several of his study sites in the Goldfields region of WA.

Conservation Significant Taxa

Two mammal species of conservation significance were recorded in the project area during the current survey. These were the Mulgara *Dasycercus cristicauda* and the Bilby *Macrotis lagotis*.

The Bilby is listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003.* The former range of the Bilby included most of the semi-arid areas of mainland Australia, however it is now confined to *Triodia* hummock grassland and *Acacia* scrub across parts of northern Australia (see Section 5.1).

The Mulgara is also listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003.* This species apparently prefers mature spinifex (*Triodia* spp.) associations on sandy substrates (see Section 5.1).

The Spectacled Hare-wallaby *Lagorchestes conspicillatus* (Priority 4 listed) has been recorded in the area from a roadkill in 2003 on the Tanami Road near the Balgo Hills community. Sightings of small wallabies in the area have been attributed to this species, as a number of targeted surveys have failed to turn up any more populations of the Rufous Hare-wallaby.

Table 3.3: Mammal records from the Western Tanami survey area.

Species Name	TN01	TN02	TN03	TN04	TN05	TN06	TN07	TN08	TN09	TN11	TN12	Opportunistic	Total
Dasyuridae													
Ningaui ridei	1							1					2
Sminthopsis macroura					1								1
Sminthopsis youngsoni			1	1	1		6	1			1		11
Dasycercus cristicauda												26	26
Thylacomyidae													
Macrotis lagotis			1										1
Macropodidae													
Macropus rufus						1							1
Muridae													
Mus musculus	4	1		2	1	3							11
Notomys alexis		1	4			3						2	10
Pseudomys desertor	3		3					3		1			10
Pseudomys ?hermannsburgensis	2	6	1	1	2		2		2			1	17
Pseudomys nanus	1												1
Pseudomys ?laborifex	1	2	1									1	5
Canidae													
Canis lupus dingo	1												1
Felidae													
Felis catus	1										1		2
Camelidae													
Camelus dromedarius		1	2	1	1		1			1			7

3.3.1 Bats

Results
Over the two nights where the Anabat units were deployed, bat calls were recorded from one Anabat unit at the grid site TN02. Three calls were recorded on the evening of 30/09/04 and the early morning of 01/10/04. In all cases, the calls were recorded within an area of scattered *Eucalyptus* over mixed *Acacia* low shrubland/*Triodia* hummock grassland.

Two species were identified, the first being Gould's Wattled Bat *Chalinolobus gouldii* and the second a Long-eared Bat *Nyctophilus* sp., probably the Lesser Long-eared Bat *Nyctophilus geoffroyi*. The call signatures are presented as Figures 3.1, 3.2 and 3.3.

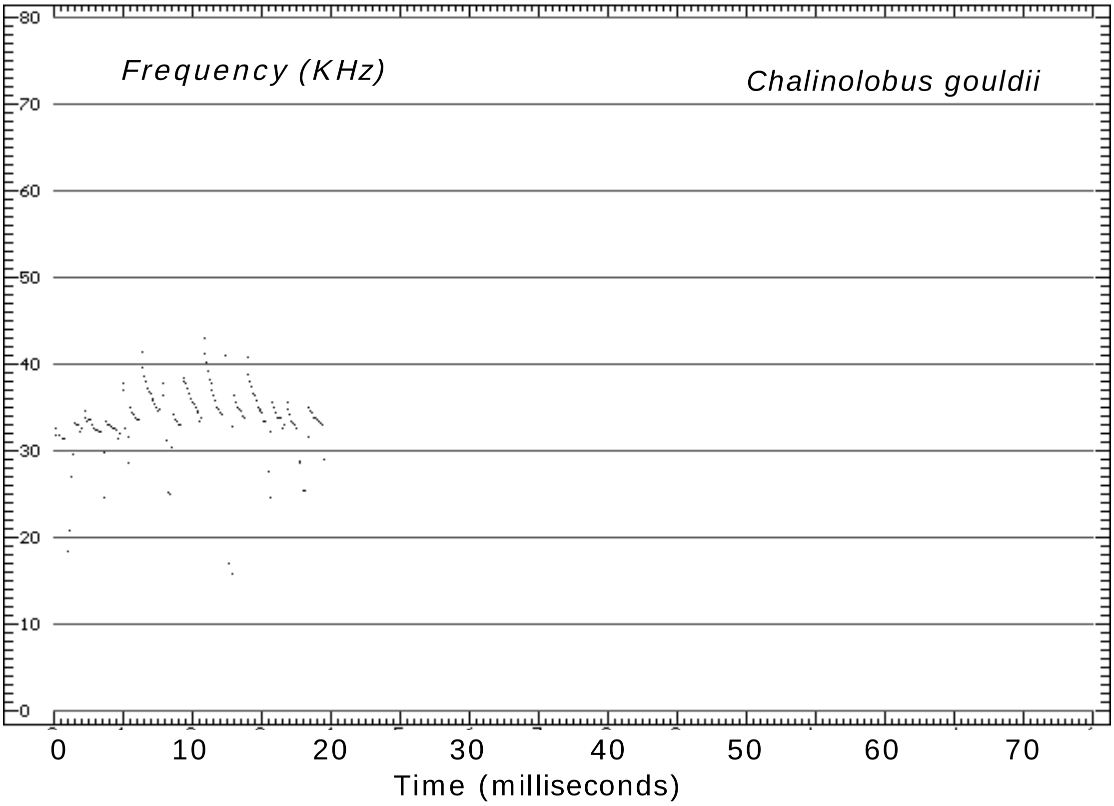

Figure 3.1: Search mode call of Gould's Wattled Bat *Chalinolobus gouldii*. (Recorded at GPS bearing 485351mE, 7800754mN on 30/09/04 at 22.21 hrs.)

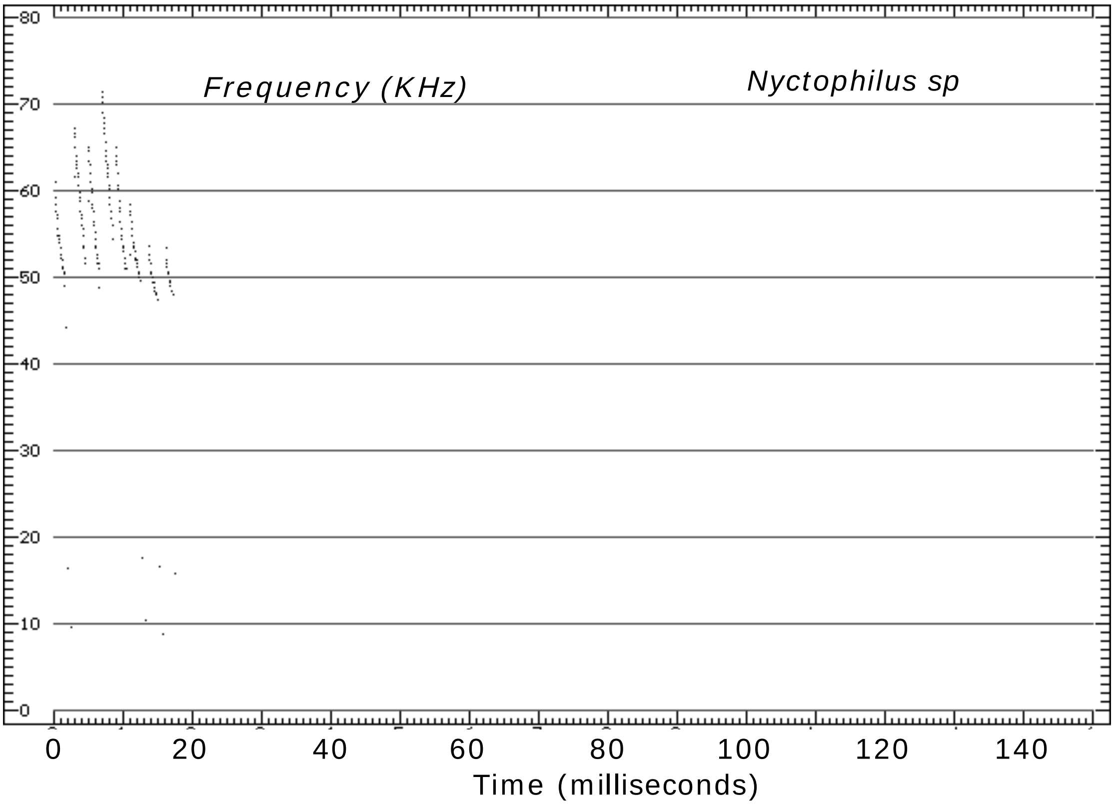

Figure 3.2: Call sequence of a Long-eared Bat, probably the Lesser Long-eared Bat *Nyctophilus geoffroyi*. (Recorded at GPS bearing 485351mE, 7800754mN, on 30/09/04 at 21.41 hrs.)

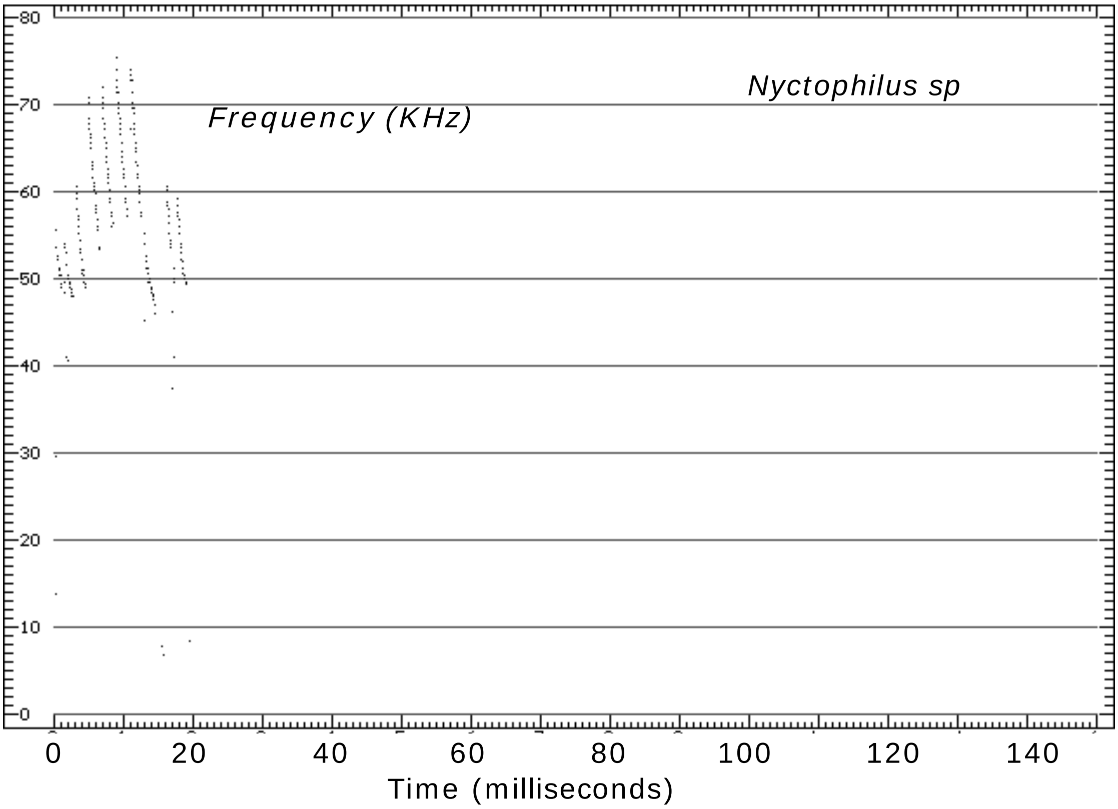

Figure 3.3: Call sequence of a Long-eared Bat, probably the Lesser Long-eared Bat *Nyctophilus geoffroyi*. (Recorded at GPS bearing 485351mE, 7800754mN, on 01/10/04 at 04:01 hrs.)

Discussion
The activity recorded is considered in proportion with that of open sand plains, providing limited regional roosting, foraging habitat and water. In addition, the weather during the duration of the field survey was unsettled, with some rain and wind and consistent high temperatures.

3.4 Herpetofauna

Species Assemblage
One frog and 40 reptile species were recorded from the trapping sites established during the Western Tanami survey (see Table 3.4). These comprised one myobatrachid frog (Australasian ground frogs), nine gekkonids (geckos), three pygopodids (legless lizards), six agamids (dragons), 14 scincids (skinks), three varanids (goannas), two typhlopids (blind snakes) and three elapids (front-fanged snakes). Specimens lodged with the WA Museum have been assigned R numbers; these are given below where relevant.

The most abundant group encountered were the Scincidae, with 142 records comprising 36.5% of all the herpetofauna records for the survey. The most common species was *Lerista bipes,* with 69 occurrences comprising 17.7% of all records.

The following section provides an annotated list of the herpetofauna recorded from the Western Tanami survey (Table 3.4). A list of vouchered specimens is given in Appendix 5.

Annotated List

MYOBATRACHIDAE

A total of 29 individuals from one species were recorded from this family during the current survey.

Notaden nichollsi
Only recorded from the *Triodia* dune site (TN08) (n=27) (R157474 - R157486), the Triodia flat at TN05 (n=1) (R number pending) and an opportunistic location within the project area (n=1) (R number pending). Likely to be present throughout the project area in suitable habitat.

GEKKONIDAE

A total of 74 individuals of nine species were recorded from this family during the current survey.

Diplodactylus conspicillatus
Six individuals recorded from the *Triodia* sandplain at TN03 (n=2) (R157350, R157431), the minor drainage line at TN04 (n=1) (R110589), the *Triodia* hillslope at TN07 (n=1) (R157395) and two individuals hand caught from opportunistic locations within the project area (R110626).

Diplodactylus stenodactylus
This species was relatively common in the project area with 33 records, mostly from pit-traps from the savanna at TN01 (n=6) (R110593, R110594, R110604, R110610, R110615, R110616), the *Triodia* hillslope at TN02 (n=5) (R110625, R110854, R157366), the *Triodia* sandplains at TN03 (n=1) (R110591) and TN06 (n=7) (R110600, R110609, R110618 - R110620), the minor drainage line at TN04 (n=6) (R110588, R110597, R110601, R110602, R110617, R110624), the *Triodia* flats at TN09 (n=4) (R110630) and TN10 (n=3) (R110592, R110599, R110603), with one individual hand-caught whilst road-spotting within the project area.

Gehyra purpurescens
Just a single individual hand captured whilst head-torching (R110580).

Gehyra variegata
Recorded from only three individuals; two hand caught from opportunistic locations (R157471) and one individual pit-trapped at the savanna at TN01 (R157465).

Heteronotia binoei
Just two individuals pit-trapped from the savanna at TN01 (n=1) (R157433) and the minor drainage line at TN12 (n=1) (R157419).

Nephrurus levis levis
Recorded from a single specimen hand caught whilst road spotting within the project area (R110633).

Rhynchoedura ornata
This species was recorded on seven occasions. Six individuals were pit-trapped from the *Triodia* dune at TN08 (n=1) (R157392) and the *Triodia* flat at TN09 (n=5) (R157393, R157398, R157400, R157458) and one specimen was hand-caught from an opportunistic location within the project area (R110583).

Strophurus ciliaris ciliaris
Recorded on 19 occasions, seven of which were opportunistic hand-captures within the project area. The remainder were caught from the *Triodia* hillslopes at TN02 (n=2) (R157441, R157467) and TN07 (n=1) (R157391), the *Triodia* sandplains at TN03 (n=3) (R157347, R157365) and TN06 (n=5) (R110622, R157351, R157352, R157394), and the minor drainage line at TN04 (n=1) (R157439).

Strophurus jeanae
Recorded from just two specimens, both of which were hand-caught at opportunistic locations within the project area (R110614, R157338).

PYGOPODIDAE

A total of 15 individuals of three species were recorded during the current survey.

Delma borea
This species was recorded on seven occasions from the savannas at TN01 (n=4) (R110608, R157426, R157430, R157447), TN03 (n=1) (R157435) and TN11 (n=2) (R110606, R110607). Records included one gravid female.

Lialis burtonis
Recorded on five occasions from pit traps from the *Triodia* hillslopes at sites TN02 (n=1) (R157434) and TN07 (n=1) (R157415), the *Triodia* sandplain at TN06 (n=2) (R110621, R157429), and from an Elliott trap at the minor drainage line at TN12 (n=1) (R157446).

Pygopus nigriceps
Recorded on three occasions; one from a pit-trap from the *Triodia* dune at TN08 (n=1) (R157455) and two individuals hand-caught from opportunistic locations within the project area (R110632, R157460).

AGAMIDAE

A total of 95 individuals of six species were recorded from this family during the current survey.

Ctenophorus isolepis isolepis
This was the second most commonly recorded herpetofauna species after *Lerista bipes,* with 61 records. This species was recorded from all sites except TN04. It was recorded from the savanna at TN01 (n=4), the *Triodia* hillslopes at sites TN02 (n=9) (R157349, R157376), TN07 (n=4) (R110631, R157422, R157442, R157454) and TN11 (n=3), the *Triodia* sandplains at sites TN03 (n=16) and TN06 (n=10) (R157380), the *Triodia* flats at sites TN05 (n=1) (R157453), TN09 (n=8) (R157379, R157382, R157390), and TN10

(n=3), the *Triodia* dune at TN08 (n=2) (R157455) and the minor drainage line at TN12 (n=1).

Ctenophorus nuchalis
Recorded on 6 occasions from the savanna at TN01 (n=1) (R157354), the *Triodia* flat at TN05 (n=4) (R157414) and the *Triodia* hillslope at TN11 (n=1).

Diporiphora lalliae
This species was recorded on 18 occasions from the *Triodia* sandplains at sites TN03 (n=3) (R157339, R157345) and TN06 (n=3) (R157353, R157436), the minor drainage lines at sites TN04 (n=6) (R110586, R157372, R157396, R157432) and TN12 (R110587), the *Triodia* flats at sites TN09 (n=1) and TN10 (n=2) (R157445), and two individuals from an opportunistic site (R157346, R157371). All individuals except one were juveniles.

Lophognathus longirostris
Recorded on five occasions. One individual was hand-caught from the minor drainage line at TN04 (R157437), one individual was observed and one pit-trapped at TN12 (R110629), and two individuals were hand-caught from the *Triodia* flat at TN09 (R157377, R157378).

Moloch horridus
Recorded from one observation within the project area.

Pogona minor
This species was recorded from four individuals. Three were pit-trapped from the *Triodia* dune at TN08 (n=1) and the *Triodia* flat at TN10 (n=2) (R157386, R157421), and one was hand caught from an opportunistic location within the project area (R157335). These records were a range extension for the species.

SCINCIDAE

A total of 142 individuals of 14 species were recorded from this family during the current survey.

Carlia munda
Recorded from just a single male pit-trapped from the minor drainage line at TN12 (R157468).

Carlia triacantha
Recorded on four occasions from the savanna at TN01 (n=1) (R157466) and the minor drainage line at TN12 (n=3) (R157406, R157417).

Ctenotus grandis titan
This species was recorded on just two occasions from a pit-trap from the savanna at TN01 (n=1) and an Elliott trap from the *Triodia* flat at TN09 (n=1) (R157473).

Ctenotus helenae
A total of six individuals were recorded from the savanna at TN01 (n=1) (R157342), the *Triodia* flat at TN05 (n=1), the *Triodia* dune at TN08 (n=2) (R157423, R157451) and the minor drainage line at TN12 (n=2) (R157418, R157469).

Ctenotus pantherinus ocellifer
A total of 20 individuals were recorded, 19 of which were pit-trapped from the *Triodia* sandplains at sites TN03 (n=2) (R157461, R157462) and TN06 (n=1), the minor drainage line at TN04 (n=2) (R157340, R157389), the *Triodia* flats at sites TN05 (n=4) (R157387, R157410), TN09 (n=2) (R157383, R157411) and TN10 (n=3), the *Triodia* hillslopes at TN07 (n=1) and TN11 (n=2) (R157424), and the *Triodia* dune at TN08 (n=2) (R157409, R157452). In addition, one individual was caught in an Elliott trap at an opportunistic location (R157425).

Ctenotus piankai
This species was recorded on six occasions, all from pit-traps from the *Triodia* hillslopes at TN02 (n=2) (R110627, R110628) and TN11 (n=4) (R110581, R157412, R157440, R157494).

Ctenotus schomburgkii
Recorded on four occasions from the *Triodia* flat at TN10 (n=3) (R110590, R157443) and the minor drainage line at TN12 (n=1).

Ctenotus tanamiensis
Recorded from only two individuals, both from the *Triodia* flat at site TN09. One individual was pit trapped (R110634), the other individual observed.

Eremiascincus sp.
This species was recorded on eight occasions from the minor drainage line at TN04 (n=2) (R110605, R157335), the *Triodia* sandplain at TN06 (n=3) (R110611 - R110613), the *Triodia* dune site TN08 (n=1) (R157450) and two individuals from opportunistic locations; one from camp, the other whilst road spotting in the project area (R110585).

Lerista bipes
This was the most commonly recorded species, with 69 records from the savanna site at TN01 (n=1), the *Triodia* hillslopes at TN02 (n=8) (R157360, R157364, R157369, R157388) and TN07 (n=2), the *Triodia* sandplains at TN03 (n=22) (R157341, R157361 - R157363, R157367, R157407) and TN06 (n=5), the minor drainage lines at TN04 (n=13) (R157356, R157357, R157359, R157368, R157370, R157373- R157375) and TN12 (n=2), the *Triodia* dune site at TN08 (n=6) (R157358, R157385), and the *Triodia* flats at TN09 (n=4) and TN10 (n=6).

Lerista greeri
Recorded from five individuals from the *Triodia* sandplain at site TN06 (n=1) (R157470), the *Triodia* flats at TN09 (n=1) (R157416) and TN10 (n=2) (R157404, R157420), and the minor drainage line at TN12 (n=1) (R157405).

Menetia greyii
Recorded on eight occasions from the savanna site TN01 (n=3) (R157343, R157344, R157348), the minor drainage lines at TN04 (n=1) (R157337) and TN12 (n=1) (R157408), the *Triodia* flat at TN05 (n=1) (R157397), the *Triodia* sandplain at TN06 (n=1) (R110623) and the *Triodia* hillslope at TN07 (n=1).

Morethia ruficauda ruficauda
Recorded from only three individuals, all pit-trapped from the *Triodia* flats at TN05 (n=2) (R110595, R110596) and TN09 (n=1) (R157472).

Tiliqua multifasciata
This species was recorded on four occasions from the *Triodia* dune at site TN08 (n=1), the minor drainage line at TN12 (n=1) (R157413) and two individuals from Elliott traps from an opportunistic site within the project area.

VARANIDAE

Eighteen individuals of three species were recorded from this family during the current survey.

Varanus acanthurus
This species was only recorded from two individuals. One was pit-trapped from the *Triodia* flat at TN10 (R157385); the other was observed at an opportunistic location within the project area.

Varanus eremius
Recorded from a total of 13 individuals from the savanna at TN01 (n=1) (R157444), the *Triodia* sandplains at TN03 (n=3) (R157457) and TN06 (n=1) (R157401), the *Triodia* flats at TN05 (n=2) (R157456) and TN10 (n=1), the *Triodia* hillslope at TN07 (n=1) and the *Triodia* dune at TN08 (n=4) (R157448, R157449, R157463).

Varanus gouldii
This species was observed on three occasions from the minor drainage line at TN04 (n=2) and from an opportunistic location within the survey area. No individuals were vouchered.

TYPHLOPIDAE

Nine individuals of two species were recorded from this family during the current survey.

Ramphotyphlops diversus
This species was recorded on four occasions, all from pit-traps from the *Triodia* hillslope at TN02 (n=2) (R157464, R157495) and the *Triodia* sandplain at TN03 (n=2) (R157402). Specimens included a gravid female.

Ramphotyphlops grypus
Recorded on five occasions from the minor drainage lines at TN04 (n=1) (R157381) and TN12 (n=1), the *Triodia* sandplain at TN06 (n=1) (R157399), the *Triodia* flat at TN10 (n=1) (R157403), and from an opportunistic location within the survey area (R157334).

ELAPIDAE

Six individuals of three species were recorded from this family during the current survey.

Brachyurophis roperi
Recorded from four juveniles from the *Triodia* flat at TN10 (n=2) (R110598, R157438) and the minor drainage line at site TN12 (n=2) (R157428, R157427). These were the first records of this species in the area.

Simoselaps anomalus
Recorded from one specimen only (R157336), found on the road near the Coyote Balwina campsite.

Suta punctata
Recorded from one male individual only (R110635), found whilst road-spotting on the Tanami Track within the project area.

Discussion
The survey recorded 41 species of herpetofauna from the study area, which is less than half the number yielded from the FaunaBase search. Clearly there are many additional species still unrecorded by us that could potentially be recorded during the proposed seasonal survey in 2005. We are unaware of any published reports describing results from inventory surveys of the Tanami region within WA against which we could compare these survey results.

Regional Endemism and Restricted Taxa
One species, *Ctenotus tanamiensis,* is considered endemic to the Tanami Desert.

Range Extension
This work extended the known distribution of five herpetofauna taxa in this State, including *Pogona minor* (Figure 3.4) (subspecies to be confirmed by the WA Museum), *Carlia munda*, *Ctenotus schomburgkii, Lerista greeri* and *Brachyurophis roperi* (Figure 3.5); this is rarely achieved elsewhere in the State. The range extension for *Pogona minor* was particularly significant as the species had never been recorded near the area previously.

The survey also collected only the second *Ctenotus tanamiensis* to be lodged in the Western Australian Museum's collection, as well as contributing important specimens of *Diplodactylus stenodactylus* and *Eremiascincus* sp. to current taxonomic revisions.

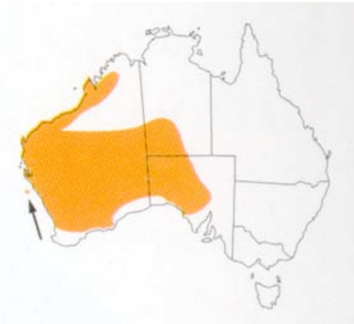

Figure 3.4: Distribution of *Pogona minor* (from Wilson and Swan 2003).

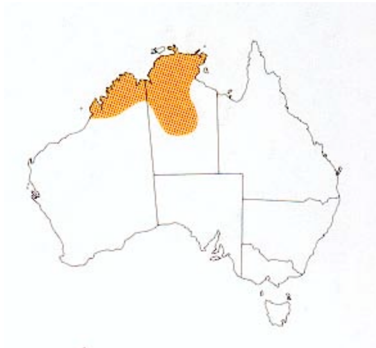

Figure 3.5: Distribution of *Brachyurophis roperi* (from Wilson and Swan 2003).

Unresolved Species Complexes

Diplodactylus stenodactylus is recognised as a species complex, with a number of new taxa recognised (Mr Laurie Smith, WA Museum, pers. comm. 2004). Other taxa belonging to known species complexes recorded during the current survey include *Heteronotia binoei* (Aplin and Smith 2001), *Eremiascincus* sp., *Ctenotus schomburgkii* (Aplin et al. submitted), *Menetia greyii* (Aplin and Smith 2001; Aplin et al. submitted) and *Lerista bipes*. The *Eremiascincus* sp. recorded within the study area could not be assigned to either of the two currently described taxa. In addition, there is strong evidence to suggest that *Moloch horridus* may comprise two species (Aplin et al. submitted).

While the taxonomic status of the Tanami forms of these taxa remains unresolved, it is difficult to comment on their conservation status.

Table 3.4: Herpetofauna records from the Western Tanami survey area.

	Species Name	TN01	TN02	TN03	TN04	TN05	TN06	TN07	TN08	TN09	TN10	TN11	TN12	Opportunistic	Total
Myobatrachidae															
	Notaden nichollsi					1			27					1	29
Gekkonidae															
	Diplodactylus conspicillatus			2	1			1						2	6
	Diplodactylus stenodactylus	6	5	1	6		7			4	3			1	33
	Gehyra purpurascens													1	1
	Gehyra variegata	1												2	3
	Heteronotia binoei	1											1		2
	Nephrurus levis levis													1	1
	Rhynchoedura ornata								1	5				1	7
	Strophurus ciliaris ciliaris		2	3	1		5	1						7	19
	Strophurus jeanae													2	2
Pygopodidae															
	Delma borea	4		1								2			7
	Lialis burtonis		1				2	1					1		5
	Pygopus nigriceps nigriceps								1					2	3
Agamidae															
	Ctenophorus isolepis isolepis	4	9	16		1	10	4	2	8	3	3	1		61
	Ctenophorus nuchalis	1				4						1			6
	Diporiphora lalliae			3	6		3			1	2		1	2	18
	Lophognathus longirostris				1					2			2		5
	Moloch horridus													1	1
	Pogona minor minor								1		2			1	4
Scincidae															
	Carlia munda												1		1
	Carlia triacantha	1											3		4
	Ctenotus grandis titan	1								1					2
	Ctenotus helenae	1				1			2				2		6
	Ctenotus pantherinus ocellifer			2	2	4	1	1	2	2	3	2		1	20
	Ctenotus piankai		2									4			6
	Ctenotus schomburgkii										3		1		4

	Species Name	TN01	TN02	TN03	TN04	TN05	TN06	TN07	TN08	TN09	TN10	TN11	TN12	Opportunistic	Total
	Ctenotus tanamiensis									2					2
	Eremiascincus sp.				2		3		1					2	8
	Lerista bipes	1	8	22	13		5	2	6	4	6		2		69
	Lerista greeri						1			1	2		1		5
	Menetia greyii	3			1	1	1	1					1		8
	Morethia ruficauda ruficauda					2				1					3
	Tiliqua multifasciata								1				1	2	4
Varanidae															
	Varanus acanthurus										1			1	2
	Varanus eremius	1		3		2	1	1	4		1				13
	Varanus gouldii				2									1	3
Typhlopidae															
	Ramphotyphlops diversus		2	2											4
	Ramphotyphlops grypus				1		1				1		1	1	5
Elapidae															
	Brachyurophis roperi										2		2		4
	Simoselaps anomalus													1	1
	Suta punctata													1	1

4.0 Invertebrate Fauna Inventory Survey

4.1 Overview

The survey of the Western Tanami project area recorded a large number of invertebrate taxa (not all of which have been sorted), many of which were not identified beyond family level and are not discussed here. Only those taxa belonging to groups known to include short-range endemics (eg. Mygalomorphs, Millipedes, Land Snails (see Harvey 2002)), that were otherwise of conservation significance (eg. Buprestidae) or for which expertise was otherwise available at the WA Museum (eg. Pseudoscorpions, wolf spiders and other spider groups) were identified to genus or species level.

4.2 Short Range Endemics

Many recent publications have highlighted taxonomic groups of invertebrates with naturally small distributions (less than 10, 000 km^2) (general reference, Harvey 2002; freshwater snails, Ponder and Colgan 2002; land snails, Clark and Richardson 2002). These taxa are variously described as narrow range endemics or short-range endemics (see Harvey 2002) and are in part characterised by poor dispersal capabilities, confinement to disjunct habitats and low fecundity (Harvey 2002, Ponder and Colgan 2002). Given the importance of short-range endemism to the conservation of biodiversity, the assessment of such invertebrate taxa is a potentially important component of impact assessment. Examples of taxonomic groups that show high levels of short-range endemism in this respect include millipedes, mygalomorph spiders and freshwater and terrestrial molluscs.

4.2.1 Mygalomorph Spiders (Trapdoor Spiders)

A total of 118 mygalomorph spiders across three species were captured in pit-traps (Table 4.1), predominantly during the nights when rain occurred, or when moisture was still around. Three morphotypes were identified and confirmed as probable species by Dr Mark Harvey (WA Museum). All three species belong to the genus *Aname,* a widespread arid zone genus.

Table 4.1: *Aname* species recorded from the Tanami trapping sites.

	TN01	TN02	TN03	TN04	TN05	TN06	TN07	TN08	TN09	TN10	TN11	TN12	Totals
Aname sp A		1	19	8		7	30	1	8	11	1	2	88
Aname sp B				2		2			6	12		3	25
Aname sp C	3												3
													116

4.2.2 Terrestrial Molluscs (Land Snails)

No pulmonates were recorded during the current survey.

4.3 Other Invertebrate taxa

4.3.1 Scorpionida

Two species of scorpionids were collected during the current survey. These are awaiting identification from the WA Museum.

4.3.2 Pseudoscorpionida

An unnamed species of *Synsphyronus* was recorded from beneath *Melaleuca* bark at the southern end of the haul road and within the Coyote study area. It belongs to the *S. paradoxus* group but differs from all named species of the genus in a couple of features (Dr Mark Harvey, WA Museum, pers. comm. 2004). Typically, it is the rock-inhabiting species belonging to this genus that appear most restricted (Dr Mark Harvey, pers. comm. 2004), particularly where rocky habitat is discontinuous (eg. granite outcrops in the Wheatbelt region). There is virtually no data on the extent of distribution of bark-inhabiting *Synsphyronus* in arid WA. Elsewhere in Australia, the bark-inhabiting species *Synsphyronus paradoxus* is known to have a distribution that coincides with the Murray-Darling catchment (Dr Mark Harvey, pers. comm. 2004) and a second species, *Synsphyronus heptatrichus*, previously known from the Roper River in the Northern Territory, was also recorded from Marillana Creek in the Pilbara (Biota 2004).

4.3.3 Scolopendridae (Centipedes)

Two species of Scolopendrid centipede were recorded from the project area. One species of Scutigerid was also recorded.

4.3.4 Spiders

Araneomorph spiders have been sorted to morphotypes, with final identification by WA Museum staff still pending. Families represented include the Gnaphosidae, Lycosidae, Miturgidae, Salticidae and Zodariidae.

4.3.5 Insecta

Insect specimens were identified to order or family level where possible. A summary of the representation of the insect orders and families collected is given in Table 4.2.

Table 4.2: Summary of insect taxa recorded during the survey.

Order	Family	Common Name
Orthoptera		Crickets, grasshoppers
Hymenoptera		Ants, Bees, Wasps
Coleoptera		Beetles
Hemiptera		Bugs
Thysanura	Lepismatidae	Silverfish
Blattodea	Blattidae	Cockroaches
Mantodea	Mantidae	Praying Mantids
Dermaptera		Earwigs

Given that it is unlikely that the insect groups represented contain any short-range endemics, they will not form a focus for ongoing identification work.

5.0 Conservation Significance

5.1 Threatened Fauna

Native fauna species which are rare, threatened with extinction, or have high conservation value are specially protected by law under the *Western Australian Wildlife Conservation Act 1950*. In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan & Australia Migratory Bird Agreement (JAMBA) and the China & Australia Migratory Bird Agreement (CAMBA).

Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 1998* recognises four distinct schedules of taxa:

1. Schedule 1 taxa are fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;
2. Schedule 2 taxa are fauna which are presumed to be extinct and are declared to be fauna in need of special protection;
3. Schedule 3 taxa are birds which are subject to an agreement between the governments of Australia, Japan and China relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection; and
4. Schedule 4 taxa are fauna that are in need of special protection, otherwise than for the reasons mentioned in paragraphs (1), (2) and (3).

In addition to the above classification, fauna are also classified under five different Priority codes:

Priority One — Taxa with few, poorly known populations on threatened lands.
Taxa which are known from a few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Two — Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.
Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Three — Taxa with several, poorly known populations, some on conservation lands.
Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Four — Taxa in need of monitoring.
Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened.

Priority Five — Taxa in need of monitoring
Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

A search of the CALM Schedule and Priority Fauna database for species potentially occurring in the area yielded two Schedule 1 species, two Schedule 4 species and three Priority species. An additional two Schedule 1 and two Priority 4 species may occur in the area based on other information. The 11 conservation significant species potentially occurring in the area are discussed briefly below.

Table 5.1: Species of State level conservation significance recorded from or that may occur within the Western Tanami survey area. The "*" denotes species recorded during the current survey.

Species	State Level	Federal Level
Mulgara *Dasycercus cristicauda**	Schedule 1	Vulnerable
Bilby *Macrotis lagotis**	Schedule 1	Vulnerable
Southern Marsupial Mole *Notoryctes typhlops*	Schedule 1	Endangered
Giant Desert Skink *Egernia kintorei*	Schedule 1	Vulnerable
Peregrine Falcon *Falco peregrinus*	Schedule 4	-
Major Mitchell's Cockatoo *Cacatua leadbeateri**	Schedule 4	-
Gravel Dragon *Cryptagama aurita*	Priority 1	-
Ctenotus uber johnstonei	Priority 2	-
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	Priority 3	-
Bush Stonecurlew *Burhinus grallarius*	Priority 4	-
Australian Bustard *Ardeotis australis**	Priority 4	-

Schedule 1 Fauna

Mulgara *Dasycercus cristicauda* (Schedule 1, Vulnerable)

Distribution: The Mulgara is a medium-sized (60-120 g) carnivorous marsupial occurring in spinifex sandplain habitat across the arid zone of Western Australia.

Ecology: It is listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003.* This species apparently prefers mature spinifex (*Triodia* spp.) associations on sandy substrates. Populations are thought to contract to core habitat areas during harsh years and have also been documented as undergoing rapid expansions in response to good conditions (Woolley 1992).

Likelihood of occurrence: Evidence (burrows, diggings, scats and tracks) of Mulgaras was recorded from several locations in the project area along and adjacent to the haul road (Figure 5.1). All records from the project area were from sandplain vegetated with *Triodia* spp. (spinifex) with a sparse overstorey of low shrubs.

Potential Impacts: The major potential impact to the local population of this species arises from the planned construction of the mine haul road. The primary impact here is in relation to habitat loss, although there may be some low frequency individual mortality events due to road kill. Altered fire regimes may also affect this species. The Mulgara is apparently more widespread and common in both the Northern Territory and Western Australia than previously thought (Roy Teale, Biota, pers. obs.; Pip Masters, pers. comm. 2004). In both the NT and WA the species conservation status could probably be revised downwards (Roy Teale, pers. obs.; Pip Masters, pers. comm. 2004).

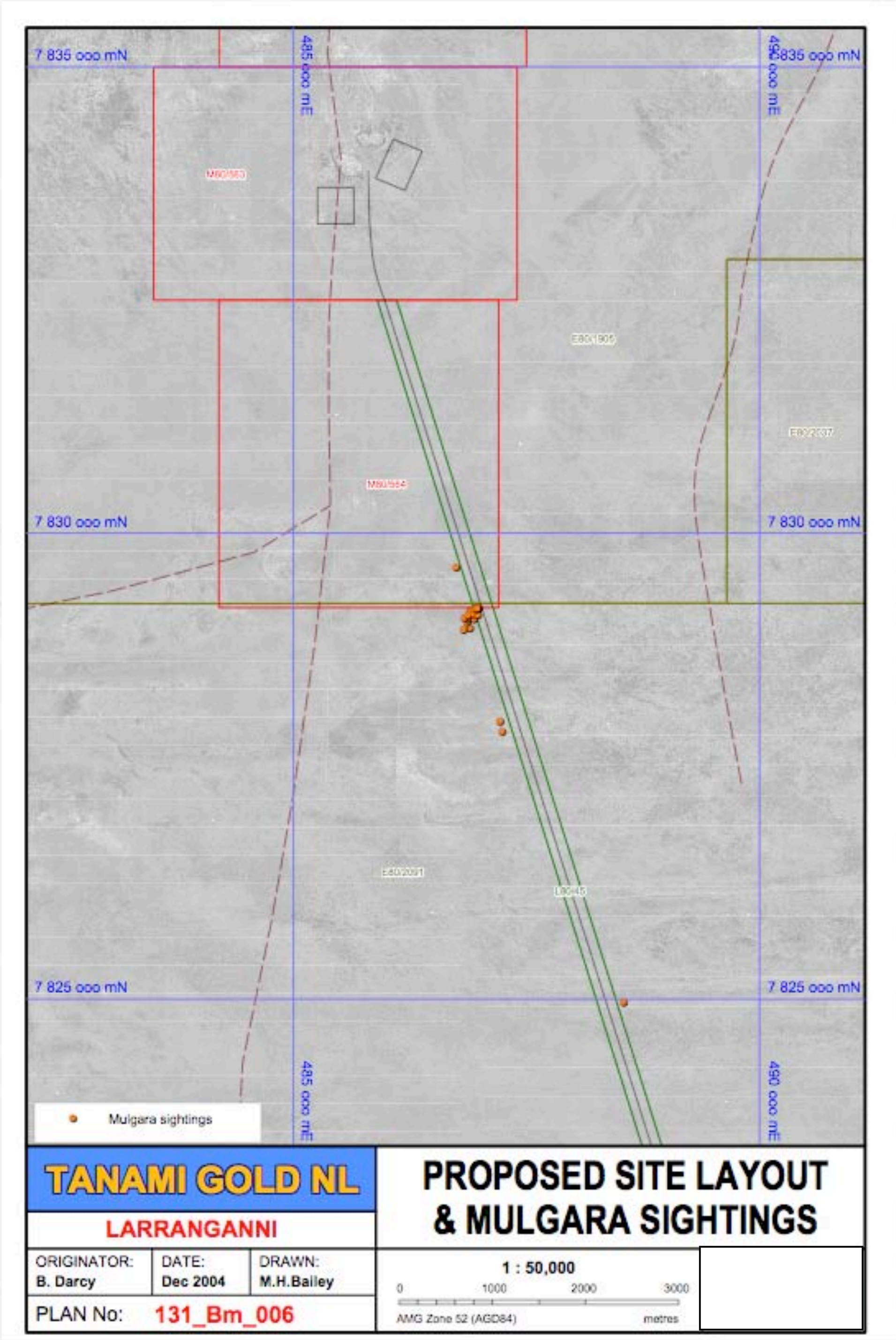

Figure 5.1: Location of Mulgara records (diggings, scats and burrows) (represented as circles) within and adjacent to the proposed haul road.

Bilby *Macrotis lagotis* (Schedule 1, Vulnerable)
Distribution: The former range of the Bilby included most of the semi-arid areas of mainland Australia, however, it is now confined to *Triodia* hummock grassland and *Acacia* scrub across parts of northern Australia.

Ecology: The Bilby *Macrotis lagotis* is a medium sized ground mammal, ranging in weight from 1.0-2.5 kg. The species is apparently strictly nocturnal and constructs a substantial burrow system, which may be up to 3 m in length (Flannery 1990). Similar to the Mulgara, the species has been documented as holding temporary home ranges and showing relatively rapid changes in distribution in response to variation in habitat resources (Johnson 1995). Whilst fox and cat predation and the effect of rabbits and stock are thought to be the principal factors in the decline of this species, fire has also been suggested as an important factor in maintaining habitat diversity for this species (Johnson 1995). In the Tanami, it appears that the species is most commonly associated with low lateritic rise habitats adjacent to drainages or wetter areas, although site fidelity is often low and individual movements large (Ric Southgate, pers. comm. 2004). This habitat type is though to account for approximately 8% of the Tanami Desert (Ric Southgate, pers. comm. 2004).

Likelihood of occurrence: Scratchings of the Bilby were recorded from this habitat type in the Coyote project area coinciding with the proposed airstrip. An unused burrow and several diggings were located in the adjacent sandplain at the proposed camp site.

Potential Impacts: The principal impact on this local Bilby population will arise from the construction of the project airstrip and part of the camp area. This will utilise the more elevated laterite unit to provide for better all-weather access to the site and will result in the removal of approximately 31 ha of lateritic habitat.

Clearing of lateritic substrates for individual proposals may contribute to cumulative impacts in the Tanami region, and may in turn affect the status of Bilbies within this region as a whole. To place this habitat removal in context, a review of lateritic habitats was undertaken, both within the project lease area and the wider locality (a 50 km radius around the project area). The results of this initial analysis indicate that a relatively small proportion of core Bilby habitat will be disturbed by the proposed action at both the project area (Figure 5.2) and wider locality scales (Figure 5.3). Locally, the proposed action of clearing for the camp and airstrip will result in the removal of approximately 31 ha of the 884 ha of lateritic habitat in the lease area (3.5%). This accounts for a much smaller proportion of the habitat at the wider scale (Figure 5.3).

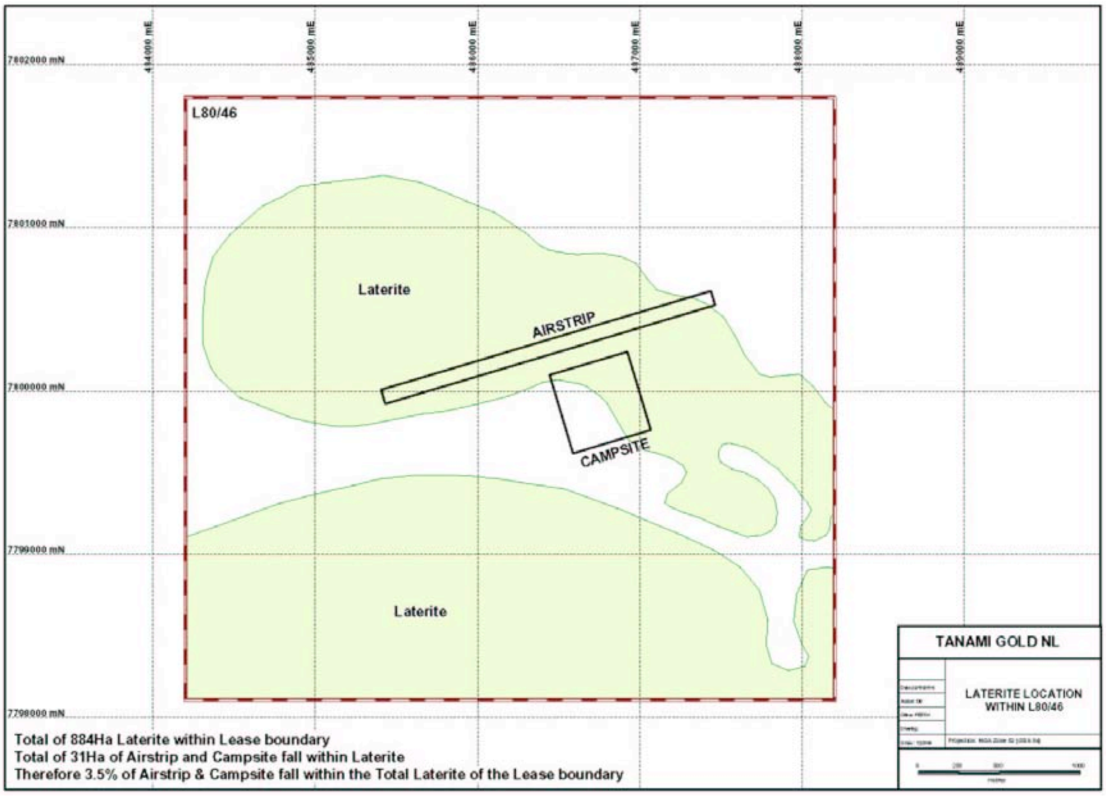

Figure 5.2: Lateritic habitat in the project lease area.

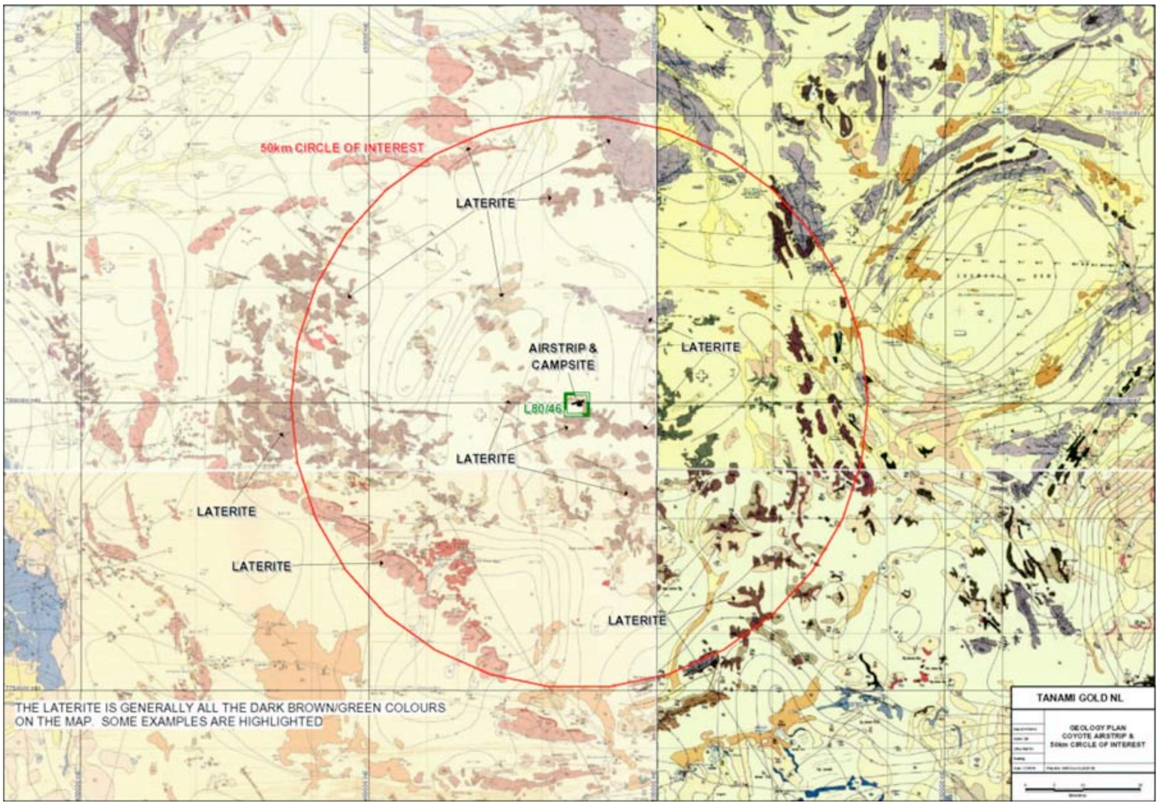

Figure 5.3: Lateritic habitat in the wider locality (50 km radius of the site) (Lateritic units indicated by darker brown/green colours).

Southern Marsupial Mole *Notoryctes typhlops* (Schedule 1)
Ecology: A small burrowing species about which very little is known.

Likelihood of occurrence: Not recorded from the project area. According to the CALM database search there are two records of this species from the Tanami Desert, though FaunaBase shows only one record either undated or prior to 1850. FaunaBase does, however, show records of the Northern Marsupial Mole from the vicinity of the Tanami Desert.

Potential Impacts: The major threatening process to this species has been identified as feral cats and foxes. It is difficult to gauge what impact, if any, the proposed mines and haul road would have on this species.

Giant Desert Skink *Egernia kintorei* (Schedule 1)
Distribution: The distribution of the Giant Desert Skink encompasses the western desert regions of arid Australia. The stronghold for this species appears to be the Tanami Desert.

Ecology: Within the Recovery Plan for the Great Desert Skink (*Egernia kintorei*) 2001-2011, the preferred habitat within the Tanami Desert is listed as "paleodrainage lines characterised by giant termite mounds and titree (*Melaleuca* spp.) shrubs." In general this species inhabits sandplains vegetated with *Triodia* species, typically *T. basedowii*, but also *T. pungens* and *T. schinzii*.

The major threatening process appears to be inappropriate burning regimes. In a survey in the Tanami Desert, Masters et al. (1997) found Great Desert Skinks present at seven of 165 sites, including four sites that had been recently burnt. At the Uluru study site, most burrows were found in habitat that had been burnt within the last 15 years.

Likelihood of occurrence: Not recorded from the study area. It is considered likely that this species occurs within the study area, particularly within the Larranganni area and along the northern section of the haul road where habitat seems most suitable.

Potential Impacts: As mentioned above, the key threatening process to these species appears to be changed burning regimes and, to a lesser extent, foxes and cats.

Schedule 4 Fauna

Peregrine Falcon *Falco peregrinus* (Schedule 4)

Distribution: The Peregrine Falcon has an almost cosmopolitan distribution. The only subspecies in Australia (*macropus*) is widespread throughout Australia and Tasmania (Marchant and Higgins 1993). The Australian population has been estimated at 3,000 to 5,000 pairs (Cade 1982).

Ecology: This species inhabits a wide range of habitats including forest, woodlands, wetlands and open country. The availability of prey is apparently more important than habitat in determining its distribution. Home ranges are probably defended year round and are variable in size, though typically not less than 480 ha (Marchant and Higgins 1993).

This species typically nests on cliffs (81% of nests Australia-wide) but also on stick nests (11%) and in tree hollows (8%). Breeding typically occurs from August to November (Johnstone and Storr 1998). Food is almost exclusively birds, such as pigeons, parrots and passerines, which are captured in flight (Johnstone and Storr 1998). Mammals such as possums and rabbits have been recorded as rare prey items (Marchant and Higgins 1993).

Likelihood of occurrence: Not recorded from the study area. It is likely that this species would occur in the woodland habitats within the Western Tanami project area.

Potential Impacts: The conservation status of this species would not be impacted by the proposed development either at the Pilbara bioregion or Hamersley subregion level. The reason for initially listing this species was a global decline associated with the use of DDT. It is unlikely that the project will affect the conservation status of this species.

Major Mitchell's Cockatoo *Cacatua leadbeateri* (Schedule 4)

Distribution: A species endemic to arid Australia (Higgins 1999) with a patchy and disjunct distribution in Western Australia. The most significant decline in WA has occurred in the Wheatbelt region associated with land clearing (Higgins 1999), though trapping and nest robbing for aviculture have also been contributing factors (Higgins 1999).

Ecology: This species inhabits lightly or sparsely wooded country near water (Johnstone and Storr 1998).

Likelihood of occurrence: Two records from within the project area and a number of observations of pairs or small groups outside the project area.

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. Local movements away from mining activities possible due to increased noise.

Priority Taxa

Gravel Dragon *Cryptagama aurita* (Priority 1)

Distribution: In Western Australia, this species is only known from Halls Creek and Wolf Creek Crater (source: FaunaBase). It has also been collected from an additional locality, Wave Hill in the Northern Territory.

Ecology: It would appear that little is known of the ecology of this species, other than it occurs on lateritic soils supporting *Triodia*.

Likelihood of occurrence: Not recorded from the study area. Areas of lateritic soils dominated with *Triodia* were recorded predominantly in the Coyote project area (see account under Bilby above).

Potential Impacts: This species may be affected by clearing of lateritic soils associated with the construction of the airstrip and camp and for use as base material on roads.

Ctenotus uber johnstonei (Priority 2)
Distribution: Known only from the Balgo Hills area of Western Australia. However, Biota (2002) have collected specimens from the western edge of the Fortescue Marshes that have tentatively been identified as *C.* affin. *uber johnstonei.*

Ecology: According to Wilson and Knowles (1988), this species is only known from "an area of chenopod shrubland at the base of a sandstone hill in the vicinity of Balgo…". Specimens belonging to possibly the same taxon collected by Biota (2002) in the Pilbara were recorded from *Acacia xiphophylla* over chenopods south of the Fortescue Marsh and *Acacia xiphophylla* scattered tall shrubs to high open shrubland over *Sclerolaena cuneata* herbland and open chenopods on the western edge of the Fortescue Marsh.

Likelihood of occurrence: Not recorded from the study area. Only small areas with very occasional chenopods were noted in the project area, all in the vicinity of the Larranganni deposit.

Potential Impacts: It is unlikely that the project would affect the conservation status of this species.

Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti* (Priority 3)
Distribution: There are scattered records of this species from the Kimberley and Pilbara regions of Western Australia.

Ecology: Apparently prefers large spinifex (*Triodia*) clumps in which to shelter during the day.

Likelihood of occurrence: Not recorded from the study area during the recent survey. Small macropods matching the description of this species have been reported by exploration personnel on the Tanami site. There are occasional areas of suitable habitat.

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. A possible increase in mortality associated with increased road traffic, including along the haul road.

Bush Stonecurlew *Burhinus grallarius* (Priority 4)
Distribution: This species is widespread in Australia and southern New Guinea. It remains common in tropical Australia but has declined alarmingly in temperate Australia and has disappeared from many regions (Marchant and Higgins 1993). Populations are apparently secure in the Pilbara (Ron Johnstone, WA Museum, pers. comm. 2003). The Australian population has been estimated at c. 15,000 individuals. This species was once found throughout most of the south-west of Western Australia, but has disappeared from many areas.

Ecology: Bush Stone-curlews inhabit sparsely grassed, lightly timbered forest or woodland. In southern Australia, they persist most often where there is a well-structured litter layer and fallen timber debris. Individuals have an estimated home range of about

250 ha (Johnson and Baker-Gabb 1993). This species breeds from July to January. The eggs are either laid directly on the ground or in a small scrape (Johnstone and Storr 1998). This species is a terrestrial feeder and is quite wide-ranging in its diet. It feeds primarily on invertebrates, particularly beetles, but also eats small lizards, frogs, snakes, vegetation and seeds (Marchant and Higgins 1993). Foxes are usually considered to be the primary cause for their decline, hence their relative abundance in the tropics, but habitat clearance has also been identified as a threatening process (Garnett and Crowley 2000).

Likelihood of occurrence: Not recorded from the study area. It is likely that this species would occur within the project area.

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. Increased mortality associated with increased road traffic, including along the haul road. Project impacts are unlikely to change the conservation status of this species.

Australian Bustard *Ardeotis australis* (Priority 4)

Distribution: The Australian Bustard occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the state (Johnstone and Storr 1998). Its wider distribution includes eastern Australia and New Guinea.

Ecology: This species prefers open or lightly wooded grassland including *Triodia* sandplains (Johnstone and Storr 1998) and is considered scarce to common depending on season and habitat. It has an omnivorous diet and occurs in a relatively broad range of habitats but appears to have some preference for grasshoppers and is often attracted to recently burnt areas (Marchant and Higgins 1993). This species breeds from March to September and the eggs are laid on bare, preferably stony, ground (Johnstone and Storr 1998).

Likelihood of occurrence: There were five records of this species from four sites, with additional opportunistic records noted along the Tanami Track.

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. Increased mortality associated with increased road traffic, including along the haul road.

6.0 Potential Impacts and Management

6.1 Generic impacts and Management

Below is a list of generic impacts that are typically associated with mining and associated infrastructure proposals of a similar scale to the proposed Western Tanami project.

Direct fauna habitat disturbance and modification
The principal impacts arising from the proposed development are associated with the clearing of fauna habitat associated with establishment of:

- new mine pits;
- a processing plant;
- associated mine infrastructure (e.g. waste dumps, haul roads);
- a haul road between the Larranganni deposits and processing plant (approximately 40 km in length); and
- associated infrastructure (a new camp, mine offices, new airstrip, power transmission lines, bulk fuel storage, vehicle workshops, etc.).

Indirect fauna habitat disturbance and modification
A number of indirect modifications may also occur to fauna habitat as a result of the construction and operation of the mines and haul road. These include changes to surface hydrology, increased erosion and weed introduction or spread. There are no apparent areas of sheet flow dependent habitat in the study area, nor any creeks.

Direct loss of habitat
Habitat supporting two Schedule 1 taxa will be cleared as part of this proposal. It is considered unlikely that the loss of habitat will affect the conservation status of the Mulgara. Habitat clearing within the project area is similarly considered unlikely to affect the conservation status of the Bilby, however effects of habitat loss will be investigated further during survey work planned for April 2005.

Direct loss of individual fauna
It is inevitable that there will be some localised loss of fauna due to direct mortality arising from construction activities, including that which may occur during the clearing of habitat. Ongoing impacts may also arise from more frequent vehicle movements, haulage movements and machinery operation. For all vertebrate and the majority of invertebrate taxa, it is unlikely that the loss of individuals associated with such direct mortalities would be significant enough to affect the overall conservation status of any of the species recorded from the study area.

We have not fully established the distribution of the potential short range taxa (mygalomorph spiders) recorded from the study area to determine whether impacts may be significant. However, the habitat type from where they were recorded appears widespread.

In relation to both habitat loss and direct loss of fauna, it is noted that cumulative effects of a variety of disturbances such as: mining proposals; road construction and maintenance; wildfires; increased road usage associated with tourism; ferals and grazing etc. in the Tanami region may impact negatively on some species.

Noise
Noise from mining activities including blasting, haulage and general mining operations may impact on fauna. However, we did not record any particularly sensitive habitats or

communities within the study area that may be at particular risk (eg. significant bat roosts or breeding populations of birds).

Weed Spread
Ground disturbance associated with construction and operation of the mines and haul road provides an opportunity for the infiltration and spread of weeds. The consequences of weed infiltration on the biodiversity of fauna is not well documented.

6.2 Recommendations

The following recommendations arise from the fauna survey of the Western Tanami study area:

- Tanami Gold has already commissioned a systematic fauna survey of their site and defined the key habitats for Bilby and Mulgara within the lease. These areas will be identified as control areas to be left undisturbed as far as practicable within the context of developing the mine and associated infrastructure.

- An additional seasonal fauna survey of the ground disturbance areas will be carried out. This will focus on Mulgara and Bilby habitat utilisation.

- An exploration Management Plan should be developed to ameliorate potential impacts to either Bilbies or Mulgaras and their habitat arising from proposed future exploration activities.

- Lateritic surfaces as defined by the geological survey map will be ground-truthed to determine concordance with potential Bilby habitat as understood by Ric Southgate.

- All members of the work force on site will be provided with an environmental induction to ensure they are familiarised with the presence of Bilby and Mulgara in the area. This will include driving speed restrictions, ensuring that off-road driving is minimised and fire risk minimisation.

- Prior to completion of the project, airstrip and camp lateritic areas (Bilby habitat) will be subject to an investigation to determine specific fauna habitat reconstruction methodologies to maximise the potential for future use by Bilbies.

- Tanami Gold, in collaboration with relevant agencies (eg CALM) will communicate the findings of the Bilby habitat study to other stakeholders in the Tanami region. This is currently poorly understood (Ric Southgate, pers. comm.), and will assist in the wider conservation of this species.

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CALM Permit

Appendix 1

BIOTA

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

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PAGE 2
NO. SF004664

DATE OF ISSUE 15/08/2004
DATE OF EXPIRY 21/09/2005
VALID FROM 22/09/2004

LICENSING OFFICER

(ROY JOHN)

LICENSEE: MR RJ TEALE
ADDRESS BIOTA ENVIRONMENTAL SERVICES
2/186 SCARBOROUGH BEACH RD.,
MT.HAWTHORN
WA 6016

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

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WILDLIFE CONSERVATION ACT 1950
REGULATION 17

LICENCE TO TAKE FAUNA FOR SCIENTIFIC PURPOSES

THE UNDERMENTIONED PERSON MAY TAKE FAUNA FOR RESEARCH OR OTHER SCIENTIFIC PURPOSES AND WHERE AUTHORISED, KEEP IT IN CAPTIVITY, SUBJECT TO THE FOLLOWING AND ATTACHED CONDITIONS, WHICH MAY BE ADDED TO, SUSPENDED OR OTHERWISE VARIED AS CONSIDERED FIT.

EXECUTIVE DIRECTOR

CONDITIONS

1 THE LICENSEE SHALL COMPLY WITH THE PROVISIONS OF THE WILDLIFE CONSERVATION ACT AND REGULATIONS AND ANY NOTICES IN FORCE UNDER THIS ACT AND REGULATIONS.

2 UNLESS SPECIFICALLY AUTHORISED IN THE CONDITIONS OF THIS LICENCE OR OTHERWISE IN WRITING BY THE EXECUTIVE DIRECTOR, SPECIES OF FAUNA DECLARED AS LIKELY TO BECOME EXTINCT, RARE OR OTHERWISE IN NEED OF SPECIAL PROTECTION SHALL NOT BE CAPTURED OR OTHERWISE TAKEN.

3 NO FAUNA SHALL BE TAKEN FROM ANY NATURE RESERVE, WILDLIFE SANCTUARY, NATIONAL PARK, MARINE PARK, TIMBER RESERVE OR STATE FOREST WITHOUT PRIOR WRITTEN APPROVAL OF THE EXECUTIVE DIRECTOR. NO FAUNA SHALL BE TAKEN FROM ANY OTHER PUBLIC LAND WITHOUT THE WRITTEN APPROVAL OF THE GOVERNMENT AUTHORITY MANAGING THAT LAND.

4 NO ENTRY OR COLLECTION OF FAUNA TO BE UNDERTAKEN ON ANY PRIVATE PROPERTY OR PASTORAL LEASE WITHOUT THE CONSENT IN WRITING OF THE OWNER OR OCCUPIER, OR FROM ANY ABORIGINAL RESERVE WITHOUT THE WRITTEN APPROVAL OF THE DEPARTMENT OF INDIGENOUS AFFAIRS.

5 NO FAUNA OR THEIR PROGENY SHALL BE RELEASED IN ANY AREA WHERE IT DOES NOT NATURALLY OCCUR, NOR HANDED OVER TO ANY OTHER PERSON OR AUTHORITY UNLESS APPROVED BY THE EXECUTIVE DIRECTOR, NOR SHALL THE REMAINS OF SUCH FAUNA BE DISPOSED OF IN SUCH MANNER AS TO CONFUSE THE NATURAL OR PRESENT DAY DISTRIBUTION OF THE SPECIES.

6 THIS LICENCE AND THE WRITTEN PERMISSION REFERRED TO AT CONDITIONS 3 & 4 MUST BE CARRIED BY THE LICENSEE OR AUTHORISED AGENT AT ALL TIMES FOR THE PURPOSE OF PROVING THEIR AUTHORITY TO TAKE FAUNA WHEN QUESTIONED AS TO THEIR RIGHT TO DO SO BY A WILDLIFE OFFICER, ANY OTHER STATE OR LOCAL GOVERNMENT EMPLOYEE OR ANY MEMBER OF THE PUBLIC.

7 **********ANY INTERACTION INVOLVING GAZETTED THREATENED FAUNA THAT MAY BE HARMFUL AND/OR INVASIVE MAY REQUIRE APPROVAL FROM THE COMMONWEALTH GOVERNMENT DEPARTMENT , "ENVIRONMENT AUSTRALIA", PHONE 02 6274 1111. INTERACTION WITH SUCH SPECIES IS CONTROLLED BY THE COMMONWEALTH GOVERNMENT'S "ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999" & "ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION REGULATIONS 2000" AS WELL AS CALM'S WILDLIFE CONSERVATION ACT & REGULATIONS.**********

8 NO BIOPROSPECTING INVOLVING THE REMOVAL OF SAMPLE AQUATIC AND TERRESTRIAL ORGANISMS (BOTH FLORA AND FAUNA) FOR CHEMICAL EXTRACTION AND BIOACTIVITY SCREENING IS PERMITTED TO BE CONDUCTED WITHOUT SPECIFIC WRITTEN APPROVAL BY THE EXECUTIVE DIRECTOR OF C.A.L.M.

9 FURTHER CONDITIONS (NUMBERED 1 TO 10) ARE ATTACHED.

PURPOSE	FAUNA SURVEY FOR ENVIRONMENTAL IMPACT ASSESSMENT TANAMI DESERT PROJECT.
AUTHORISED PERSONS	GARTH HUMPHREYS, MIKE CRAIG, GREG HAROLD, ZOE HAMILTON.

WILDLIFE CONSERVATION ACT 1950
WILDLIFE CONSERVATION REGULATIONS

Regulation 17:- Licence to Take Fauna for Scientific Purposes

FURTHER CONDITIONS (OF LICENCE NUMBER SF 4664)

1. The licensee shall ensure that all due care is taken in the capture and handling of fauna to prevent injury or mortality resulting from that capture or handling. Where traps or other mechanical means or devices are used to capture fauna these shall be inspected at regular intervals throughout each day of their use. At the conclusion of research all markers etc and signs erected by the licensee and all traps shall be removed, all pitfalls shall be refilled or capped and the study area returned to the condition it was in prior to the research/capture program. During any break in research, cage traps should be removed and pitfalls either removed, capped or filled with sand.

2. No collecting is to be undertaken in areas where it would impinge on pre-existing scientific research programs.

3. Any form of colour marking of birds or bats to be coordinated by the Australian Bird and Bat Banding Schemes.

4. Any inadvertently captured specimens of fauna which is declared as likely to become extinct, rare or otherwise in need of special protection is to be released immediately at the point of capture. Where such a specimen is injured or deceased, the licensee shall contact CALM licensing staff at Kensington (08 9334 0434) for advice on disposal. Records are to be kept of any fauna so captured and details included in the report required under further condition 6 below.

5. Prior to any renewal of this research licence the licensee shall submit a summary report outlining work conducted under this licence and work proposed for the next research period.

6. Within one month of the expiration of this licence (or at such other time or times as the Executive Director may determine) the holder shall furnish to the Executive Director [ATTENTION: WILDLIFE CLERK] a return setting out in full detail the number of each species of fauna taken during the currency of the licence, the localities where the species was/were taken and the method of handling of such fauna and disposal of specimens. A copy of any paper or report resulting from this research should be lodged in due course with the Executive Director. In the case of consultants, a list of the fauna handled, the localities involved and a copy of the interpretive data prepared should be lodged.

7. As a general rule not more than ten specimens of any one protected species shall be permanently taken from any location less than 20km apart. Where exceptional circumstances make it necessary to take large series in order to obtain adequate statistical data the collector will proceed with circumspection and justify their actions to the Executive Director in advance.

8. No fauna, whether dead or alive, may be taken out of Western Australia without the necessary export permit issued under the *Wildlife Conservation Act 1950*. It should be noted that the permit will not be issued unless the State to which the fauna is going has approved that fauna entering that State. In addition to the requirements of the Australian States, the Commonwealth controls exports overseas through Commonwealth legislation administered by the Australian Nature Conservation Agency.

9. All holotypes and syntypes and a half share of paratypes of species or subspecies permitted to be permanently taken under this licence shall be donated to the Western Australian Museum. Duplicates (one pair in each case) of any species collected which represents a significant extension of geographic range shall be donated on request to the Western Australian Museum.

10. To prevent any unnecessary collecting in this state, all specimens and material collected under the authority of this license shall, on request, be loaned to the Western Australian Museum. Also, the unused portion or portions of any specimen collected under the authority of this license shall be offered for donation to the Western Australian Museum or made available to other scientific workers if so required.

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CALM Import Licence

Appendix 2

BIOta

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

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WILDLIFE CONSERVATION ACT 1950
REGULATION 19

LICENCE TO IMPORT SKINS OF FAUNA (OR OTHER DEAD FAUNA)

THE LICENSEE MAY IMPORT INTO WESTERN AUSTRALIA, SUBJECT TO THE CONDITIONS ENDORSED HEREON, THE SPECIFIED CONSIGNMENT OF FAUNA. THIS LICENCE IS ISSUED SUBJECT TO AN EXPORT PERMIT (WHERE APPLICABLE) BEING GRANTED BY THE STATE FROM WHICH THE CONSIGNMENT IS BEING EXPORTED. THIS LICENCE IS VALID FOR ONE CONSIGNMENT ONLY.

EXECUTIVE DIRECTOR

CONDITIONS

1 THIS LICENCE AND THE CORRESPONDING INTERSTATE LICENCE (IF APPLICABLE) ARE BOTH TO BE ATTACHED TO OR ACCOMPANY THE CONTAINER(S) IN WHICH THE CONSIGNMENT IS HELD. IF, DUE TO UNFORESEEN CIRCUMSTANCES, THESE LICENCES CANNOT BE ATTACHED, THEN BOTH LICENCE NUMBERS ARE TO BE CLEARLY WRITTEN ON THE CONTAINER(S).

SPECIES REPTILES **AS PER ATTACHED LIST**
(Reptilia)
IMPORT FROM MR R TEALE
NORTHERN TERRITORY

DATE OF ISSUE 12/10/2004
DATE OF EXPIRY 12/10/2004
VALID FROM 07/10/2004

DPStone
LICENSING OFFICER
(ROY JOHN)

LICENSEE: MR RJ TEALE
ADDRESS BIOTA ENVIRONMENTAL SERVICES
2/186 SCARBOROUGH BEACH RD.,
MT.HAWTHORN
WA 6016

Job #282

(08 93340278)

List of Specimens from Tanami

Varanus eremius 9
V. acanthurus 1
Ctenophorus isolepis 12
C. nuchalis 2
Diporiphora winneckei 11
D. lalliae 1
Lophognathus longirostris 4
~~[illegible]~~
Diplodactylus conspicillatus 4
D. stenodactylus 24
Gehyra variegata 4
Heteronotia binoei 2
Nephrurus levis 1
Strophurus jeanae 2
S ciliaris 12
Rhynchoedura ornata 6
Delma borea 6
Lialis burtonis 4
3
P. nigriceps 3
Carlia munda 1
Carlia triacantha 3
Ctenotus grandis 1
C. pantherinus 13
C. schomburgkii 2
C. helenae 5

C. tanamiensis 1
C pianka 6
Eremiascincus sp. 7
Lerista bipes 26
M. greyii 7
Tiliqua multifasciata 2
Brachyurophis roperi x 3
Suta punctata x 1
Simoselaps anomalus x 1
Ramphotyphlops sp. 4
R grypus 4
Notaden nichollsi 13
Ningaui ridei 2
Sminthopsis youngsoni 12
Notomys alexis 7
Pseudomys desertor 7
P. nanus 1
P. hermannsburgensis 13
Pseudomys sp 4
Mus musculus 7

Regards Ray

08/10 '04 FRI 11:19 [TX/RX NO 5093] 001

Records from WA Museum Database Search

Appendix 3

BIOta

Amphibia collected between -18.5666, 127.6833 and -20.9000, 130.01666

Hylidae
Cyclorana australis
Cyclorana longipes
Cyclorana maini
Litoria caerulea
Litoria coplandi
Litoria inermis
Litoria pallida
Litoria rubella
Litoria wotjulumensis

Myobatrachidae
Neobatrachus aquilonius
Neobatrachus sp
Notaden nichollsi
Uperoleia borealis
Uperoleia micromeles
Uperoleia sp

Reptiles collected between -18.5666, 127.683333 and -20.90000, 130.0166

Agamidae
Amphibolurus gilberti
Cryptagama aurita
Ctenophorus caudicinctus
Ctenophorus caudicinctus macropus
Ctenophorus isolepis
Ctenophorus isolepis isolepis
Ctenophorus nuchalis
Diporiphora bennettii
Diporiphora lalliae
Diporiphora sp
Diporiphora winneckei
Lophognathus gilberti
Lophognathus longirostris
Tympanocryptis lineata centralis

Boidae
Antaresia stimsoni stimson
Aspidites ramsayi

Elapidae
Acanthophis pyrrhus
Demansia olivacea
Furina ornate
Pseudechis australis
Pseudonaja modesta
Pseudonaja nuchalis
Suta ordensis
Suta punctata

Gekkonidae
Diplodactylus ciliaris
Diplodactylus stenodactylus
Diplodactylus taeniatus
Gehyra australis
Gehyra montium
Gehyra Pilbara
Gehyra purpurascens
Gehyra sp
Gehyra variegata
Heteronotia binoei
Nephrurus laevissimus
Nephrurus levis
Nephrurus levis levis
Rhynchoedura ornate
Strophurus ciliaris aberrans
Strophurus ciliaris ciliaris
Strophurus jeanae

Pygopodidae
Delma borea
Delma butleri
Delma Harold
Delma nasuta
Delma tincta
Lialis burtonis
Pygopus nigriceps

Scincidae
Carlia munda
Carlia rufilatus
Carlia triacantha
Cryptoblepharus plagiocephalus
Ctenotus brooksi brooksi
Ctenotus grandis
Ctenotus greeri
Ctenotus helenae
Ctenotus inornatus
Ctenotus leonhardii
Ctenotus militaris
Ctenotus pantherinus acripes
Ctenotus pantherinus ocellifer
Ctenotus piankai
Ctenotus quattuordecimlineatus
Ctenotus robustus
Ctenotus saxatilis
Ctenotus schomburgkii
Ctenotus tanamiensis
Ctenotus uber johnstonei
Cyclodomorphus melanops melanops
Egernia striata
Eremiascincus fasciolatus
Eremiascincus richardsonii
Lerista aericeps
Lerista bipes
Lerista greeri

Lerista orientalis
Lerista vermicularis
Menetia greyii
Morethia ruficauda
Morethia ruficauda ruficauda
Notoscincus ornatus
Notoscincus ornatus ornatus
Proablepharus reginae
Tiliqua multifasciata

Typhlopidae
Ramphotyphlops diversus
Ramphotyphlops grypus
Ramphotyphlops guentheri

Varanidae
Varanus acanthurus
Varanus brevicauda
Varanus eremius
Varanus gilleni
Varanus tristis
Varanus tristis tristis

Mammals collected between-18.5666, 127.683333 and -20.90000, 130.0166

Canidae
Canis lupus familiaris

Dasyuridae
Dasycercus cristicauda
Pseudantechinus macdonnellensis
Sminthopsis macroura
Sminthopsis youngsoni

Emballonuridae
Saccolaimus flaviventris
Taphozous hilli

Felidae
Felis catus

Macropodidae
Lagorchestes conspicillatus leichardti
Macropus robustus
Onychogalea unguifera

Molossidae
Chaerephon jobensis
Tadarida australis

Muridae
Leggadina forresti
Leggadina lakedownensis
Mus musculus
Notomys alexis
Pseudomys desertor
Pseudomys hermannsburgensis
Pseudomys laborifex
Pseudomys nanus
Pseudomys sp_nov
Rattus villosissimus

Notoryctidae
Notoryctes caurinus
Notoryctes typhlops

Phalangeridae
Trichosurus vulpecula arnhemensis

Pteropodidae
Pteropus scapulatus

Thylacomyidae
Macrotis lagotis

Vespertilionidae
Chalinolobus gouldii
Nyctophilus geoffroyi
Scotorepens balstoni
Scotorepens greyii
Vespadelus finlaysoni

Birds collected between -18.5666, 127.683333 and -20.90000, 130.0166

Acanthizidae
Gerygone fusca
Gerygone fusca mung
Smicrornis brevirostris

Accipitridae
Accipiter cirrocephalus cirrocephalus
Accipiter fasciatus
Elanus caeruleus axillaris
Haliastur sphenurus
Hamirostra melanosternon
Hieraaetus morphnoides

Alaudidae
Mirafra javanica horsfieldii

Anatidae
Anas gracilis

Artamidae
Artamus cinereus
Artamus cinereus melanops

Campephagidae

Coracina novaehollandiae
Coracina novaehollandiae novaehollandiae
Lalage tricolor

Caprimulgidae
Eurostopodus argus

Charadriidae
Charadrius melanops
Erythrogonys cinctus
Vanellus miles

Columbidae
Geopelia cuneata
Geopelia striata
Geopelia striata placida
Geophaps plumifera
Ocyphaps lophotes

Corvidae
Corvus orru

Cracticidae
Cracticus nigrogularis

Cuculidae
Chrysococcyx basalis
Cuculus pallidus

Dicaeidae
Dicaeum hirundinaceum

Dicruridae
Rhipidura leucophrys
Rhipidura leucophrys leucophrys
Rhipidura rufiventris isura

Falconidae
Falco berigora
Falco cenchroides cenchroides

Gruidae
Grus rubicunda

Halcyonidae
Todiramphus pyrrhopygia
Todiramphus sanctus sanctus

Hirundinidae
Hirundo ariel
Hirundo nigricans nigricans

Maluridae
Malurus lamberti
Malurus lamberti assimilis
Malurus leucopterus
Malurus leucopterus leuconotus
Malurus melanocephalus cruentatus
Stipiturus ruficeps ruficeps

Meliphagidae
Acanthagenys rufogularis
Certhionyx niger
Certhionyx variegates
Conopophila rufogularis
Epthianura tricolor
Lichenostomus keartlandi
Lichenostomus penicillatus
Lichenostomus plumulus
Lichenostomus unicolor unicolor
Lichenostomus virescens
Lichenostomus virescens forresti
Lichmera indistincta indistincta
Manorina flavigula
Manorina flavigula lutea
Melithreptus gularis laetior
Philemon citreogularis citreogularis
Phylidonyris albifrons

Meropidae
Merops ornatus

Motacillidae
Anthus australis australis

Pachycephalidae
Colluricincla harmonica brunnea
Oreoica gutturalis
Pachycephala rufiventris
Pachycephala rufiventris rufiventris

Pardalotidae
Pardalotus rubricatus
Pardalotus striatus uropygialis

Passeridae
Emblema pictum
Neochmia phaeton
Taeniopygia bichenovii
Taeniopygia guttata
Petroicidae
Microeca fascinans fascinans

Phalacrocoracidae
Phalacrocorax sulcirostris

Podargidae*Podargus strigoides brachypterus*

Pomatostomidae
Pomatostomus temporalis
Pomatostomus temporalis rubeculus

Psittacidae
Aprosmictus erythropterus
Cacatua leadbeateri
Cacatua roseicapilla
Cacatua roseicapilla roseicapilla
Cacatua sanguinea
Cacatua sanguinea sanguinea
Platycercus spurius
Platycercus zonarius
Platycercus zonarius zonarius
Trichoglossus haematodus

Ptilonorhynchidae
Ptilonorhynchus nuchalis nuchalis

Recurvirostridae
Himantopus himantopus leucocephalus
Recurvirostra novaehollandiae

Scolopacidae
Calidris acuminata
Gallinago megala

Strigidae
Ninox novaeseelandiae boobook

Sylviidae
Cincloramphus cruralis
Cincloramphus mathewsi
Eremiornis carteri

Turnicidae
Turnix velox

Tytonidae
Tyto alba
Tyto alba delicatula

Fishes collected between -18.5666, 127.683333 and -20.90000, 130.0166

No records found

Records from the CALM Rare Fauna Database Search

Appendix 4

BIOTA

VKC 15/9/04

DEPARTMENT OF
Conservation
AND LAND MANAGEMENT
Conserving the nature of WA

Your Ref:
Our Ref: 2001F001096V09
Enquiries: Christine Freegard
Phone: (08) 9334 0579
Fax: (08) 9334 0278
Email: christinef@calm.wa.gov.au

FILE REFERENCE No.
2001F001096V09

1. Finance, please raise invoice for $150 (plus GST)
inv 5422
2. File

Mr Michael Craig
Biota Environmental Sciences Pty Ltd
2/186 Scarborough Beach Rd
MT HAWTHORN WA 6016

D045602

Dear Mr Craig

REQUEST FOR THREATENED FAUNA INFORMATION

#684 I refer to your request of 1 September for information on threatened fauna occurring ~~near~~ around the proposed Coyote Gold mine in the Tanami Desert.

A search was undertaken for this area of the Department's Threatened Fauna database, which includes species which are declared as '*Rare or likely to become extinct* (Schedule 1)', '*Birds protected under an international agreement* (Schedule 3)', and '*Other specially protected fauna* (Schedule 4)'. Attached are print outs from these databases where records were found.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the sixth point that refers to the requirement to undertake field investigations for the accurate determination of threatened fauna occurrence at a site. The information supplied should be regarded as an indication only of the threatened fauna that may be present.

An invoice for $150.00 (plus GST), being the set charge for the supply of this information, will be forwarded.

It would be appreciated if any populations of threatened fauna encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss threatened fauna management, please contact my Senior Zoologist, Dr Peter Mawson on 08 93340421.

Yours sincerely

C.F.

....

for Keiran McNamara
EXECUTIVE DIRECTOR

8 September, 2004

RECEIVED 16 SEP 2004

DEPARTMENT OF CONSERVATION & LAND MANAGEMENT
24 SEP 2004
KENSINGTON W.A.

Wildlife Branch: 17 Dick Perry Avenue, Technology Park, Kensington
Postal address: Locked Bag 104, Bentley Delivery Centre, Bentley, Western Australia 6983
Phone: (08) 9334 0455 Fax: (08) 9334 0278 Website: www.naturebase.net

Threatened and Priority Fauna Database

18.5666 °S 127.6833 °E / 20.9 °S 130.0166 °E Coyote Gold mine in the Tanami Desert

*	*Date*	*Certainty*	*Seen*	*Location Name*	*Method*

Schedule 1 - Fauna that is rare or is likely to become extinct

Notoryctes typhlops — **Southern Marsupial Mole (Itjaritjari)** — *2 records*

This species is an inhabitant of sandy desert areas and is rarely observed or recorded.

Date	Certainty	Seen	Location Name	Method
1964	1	1	Tanami Desert	Dead
1979	1	1	Tanami Desert	Dead

Egernia kintorei — **Giant Desert Skink** — *0 records*

A burrowing species of skink found in a variety of desert habitats on sandy, clay and loamy soils. A nearby record suggests that this species could possibly occur in the area in question.

Schedule 4 - Other specially protected fauna

Falco peregrinus — **Peregrine Falcon** — *0 records*

This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. It may occur in the area in question.

Cacatua leadbeateri — **Major Mitchell's Cockatoo** — *2 records*

This species is sporadically distributed through arid and semi-arid Australia and may occur in sparsely timbered grasslands and shrublands and rocky outcrops.

Date	Certainty	Seen	Location Name	Method
1980	1	15	Tanami Desert	Day sighting
1995	1	2	Sturt Creek	Day sighting

Priority One

Cryptagama aurita — **Cryptagama aurita** — *0 records*

This reptile has only been collected from a few locations in arid north eastern Western Australia. Records in surrounding areas suggest that this species may occur in the area in question.

Priority Two

Ctenotus uber johnstonei — **Ctenotus uber johnstonei** — *1 records*

This species of skink is associated with small rock outcrops on open sandy and stony plains.

Date	Certainty	Seen	Location Name	Method
1979	1	1	Balgo Hill	

Priority Three

Lagorchestes conspicillatus leichardti — **Spectacled Hare-wallaby (mainland)** — *1 records*

This species has declined in many parts of its range and is vulnerable to cat and fox predation. It inhabits tropical grasslands and also suffers from the impacts of frequent fires.

Date	Certainty	Seen	Location Name	Method
1997	1	1	Sturt Creek	Day sighting

Priority Four

0 records

Wednesday, 8 September 2004 — Department of Conservation and Land Management

Page 2 of 2

Threatened and Priority Fauna Database

18.5666°S 127.6833°E / 20.9°S 130.0166°E Coyote Gold mine in the Tanami Desert

* *Date*	*Certainty*	*Seen*	*Location Name*	*Method*

Priority Five

0 records

* Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation

Wednesday, 8 September 2004 **Department of Conservation and Land Management**

Vertebrate Specimens Lodged with the WA Museum

Appendix 5

BIOta

Survey	Date	Site	Species Name	Museum Number
Coyote Fauna Survey	30/09/04	TN05	*Ctenotus pantherinus ocellifer*	R
Coyote Fauna Survey	2/10/04	TN06	*Ctenotus pantherinus ocellifer*	R
Coyote Fauna Survey	2/10/04	TN06	*Diplodactylus stenodactylus*	R
Coyote Fauna Survey	2/10/04	TN06	*Diplodactylus stenodactylus*	R
Coyote Fauna Survey	5/10/04	Opportunistic	*Strophurus ciliaris ciliaris*	R
Coyote Fauna Survey	1/10/04	TN09	*Diplodactylus stenodactylus*	R
Coyote Fauna Survey	1/10/04	TN09	*Rhynchoedura ornata*	R
Coyote Fauna Survey	6/10/04	Opportunistic	*Gehyra variegata*	R
Coyote Fauna Survey	4/10/04	TN03	*Varanus eremius*	R
Coyote Fauna Survey	5/10/04	TN05	*Varanus eremius*	R
Coyote Fauna Survey	2/10/04	TN03	*Strophurus ciliaris ciliaris*	R
Coyote Fauna Survey	30/09/04	TN02	*Diplodactylus stenodactylus*	R
Coyote Fauna Survey	6/10/04	TN08	*Notaden nichollsi*	R
Coyote Fauna Survey	6/10/04	TN08	*Varanus eremius*	R
Coyote Fauna Survey	6/10/04	TN08	*Pogona minor minor*	R
Coyote Fauna Survey	29/09/04	TN03	*Ramphotyphlops diversus*	R
Coyote Fauna Survey	6/10/04	TN08	*Notaden nichollsi*	R
Coyote Fauna Survey	27/09/04	Opportunistic	*Gehyra purpurascens*	R110580
Coyote Fauna Survey	2/10/04	TN11	*Ctenotus piankai*	R110581
Coyote Fauna Survey	4/10/04	Opportunistic	*Rhynchoedura ornata*	R110583
Coyote Fauna Survey	5/10/04	Opportunistic	*Eremiascincus sp*	R110585
Coyote Fauna Survey	4/10/04	TN04	*Diporiphora lalliae*	R110586
Coyote Fauna Survey	4/10/04	TN12	*Diporiphora lalliae*	R110587
Coyote Fauna Survey	4/10/04	TN04	*Diplodactylus stenodactylus*	R110588
Coyote Fauna Survey	4/10/04	TN04	*Diplodactylus conspicillatus*	R110589
Coyote Fauna Survey	2/10/04	TN10	*Ctenotus schomburgkii*	R110590
Coyote Fauna Survey	29/09/04	TN03	*Diplodactylus stenodactylus*	R110591
Coyote Fauna Survey	3/10/04	TN10	*Diplodactylus stenodactylus*	R110592
Coyote Fauna Survey	3/10/04	TN01	*Diplodactylus stenodactylus*	R110593
Coyote Fauna Survey	3/10/04	TN01	*Diplodactylus stenodactylus*	R110594
Coyote Fauna Survey	3/10/04	TN05	*Morethia ruficauda ruficauda*	R110595
Coyote Fauna Survey	1/10/04	TN05	*Morethia ruficauda ruficauda*	R110596
Coyote Fauna Survey	30/09/04	TN04	*Diplodactylus stenodactylus*	R110597
Coyote Fauna Survey	3/10/04	TN10	*Brachyurophis roperi*	R110598
Coyote Fauna Survey	1/10/04	TN10	*Diplodactylus stenodactylus*	R110599
Coyote Fauna Survey	4/10/04	TN06	*Diplodactylus stenodactylus*	R110600
Coyote Fauna Survey	2/10/04	TN04	*Diplodactylus stenodactylus*	R110601
Coyote Fauna Survey	2/10/04	TN04	*Diplodactylus stenodactylus*	R110602
Coyote Fauna Survey	3/10/04	TN10	*Diplodactylus stenodactylus*	R110603
Coyote Fauna Survey	5/10/04	TN01	*Diplodactylus stenodactylus*	R110604
Coyote Fauna Survey	30/09/04	TN04	*Eremiascincus sp*	R110605
Coyote Fauna Survey	3/10/04	TN11	*Delma borea*	R110606
Coyote Fauna Survey	3/10/04	TN11	*Delma borea*	R110607
Coyote Fauna Survey	1/10/04	TN01	*Delma borea*	R110608
Coyote Fauna Survey	3/10/04	TN06	*Diplodactylus stenodactylus*	R110609
Coyote Fauna Survey	30/09/04	TN01	*Diplodactylus stenodactylus*	R110610
Coyote Fauna Survey	5/10/04	TN06	*Eremiascincus sp*	R110611
Coyote Fauna Survey	5/10/04	TN06	*Eremiascincus sp*	R110612
Coyote Fauna Survey	5/10/04	TN06	*Eremiascincus sp*	R110613
Coyote Fauna Survey	4/10/04	Opportunistic	*Strophurus jeanae*	R110614

Survey	Date	Site	Species Name	Museum Number
Coyote Fauna Survey	3/10/04	TN01	*Diplodactylus stenodactylus*	R110615
Coyote Fauna Survey	30/09/04	TN01	*Diplodactylus stenodactylus*	R110616
Coyote Fauna Survey	29/09/04	TN04	*Diplodactylus stenodactylus*	R110617
Coyote Fauna Survey	1/10/04	TN06	*Diplodactylus stenodactylus*	R110618
Coyote Fauna Survey	3/10/04	TN06	*Diplodactylus stenodactylus*	R110619
Coyote Fauna Survey	3/10/04	TN06	*Diplodactylus stenodactylus*	R110620
Coyote Fauna Survey	3/10/04	TN06	*Lialis burtonis*	R110621
Coyote Fauna Survey	4/10/04	TN06	*Strophurus ciliaris ciliaris*	R110622
Coyote Fauna Survey	4/10/04	TN06	*Menetia greyii*	R110623
Coyote Fauna Survey	3/10/04	TN04	*Diplodactylus stenodactylus*	R110624
Coyote Fauna Survey	1/10/04	TN02	*Diplodactylus stenodactylus*	R110625
Coyote Fauna Survey	4/10/04	Opportunistic	*Diplodactylus conspicillatus*	R110626
Coyote Fauna Survey	30/09/04	TN02	*Ctenotus piankai*	R110627
Coyote Fauna Survey	30/09/04	TN02	*Ctenotus piankai*	R110628
Coyote Fauna Survey	3/10/04	TN12	*Lophognathus longirostris*	R110629
Coyote Fauna Survey	3/10/04	TN09	*Diplodactylus stenodactylus*	R110630
Coyote Fauna Survey	6/10/04	TN07	*Ctenophorus isolepis isolepis*	R110631
Coyote Fauna Survey	5/10/04	Opportunistic	*Pygopus nigriceps nigriceps*	R110632
Coyote Fauna Survey	5/10/04	Opportunistic	*Nephrurus levis levis*	R110633
Coyote Fauna Survey	4/10/04	TN09	*Ctenotus tanamiensis*	R110634
Coyote Fauna Survey	4/10/04	Opportunistic	*Suta punctata*	R110635
Coyote Fauna Survey	1/10/04	TN02	*Diplodactylus stenodactylus*	R110854
Coyote Fauna Survey	30/09/04	Opportunistic	*Ramphotyphlops grypus*	R157334
Coyote Fauna Survey	29/09/04	TN04	*Eremiascincus sp*	R157335
Coyote Fauna Survey	29/09/04	Opportunistic	*Pogona minor minor*	R157335
Coyote Fauna Survey	1/10/04	Opportunistic	*Simoselaps anomalus*	R157336
Coyote Fauna Survey	29/09/04	TN04	*Menetia greyii*	R157337
Coyote Fauna Survey	28/09/04	Opportunistic	*Strophurus jeanae*	R157338
Coyote Fauna Survey	29/09/04	TN03	*Diporiphora lalliae*	R157339
Coyote Fauna Survey	29/09/04	TN04	*Ctenotus pantherinus ocellifer*	R157340
Coyote Fauna Survey	29/09/04	TN03	*Lerista bipes*	R157341
Coyote Fauna Survey	29/09/04	TN01	*Ctenotus helenae*	R157342
Coyote Fauna Survey	29/09/04	TN01	*Menetia greyii*	R157343
Coyote Fauna Survey	29/09/04	TN01	*Menetia greyii*	R157344
Coyote Fauna Survey	28/09/04	TN03	*Diporiphora lalliae*	R157345
Coyote Fauna Survey	29/09/04	Opportunistic	*Diporiphora lalliae*	R157346
Coyote Fauna Survey	29/09/04	TN03	*Strophurus ciliaris ciliaris*	R157347
Coyote Fauna Survey	29/09/04	TN01	*Menetia greyii*	R157348
Coyote Fauna Survey	30/09/04	TN02	*Ctenophorus isolepis isolepis*	R157349
Coyote Fauna Survey	30/09/04	TN03	*Diplodactylus conspicillatus*	R157350
Coyote Fauna Survey	30/09/04	TN06	*Strophurus ciliaris ciliaris*	R157351
Coyote Fauna Survey	28/09/04	TN06	*Strophurus ciliaris ciliaris*	R157352
Coyote Fauna Survey	28/09/04	TN06	*Diporiphora lalliae*	R157353
Coyote Fauna Survey	30/09/04	TN01	*Ctenophorus nuchalis*	R157354
Coyote Fauna Survey	29/09/04	TN04	*Lerista bipes*	R157356
Coyote Fauna Survey	29/09/04	TN04	*Lerista bipes*	R157357
Coyote Fauna Survey	30/09/04	TN04	*Lerista bipes*	R157358
Coyote Fauna Survey	30/09/04	TN04	*Lerista bipes*	R157359
Coyote Fauna Survey	29/09/04	TN02	*Lerista bipes*	R157360
Coyote Fauna Survey	30/09/04	TN03	*Lerista bipes*	R157361

Survey	Date	Site	Species Name	Museum Number
Coyote Fauna Survey	30/09/04	TN03	*Lerista bipes*	R157362
Coyote Fauna Survey	30/09/04	TN03	*Lerista bipes*	R157363
Coyote Fauna Survey	30/09/04	TN02	*Lerista bipes*	R157364
Coyote Fauna Survey	28/09/04	TN03	*Strophurus ciliaris ciliaris*	R157365
Coyote Fauna Survey	30/09/04	TN02	*Diplodactylus stenodactylus*	R157366
Coyote Fauna Survey	1/10/04	TN03	*Lerista bipes*	R157367
Coyote Fauna Survey	30/09/04	TN04	*Lerista bipes*	R157368
Coyote Fauna Survey	1/10/04	TN02	*Lerista bipes*	R157369
Coyote Fauna Survey	1/10/04	TN04	*Lerista bipes*	R157370
Coyote Fauna Survey	28/09/04	Opportunistic	*Diporiphora lalliae*	R157371
Coyote Fauna Survey	1/10/04	TN04	*Diporiphora lalliae*	R157372
Coyote Fauna Survey	1/10/04	TN04	*Lerista bipes*	R157373
Coyote Fauna Survey	1/10/04	TN04	*Lerista bipes*	R157374
Coyote Fauna Survey	1/10/04	TN04	*Lerista bipes*	R157375
Coyote Fauna Survey	2/10/04	TN02	*Ctenophorus isolepis isolepis*	R157376
Coyote Fauna Survey	30/09/04	TN09	*Lophognathus longirostris*	R157377
Coyote Fauna Survey	30/09/04	TN09	*Lophognathus longirostris*	R157378
Coyote Fauna Survey	1/10/04	TN09	*Ctenophorus isolepis isolepis*	R157379
Coyote Fauna Survey	2/10/04	TN06	*Ctenophorus isolepis isolepis*	R157380
Coyote Fauna Survey	30/09/04	TN04	*Ramphotyphlops grypus*	R157381
Coyote Fauna Survey	1/10/04	TN09	*Ctenophorus isolepis isolepis*	R157382
Coyote Fauna Survey	2/10/04	TN09	*Ctenotus pantherinus ocellifer*	R157383
Coyote Fauna Survey	1/10/04	TN08	*Lerista bipes*	R157385
Coyote Fauna Survey	2/10/04	TN10	*Varanus acanthurus*	R157385
Coyote Fauna Survey	2/10/04	TN10	*Pogona minor minor*	R157386
Coyote Fauna Survey	30/09/04	TN05	*Ctenotus pantherinus ocellifer*	R157387
Coyote Fauna Survey	2/10/04	TN02	*Lerista bipes*	R157388
Coyote Fauna Survey	2/10/04	TN04	*Ctenotus pantherinus ocellifer*	R157389
Coyote Fauna Survey	2/10/04	TN09	*Ctenophorus isolepis isolepis*	R157390
Coyote Fauna Survey	1/10/04	TN07	*Strophurus ciliaris ciliaris*	R157391
Coyote Fauna Survey	1/10/04	TN08	*Rhynchoedura ornata*	R157392
Coyote Fauna Survey	2/10/04	TN09	*Rhynchoedura ornata*	R157393
Coyote Fauna Survey	1/10/04	TN06	*Strophurus ciliaris ciliaris*	R157394
Coyote Fauna Survey	1/10/04	TN07	*Diplodactylus conspicillatus*	R157395
Coyote Fauna Survey	1/10/04	TN04	*Diporiphora lalliae*	R157396
Coyote Fauna Survey	1/10/04	TN05	*Menetia greyii*	R157397
Coyote Fauna Survey	2/10/04	TN09	*Rhynchoedura ornata*	R157398
Coyote Fauna Survey	2/10/04	TN06	*Ramphotyphlops grypus*	R157399
Coyote Fauna Survey	1/10/04	TN09	*Rhynchoedura ornata*	R157400
Coyote Fauna Survey	1/10/04	TN06	*Varanus eremius*	R157401
Coyote Fauna Survey	1/10/04	TN03	*Ramphotyphlops diversus*	R157402
Coyote Fauna Survey	1/10/04	TN10	*Ramphotyphlops grypus*	R157403
Coyote Fauna Survey	3/10/04	TN10	*Lerista greeri*	R157404
Coyote Fauna Survey	3/10/04	TN12	*Lerista greeri*	R157405
Coyote Fauna Survey	3/10/04	TN12	*Carlia triacantha*	R157406
Coyote Fauna Survey	1/10/04	TN03	*Lerista bipes*	R157407
Coyote Fauna Survey	3/10/04	TN12	*Menetia greyii*	R157408
Coyote Fauna Survey	3/10/04	TN08	*Ctenotus pantherinus ocellifer*	R157409
Coyote Fauna Survey	3/10/04	TN05	*Ctenotus pantherinus ocellifer*	R157410
Coyote Fauna Survey	3/10/04	TN09	*Ctenotus pantherinus ocellifer*	R157411

Survey	Date	Site	Species Name	Museum Number
Coyote Fauna Survey	3/10/04	TN11	*Ctenotus piankai*	R157412
Coyote Fauna Survey	3/10/04	TN12	*Tiliqua multifasciata*	R157413
Coyote Fauna Survey	3/10/04	TN05	*Ctenophorus nuchalis*	R157414
Coyote Fauna Survey	3/10/04	TN07	*Lialis burtonis*	R157415
Coyote Fauna Survey	4/10/04	TN09	*Lerista greeri*	R157416
Coyote Fauna Survey	4/10/04	TN12	*Carlia triacantha*	R157417
Coyote Fauna Survey	4/10/04	TN12	*Ctenotus helenae*	R157418
Coyote Fauna Survey	4/10/04	TN12	*Heteronotia binoei*	R157419
Coyote Fauna Survey	4/10/04	TN10	*Lerista greeri*	R157420
Coyote Fauna Survey	4/10/04	TN10	*Pogona minor minor*	R157421
Coyote Fauna Survey	4/10/04	TN07	*Ctenophorus isolepis isolepis*	R157422
Coyote Fauna Survey	4/10/04	TN08	*Ctenotus helenae*	R157423
Coyote Fauna Survey	4/10/04	TN11	*Ctenotus pantherinus ocellifer*	R157424
Coyote Fauna Survey	4/10/04	Opportunistic	*Ctenotus pantherinus ocellifer*	R157425
Coyote Fauna Survey	4/10/04	TN01	*Delma borea*	R157426
Coyote Fauna Survey	3/10/04	TN12	*Brachyurophis roperi*	R157427
Coyote Fauna Survey	3/10/04	TN12	*Brachyurophis roperi*	R157428
Coyote Fauna Survey	4/10/04	TN06	*Lialis burtonis*	R157429
Coyote Fauna Survey	4/10/04	TN01	*Delma borea*	R157430
Coyote Fauna Survey	3/10/04	TN03	*Diplodactylus conspicillatus*	R157431
Coyote Fauna Survey	1/10/04	TN04	*Diporiphora lalliae*	R157432
Coyote Fauna Survey	3/10/04	TN01	*Heteronotia binoei*	R157433
Coyote Fauna Survey	3/10/04	TN02	*Lialis burtonis*	R157434
Coyote Fauna Survey	3/10/04	TN03	*Delma borea*	R157435
Coyote Fauna Survey	1/10/04	TN06	*Diporiphora lalliae*	R157436
Coyote Fauna Survey	1/10/04	TN04	*Lophognathus longirostris*	R157437
Coyote Fauna Survey	2/10/04	TN10	*Brachyurophis roperi*	R157438
Coyote Fauna Survey	4/10/04	TN04	*Strophurus ciliaris ciliaris*	R157439
Coyote Fauna Survey	3/10/04	TN11	*Ctenotus piankai*	R157440
Coyote Fauna Survey	2/10/04	TN02	*Strophurus ciliaris ciliaris*	R157441
Coyote Fauna Survey	3/10/04	TN07	*Ctenophorus isolepis isolepis*	R157442
Coyote Fauna Survey	2/10/04	TN10	*Ctenotus schomburgkii*	R157443
Coyote Fauna Survey	3/10/04	TN12	*Ctenotus schomburgkii*	R157443
Coyote Fauna Survey	1/10/04	TN01	*Varanus eremius*	R157444
Coyote Fauna Survey	3/10/04	TN10	*Diporiphora lalliae*	R157445
Coyote Fauna Survey	2/10/04	TN12	*Lialis burtonis*	R157446
Coyote Fauna Survey	1/10/04	TN01	*Delma borea*	R157447
Coyote Fauna Survey	2/10/04	TN08	*Varanus eremius*	R157448
Coyote Fauna Survey	1/10/04	TN08	*Varanus eremius*	R157449
Coyote Fauna Survey	5/10/04	TN08	*Eremiascincus sp*	R157450
Coyote Fauna Survey	5/10/04	TN08	*Ctenotus helenae*	R157451
Coyote Fauna Survey	5/10/04	TN08	*Ctenotus pantherinus ocellifer*	R157452
Coyote Fauna Survey	5/10/04	TN05	*Ctenophorus isolepis isolepis*	R157453
Coyote Fauna Survey	5/10/04	TN07	*Ctenophorus isolepis isolepis*	R157454
Coyote Fauna Survey	5/10/04	TN08	*Ctenophorus isolepis isolepis*	R157455
Coyote Fauna Survey	4/10/04	TN08	*Pygopus nigriceps nigriceps*	R157455
Coyote Fauna Survey	5/10/04	TN05	*Varanus eremius*	R157456
Coyote Fauna Survey	4/10/04	TN03	*Varanus eremius*	R157457
Coyote Fauna Survey	2/10/04	TN09	*Rhynchoedura ornata*	R157458
Coyote Fauna Survey	5/10/04	Opportunistic	*Pygopus nigriceps nigriceps*	R157460

Survey	Date	Site	Species Name	Museum Number
Coyote Fauna Survey	5/10/04	TN03	*Ctenotus pantherinus ocellifer*	R157461
Coyote Fauna Survey	5/10/04	TN03	*Ctenotus pantherinus ocellifer*	R157462
Coyote Fauna Survey	3/10/04	TN08	*Varanus eremius*	R157463
Coyote Fauna Survey	5/10/04	TN02	*Ramphotyphlops diversus*	R157464
Coyote Fauna Survey	3/10/04	TN01	*Gehyra variegata*	R157465
Coyote Fauna Survey	3/10/04	TN01	*Carlia triacantha*	R157466
Coyote Fauna Survey	3/10/04	TN02	*Strophurus ciliaris ciliaris*	R157467
Coyote Fauna Survey	6/10/04	TN12	*Carlia munda*	R157468
Coyote Fauna Survey	6/10/04	TN12	*Ctenotus helenae*	R157469
Coyote Fauna Survey	4/10/04	TN06	*Lerista greeri*	R157470
Coyote Fauna Survey	6/10/04	Opportunistic	*Gehyra variegata*	R157471
Coyote Fauna Survey	5/10/04	TN09	*Morethia ruficauda ruficauda*	R157472
Coyote Fauna Survey	6/10/04	TN09	*Ctenotus grandis titan*	R157473
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157474
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157475
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157476
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157477
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157478
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157479
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157480
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157481
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157482
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157483
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157484
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157485
Coyote Fauna Survey	4/10/04	TN08	*Notaden nichollsi*	R157486
Coyote Fauna Survey	5/10/04	TN11	*Ctenotus piankai*	R157494
Coyote Fauna Survey	3/10/04	TN02	*Ramphotyphlops diversus*	R157495
Coyote Fauna Survey	5/10/04	Opportunistic	*Strophurus ciliaris ciliaris*	R
Coyote Fauna Survey	6/10/04	Opportunistic	*Gehyra variegata*	R
Coyote Fauna Survey	27/09/04	Opportunistic	*Gehyra purpurascens*	R110580
Coyote Fauna Survey	4/10/04	Opportunistic	*Rhynchoedura ornata*	R110583
Coyote Fauna Survey	5/10/04	Opportunistic	*Eremiascincus sp*	R110585
Coyote Fauna Survey	4/10/04	Opportunistic	*Strophurus jeanae*	R110614
Coyote Fauna Survey	4/10/04	Opportunistic	*Diplodactylus conspicillatus*	R110626
Coyote Fauna Survey	5/10/04	Opportunistic	*Pygopus nigriceps nigriceps*	R110632
Coyote Fauna Survey	5/10/04	Opportunistic	*Nephrurus levis levis*	R110633
Coyote Fauna Survey	4/10/04	Opportunistic	*Suta punctata*	R110635
Coyote Fauna Survey	30/09/04	Opportunistic	*Ramphotyphlops grypus*	R157334
Coyote Fauna Survey	29/09/04	Opportunistic	*Pogona minor minor*	R157335
Coyote Fauna Survey	1/10/04	Opportunistic	*Simoselaps anomalus*	R157336
Coyote Fauna Survey	28/09/04	Opportunistic	*Strophurus jeanae*	R157338
Coyote Fauna Survey	29/09/04	Opportunistic	*Diporiphora lalliae*	R157346
Coyote Fauna Survey	28/09/04	Opportunistic	*Diporiphora lalliae*	R157371
Coyote Fauna Survey	4/10/04	Opportunistic	*Ctenotus pantherinus ocellifer*	R157425
Coyote Fauna Survey	5/10/04	Opportunistic	*Pygopus nigriceps nigriceps*	R157460
Coyote Fauna Survey	6/10/04	Opportunistic	*Gehyra variegata*	R157471
Coyote Fauna Survey	5/10/04	TN02	*Pseudomys sp*	M
Coyote Fauna Survey	4/10/04	TN01	*Pseudomys nanus*	M
Coyote Fauna Survey	3/10/04	TN08	*Sminthopsis youngsoni*	M

Survey	Date	Site	Species Name	Museum Number
Coyote Fauna Survey	1/10/04	TN07	*Sminthopsis youngsoni*	M
Coyote Fauna Survey	5/10/04	TN05	*Pseudomys hermannsburgensis*	M
Coyote Fauna Survey	5/10/04	TN07	*Pseudomys hermannsburgensis*	M
Coyote Fauna Survey	4/10/04	TN01	*Ningaui ridei*	M
Coyote Fauna Survey	5/10/04	Opportunistic	*Pseudomys sp*	M
Coyote Fauna Survey	30/09/04	TN03	*Notomys alexis*	M56096
Coyote Fauna Survey	30/09/04	TN03	*Pseudomys desertor*	M56097
Coyote Fauna Survey	30/09/04	TN02	*Pseudomys hermannsburgensis*	M56098
Coyote Fauna Survey	30/09/04	TN02	*Pseudomys hermannsburgensis*	M56099
Coyote Fauna Survey	29/09/04	TN02	*Pseudomys hermannsburgensis*	M56100
Coyote Fauna Survey	29/09/04	TN03	*Pseudomys desertor*	M56101
Coyote Fauna Survey	29/09/04	TN02	*Notomys alexis*	M56102
Coyote Fauna Survey	30/09/04	TN04	*Mus musculus*	M56103
Coyote Fauna Survey	30/09/04	TN05	*Sminthopsis youngsoni*	M56104
Coyote Fauna Survey	1/10/04	TN01	*Pseudomys desertor*	M56105
Coyote Fauna Survey	1/10/04	TN02	*Mus musculus*	M56106
Coyote Fauna Survey	1/10/04	TN01	*Pseudomys hermannsburgensis*	M56107
Coyote Fauna Survey	1/10/04	TN06	*Notomys alexis*	M56108
Coyote Fauna Survey	1/10/04	TN04	*Sminthopsis youngsoni*	M56109
Coyote Fauna Survey	2/10/04	TN01	*Pseudomys desertor*	M56110
Coyote Fauna Survey	2/10/04	TN01	*Mus musculus*	M56111
Coyote Fauna Survey	2/10/04	TN03	*Notomys alexis*	M56112
Coyote Fauna Survey	2/10/04	TN03	*Notomys alexis*	M56113
Coyote Fauna Survey	2/10/04	TN04	*Pseudomys hermannsburgensis*	M56114
Coyote Fauna Survey	2/10/04	TN03	*Sminthopsis youngsoni*	M56115
Coyote Fauna Survey	1/10/04	TN06	*Mus musculus*	M56116
Coyote Fauna Survey	2/10/04	TN05	*Mus musculus*	M56117
Coyote Fauna Survey	2/10/04	TN08	*Pseudomys desertor*	M56118
Coyote Fauna Survey	1/10/04	TN07	*Sminthopsis youngsoni*	M56119
Coyote Fauna Survey	1/10/04	TN07	*Sminthopsis youngsoni*	M56120
Coyote Fauna Survey	2/10/04	TN09	*Pseudomys hermannsburgensis*	M56121
Coyote Fauna Survey	1/10/04	TN07	*Sminthopsis youngsoni*	M56122
Coyote Fauna Survey	1/10/04	TN08	*Ningaui ridei*	M56123
Coyote Fauna Survey	3/10/04	TN02	*Pseudomys hermannsburgensis*	M56125
Coyote Fauna Survey	1/10/04	TN07	*Sminthopsis youngsoni*	M56126
Coyote Fauna Survey	3/10/04	TN12	*Sminthopsis youngsoni*	M56128
Coyote Fauna Survey	3/10/04	TN08	*Pseudomys desertor*	M56129
Coyote Fauna Survey	4/10/04	TN01	*Mus musculus*	M56130
Coyote Fauna Survey	4/10/04	TN11	*Pseudomys desertor*	M56131
Coyote Fauna Survey	4/10/04	TN08	*Pseudomys desertor*	M56132
Coyote Fauna Survey	4/10/04	TN03	*Pseudomys desertor*	M56133
Coyote Fauna Survey	4/10/04	TN06	*Notomys alexis*	M56134
Coyote Fauna Survey	4/10/04	TN04	*Mus musculus*	M56135
Coyote Fauna Survey	4/10/04	TN03	*Notomys alexis*	M56136
Coyote Fauna Survey	4/10/04	TN02	*Pseudomys sp*	M56137
Coyote Fauna Survey	3/10/04	TN01	*Pseudomys desertor*	M56138
Coyote Fauna Survey	5/10/04	TN06	*Mus musculus*	M56139
Coyote Fauna Survey	5/10/04	TN01	*Pseudomys sp*	M56140
Coyote Fauna Survey	5/10/04	Opportunistic	*Pseudomys hermannsburgensis*	M56141
Coyote Fauna Survey	5/10/04	TN05	*Pseudomys hermannsburgensis*	M56142

Survey	Date	Site	Species Name	Museum Number
Coyote Fauna Survey	5/10/04	TN07	*Pseudomys hermannsburgensis*	M56143
Coyote Fauna Survey	5/10/04	TN05	*Sminthopsis macroura*	M56144
Coyote Fauna Survey	5/10/04	TN02	*Pseudomys hermannsburgensis*	M56145
Coyote Fauna Survey	5/10/04	TN03	*Pseudomys sp*	M56146

Appendix 12

Fauna Habitats and Fauna Assemblage Report (Biota)

Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project Area

Prepared for

Tanami Gold NL

Prepared by

Biota Environmental Sciences Pty Ltd

October 2005

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Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project Area

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1.0 Summary

Introduction

Tanami Gold N.L. proposes to mine the Coyote and Bald Hill (formerly Larranganni) deposits as part of the Coyote Project located in the Western Tanami Desert, 30 km from the W.A. border directly adjacent to the Tanami Track. Stage 1 of the project will involve the development of an open pit followed by an underground mine on the Coyote orebody. This mining operation will be supported by a small processing facility and associated infrastructure including an 80 person camp and airstrip. On completion of Stage 1, Stage 2 will involve the development of a haul road 35 km north to Bald Hill and the development of the Sandpiper and Kookaburra pits in that area.

The open pit mines will utilise a conventional mining fleet incorporating a 110t excavator and associated haulage trucks. The waste material will be stacked on a waste dump that will be battered down and rehabilitated on completion of mining. Ore will be processed through a small processing plant with gold being extracted using both gravity separation techniques and vat leaching. On completion of processing, the vats will be drained then buried beneath waste from the waste dump. Where possible, rehabilitation will be undertaken progressively throughout the duration of the operation.

Biota Environmental Sciences was commissioned to undertake a fauna habitat and fauna assemblage survey of the Coyote and Bald Hill Deposits and an associated haul road (the Western Tanami Project) in September 2004 and June 2005.

Results

Fauna habitat classification was developed on the basis of the dominant landform and vegetation type. It does not cover all habitats available to the entire assemblage of invertebrate and vertebrate fauna, as this would be difficult to resolve and logistically impracticable to sample. Rather, the classifications provide a convenient framework within which to summarise species occurrence in the annotated lists and associated tables.

Six primary habitats were identified within the project area and these are largely based on vegetation structure and landforms as follows:

- savanna – Open *Eucalyptus* woodland over open *Acacia* over *Triodia* and grasses in unburnt/disturbed areas on red-brown clayey-loam (TN01);
- *Triodia* hillslope - Scattered *Eucalyptus* over mixed *Acacia* low shrubland/*Triodia* hummock grassland on laterite gravelly sandy-loam (TN02, TN07, TN11);
- *Triodia* sandplain – Dense but patchy *Acacia* and *Grevillea* over a *Triodia* hummock grassland (or tussock grasses in recently burnt areas) on red-brown loamy sand (TN03, TN06);
- *Triodia* flat – Dense ground layer of *Triodia* interspersed with scattered large termite mounds and essentially no overstorey on dark brown loamy clay (TN05, TN09, TN10);
- minor drainage line – Scattered eucalypts over *Melaleuca*, *Acacia* and *Grevillea* over a relatively dense ground layer of *Triodia longiceps* on red-brown loamy sand (TN04, TN12); and
- *Triodia* dune – Scattered *Acacia* and *Grevillea* over a dense ground layer of *Triodia* and herbs (which became more open on the dune crest) on red-brown sand (TN08).

The field survey recorded a combined total of 123 vertebrate species including 58 species of bird, 14 native mammals, four introduced mammals, 44 reptiles, one frog and two bats.

The surveys recorded 909 individuals of 58 bird species in the combined study area of the Coyote and Bald Hill Deposits and the haul road. This included 79 individuals of 21 species of non-passerine and 830 individuals of 37 species of passerine. The most speciose families were

the Meliphagidae (10 species), Psittacidae (5 species), Sylviidae (4 species), Columbidae (3 species), Maluridae (3 species), Pachycephalidae (3 species) and Falconidae (3 species).

The survey recorded 14 native and four introduced species of mammals, comprising five dasyurids (carnivorous marsupials), one thylacomyid (bilbies), two macropods[1] (kangaroos and wallabies), six native and one introduced murid rodents (mice), one canid (dogs), one felid (cats) and one camelid (camels).

One frog and 44 reptile species were recorded from the trapping sites established during the Western Tanami surveys. These comprised one myobatrachid frog (Australasian ground frogs), nine gekkonids (geckos), three pygopodids (legless lizards), six agamids (dragons), 16 scincids (skinks), five varanids (goannas), two typhlopids (blind snakes) and three elapids (front-fanged snakes).

The survey recorded five species of conservation significance:

Species	State Level	Federal Level
Mulgara *Dasycercus cristicauda*	Schedule 1	Vulnerable
Bilby *Macrotis lagotis*	Schedule 1	Vulnerable
Major Mitchell's Cockatoo *Cacatua leadbeateri*	Schedule 4	-
Spectacled Hare-wallaby *Lagorchestes conspicillatus*†	Priority 4	
Australian Bustard *Ardeotis australis*	Priority 4	-

† Recorded from tracks only

The surveys also recorded eight different taxa of mygalomorph spiders, a group known to support species with narrow distributions. Without detailed regional collections and taxonomic reviews, it is unclear as to whether any of the taxa collected by this survey have restricted distributions.

Recommendations

The following recommendations arise from the two phase fauna survey of the Western Tanami study area:

- Tanami Gold has already commissioned a systematic fauna survey of their site and defined the key habitats for Bilby and Mulgara within the lease. These areas will be identified as control areas to be left undisturbed as far as practicable within the context of developing the mine and associated infrastructure.
- An exploration Management Plan should be developed to ameliorate potential impacts to either Bilbies or Mulgaras and their habitat arising from proposed future exploration activities.
- All members of the work force on site will be provided with an environmental induction to ensure they are familiarised with the presence of Bilby and Mulgara in the area. This will include driving speed restrictions, ensuring that off-road driving is minimised, and fire risk minimisation.
- Prior to completion of the project, airstrip and camp lateritic areas (Bilby habitat) will be subject to an investigation to determine specific fauna habitat reconstruction methodologies to maximise the potential for future use by Bilbies.
- Tanami Gold, in collaboration with relevant agencies (eg. CALM), will communicate the findings of the Bilby habitat study to other stakeholders in the Tanami region. This is currently poorly understood (Mr Ric Southgate, pers. comm.), and will assist in the wider conservation of this species.

In addition, a recommendation to investigate the taxonomic identity of a mound building *Pseudomys*[2] collected during Phase 2 has already been acted upon (see Section 6.2). More

[1] R. Southgate recorded tracks from which he considered most likely to be the Spectacled Hare-wallaby *Lagochestes conspicillatus* from one site.

[2] There appears to be some confusion over the taxonomy of this group, with *P. laborifex* and *P. johnstonei* possibly synonymous, and *P. calabyi* not previously known from this State.

specifically, this recommendation suggested that Tanami Gold engage Ms Norah Cooper of the Western Australian Museum to examine the skull morphology of the specimens collected from the Bald Hill project area and compare them to *P. johnstonei*, *P calabyi*, *P. chapmani* and *P laborifex*. It was also recommended that Dr. Steve Donellan of the South Australian Museum undertake genetic studies to supplement these morphological analyses.

2.0 Introduction

2.1 Background to the Coyote and Bald Hill Deposits and Location of the Project Area

Tanami Gold N.L. proposes to mine the Coyote and Bald Hill (formerly Larranganni) deposits as part of the Coyote Project located in the Western Tanami Desert 30 km from the W.A. border directly adjacent to the Tanami Track (Figure 2.1). Stage 1 of the project will involve the development of an open pit followed by an underground mine on the Coyote orebody. This mining operation will be supported by a small processing facility and associated infrastructure including an 80 person camp and airstrip. On completion of Stage 1, Stage 2 will involve the development of a haul road 35 km north to Bald Hill and the development of the Sandpiper and Kookaburra pits in that area.

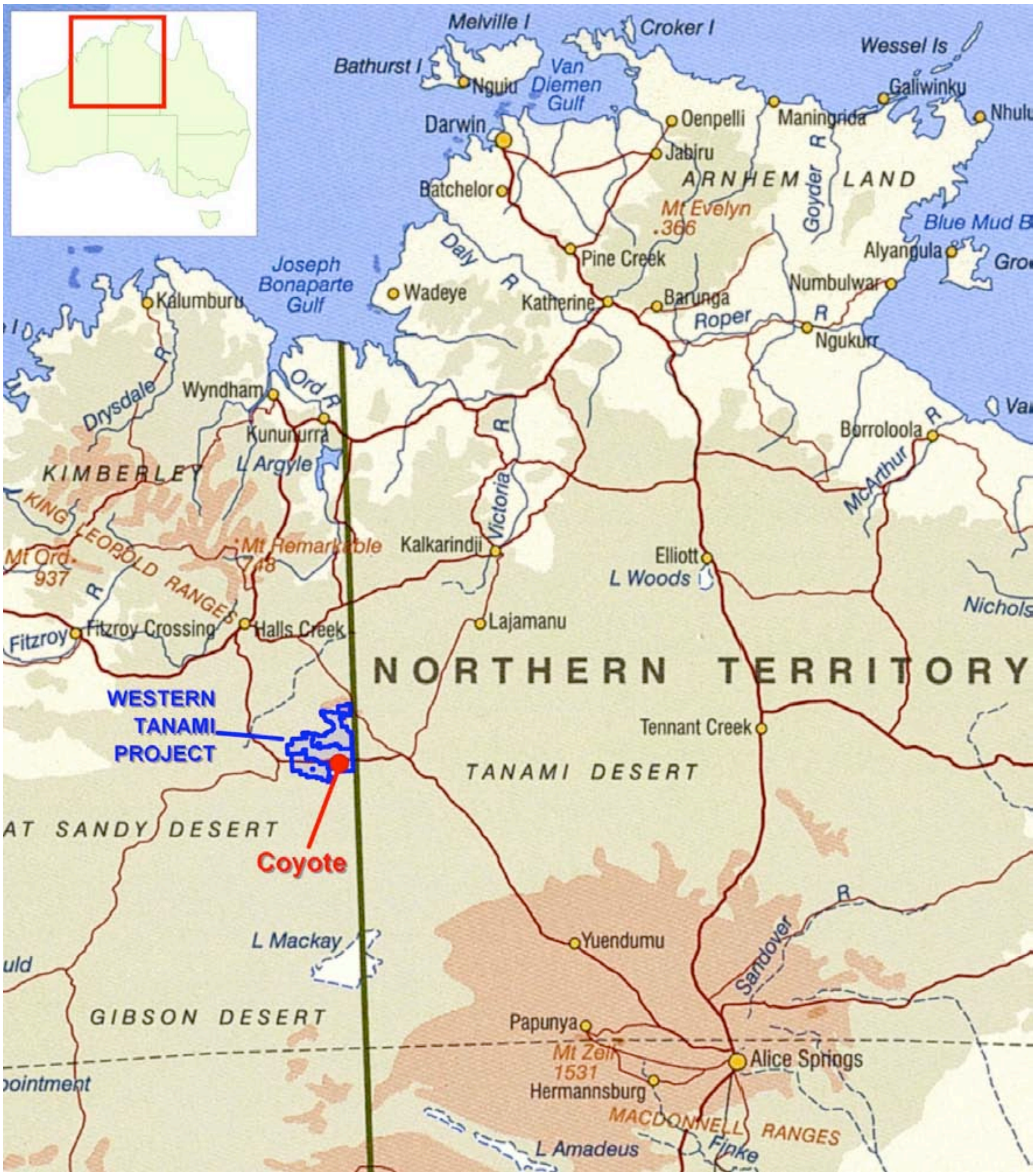

Figure 2.1: Locality figure showing the Western Tanami project.

The open pit mines will utilise a conventional mining fleet incorporating a 110t excavator and associated haulage trucks. The waste material will be stacked on a waste dump that will be battered down and rehabilitated on completion of mining. Ore will be processed through a small processing plant with gold being extracted using both gravity separation techniques and vat leaching. On completion of processing, the vats will be drained then buried beneath waste from the waste dump. Where possible, rehabilitation will be undertaken progressively throughout the duration of the operation.

2.2 Scope and Objectives of this Study

This report documents the results of a two phase fauna survey of the Coyote and Bald Hill project areas. This study was planned and implemented as far as practicable according to the Environmental Protection Authority (EPA) Position Statement No. 3 "Terrestrial Biological Surveys as an Element of Biodiversity Protection" (EPA 2002) and Guidance Statement No. 56 "Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia" (EPA 2004).

As such, the study aimed to:

- provide baseline information regarding fauna habitats and fauna assemblages of the project area. This incorporated a desktop review of available information, together with a field study (utilising techniques generally accepted as standard for the region), which addressed: description of fauna habitats occurring in the project area, including identification of any habitats of particular conservation significance; cataloguing of the fauna assemblage within the project area (based on a two phase survey); and collation of information regarding any fauna of conservation interest);
- place the information from the project area in regional context by comparison with available data from other localities; and
- provide management recommendations to minimise impact to fauna habitats and fauna species of particular conservation significance within the project area.

In addition, the second phase of the survey was expanded to address some of the key findings of the Phase 1 survey. These included requirements for:

- survey of the ground disturbance areas focusing on Mulgara and Bilby habitat utilisation; and
- ground-truthing of the lateritic surfaces as defined by the geological survey map to determine concordance with potential Bilby habitat (as understood by Mr Ric Southgate).

3.0 Survey Methodology

3.1 Database Searches

A search was commissioned of the Threatened Fauna Database held by the Department of Conservation and Land Management (CALM) in September 2004 for threatened fauna records in the vicinity of the study area. The bounding coordinates used were:

- -18.5666°S, 127.6833°E; and
- -20.9000°S, 130.01666°E.

The Western Australian Museum FaunaBase database was also searched for records of vouchered fauna specimens between:

- -18.5666°S, 127.6833°E; and
- -20.9000°S, 130.01666°E.

Results of the two searches are contained in Appendices 4 and 3 respectively.

3.2 Survey Timing and Weather

Phase 1 of the survey was conducted over a 10-day period between the 27/09/04 – 06/09/04. Phase 2 was conducted over an 8-day period between the 14/06/05 – 21/06/05.

During the first sampling phase weather was hot, with maximum temperatures between 34.0°C - 40.0°C and minimum temperatures between 18.5°C – 25.0°C (as measured at the Balgo Hills recording station; Table 3.1). There was 6.4 mm of rainfall during this period, which occurred during the 24hrs to 9 a.m. on the 4/10/04. The mean maximum temperature for October 2004 (38.8°C) was slightly higher than that in previous years (36.9°C). The mean minimum temperature (23.5°C) was also slightly higher than in previous years (22.2°C) (see Table 3.3).

During the second sampling phase, maximum temperatures ranged between 18.1°C – 29.3°C and minimum temperatures between 11.0°C – 22.9°C (as measured at the Balgo Hills recording station; Table 3.2). There was 32.6 mm of rainfall during this period, which occurred between 17/06/05 – 20/06/05. The mean maximum temperature for June 2005 (25.2°C) was slightly lower than that in previous years (26.3°C). The mean minimum temperature (13.2°C) was slightly higher than in previous years (12.6°C).

Table 3.1: Daily meteorological observations for Balgo Hills for 26/9/04 – 8/10/04 (data provided by the Western Australian Bureau of Meteorology).

Date	Maximum Temperature (°C)	Minimum Temperature (°C)	Temperature at 9am (°C)	Temperature at 3pm (°C)	Rainfall 24 hrs to 9am (mm)
27/9/04	36.1	23.6	31.0	35.3	0
28/9/04	35.1	23.2	31.9	34.0	0
29/9/04	35.7	22.2	30.1	34.9	0
30/9/04	36.7	24.9	31.4	35.4	0
1/10/04	37.5	22.9	32.5	36.6	0
2/10/04	39.0	23.5	34.3	36.8	0
3/10/04	36.3	23.2	30.6	35.6	0
4/10/04	34.0	18.5	27.2	32.7	6.4
5/10/04	37.5	21.5	33.7	36.6	0
6/10/04	40.0	25.0	36.3	39.2	0

Table 3.2: Daily meteorological observations for Balgo Hills for 13/06/05 – 22/06/05 (data provided by the Western Australian Bureau of Meteorology).

Date	Maximum Temperature (°C)	Minimum Temperature (°C)	Temperature at 9am (°C)	Temperature at 3pm (°C)	Rainfall 24 hrs to 9am (mm)
14/06/05	23.1	14.7	16.7	21.9	0
15/06/05	27.1	11.0	18.2	26.0	0
16/06/05	29.3	17.0	21.1	28.1	0
17/06/05	18.8	22.9	20.4	20.3	0.6
18/06/05	19.6	15.5	17.1	19.6	11.1
19/06/05	18.1	16.4	18.0	17.1	18.6
20/06/05	19.5	13.0	15.7	18.5	2.3
21/06/05	19.2	11.4	15.8	17.4	0

Table 3.3: Climatological Summary for Balgo Hills using data from 1940 to 2004 (data provided by the Western Australian Bureau of Meteorology).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Mean Daily Maximum Temperature (°C)	38.6	36.9	36.8	34.0	29.2	26.3	26.4	28.8	33.6	36.9	38.5	38.7	
Mean Daily Minimum Temperature (°C)	25.2	24.1	23.1	20.3	15.6	12.6	11.9	14.0	18.4	22.2	24.3	25.1	
Mean Total Monthly Rainfall (mm)	67.9	86.2	41.9	19.2	16.0	9.6	8.4	2.4	2.8	11.0	20.7	55.8	341.9
Mean Maximum Air Temperature 2004 (°C)	38.2	33.4	35.3	34.4	27.1	26.2	26.9	28.4	31.4	38.8	38.8	40.6	
Mean Minimum Air Temperature 2004 (°C)	25.1	23.4	23.7	20.7	16.6	13.3	12.7	13.6	16.4	23.5	24.4	25.8	
Total Monthly Rainfall 2004 (mm)	135.3	257.5	33.1	4.0	42.5	0.3	0	0	0	8.7	13.5	24.8	519.7

3.3 Survey Team and Acknowledgements

The vertebrate fauna sampling for this survey was conducted under "Licence To Take Fauna For Scientific Purposes" No. SF004664 (Appendix 1) issued to Mr Roy Teale (Biota Environmental Sciences). Ethics approval was granted under the Western Australian Museum (Department of Conservation and Land Management) Animal Ethics Committee, which covers Mr Roy Teale as a Research Associate with the WA Museum. The fauna survey team comprised Mr Roy Teale, Dr Mike Craig, Mr Dan Kamien and Ms Zoë Hamilton (all of Biota Environmental Sciences), Mr Greg Harold (consultant) and Mr Ric Southgate (consultant).

During Phase 1 (2004), vertebrate species that were to be lodged with the Western Australian Museum were imported from the Northern Territory back into Western Australia under "Licence To Import Skins Of Fauna (Or Other Dead Fauna)" No. IS000187 (Appendix 2) issued to Mr Roy Teale.

Analysis of bat recordings was completed by Mr Lee Mould (Biota Environmental Sciences).

Invertebrate identification was undertaken by Mr Dan Kamien and Mr Myles Menz (Biota Environmental Sciences). The WA Museum, in particular Dr Volker Fromenau and Dr Mark Harvey, provided assistance with final invertebrate identification and information.

Ms Norah Cooper, Dr Paul Doughty, Dr Ric How and Mr Brad Maryan (all of the WA Museum) provided advice on vertebrate species to be vouchered with the WA Museum. Mr Brad Maryan assisted with confirmation of herpetofauna identifications, and Ms Norah Cooper assisted with mammal identifications. Following the discovery of the Pebble-mound Mouse during Phase 2, Ms Norah Cooper was responsible for identifying the taxon recorded and coordinating the molecular studies carried out by Dr Steve Donellan at the Evolutionary Biology Unit of the South Australian Museum. We are greatly appreciative of the support provided by all staff at the WA Museum who assisted with resolving the taxonomic identity of this species in such a short period of time.

Dr Dave Pearson (CALM) provided advice on Mulgara *Dasycercus cristicauda* and Bilby *Macrotis lagotis* recorded from the site.

3.4 Systematic Censusing

Systematic censusing focused on the Coyote, Bald Hill and Haul Road study sites. The central component of the systematic censusing consisted of 12 trapping grids, each located within a defined habitat. Each trapping grid consisted of a single row of six pitfall traps (alternating 20 litre buckets and PVC tubes) spaced at approximately 8 m intervals and connected with a single length of 30 cm high flywire fence. At selected sites (see Table 3.4 and Table 3.5), lines of medium-sized Elliott traps were also established in addition to cage traps and funnels.

Moreover, a suspected Mulgara burrow complex was surrounded by a number of Elliott traps for three nights during Phase 1. Elliott traps were also laid around three *Pseudomys* sp. pebble-mounds during Phase 2 of the survey.

3.4.1 Avifauna Sampling

The avifauna of the project area was sampled using a combination of techniques, which included:

- unbounded area searches conducted at the systematic sampling grids;
- unbounded area searches conducted at opportunistic locations containing habitats or microhabitats likely to support previously unrecorded species; and
- opportunistic observation of birds recorded while driving around the study area.

Table 3.4: Site location and trap effort for the Tanami Gold proposal during Phase 1.

Site	Location (WGS 84)	Trap Type	Date Opened	Date Closed	Nights Open	No. of Traps	Total Effort
TN01	481903mE	Elliott	28/9/04	5/10/04	7	20	140
	7799594mN	Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	1	7
TN02	485351mE	Elliott	28/9/04	5/10/04	7	10	70
	7800754mN	Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	1	7
TN03	485974mE	Elliott	28/9/04	5/10/04	7	20	140
	7799699mN	Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	2	14
TN04	484092mE	Elliott	28/9/04	5/10/04	7	10	70
	7804316mN	Pit	28/9/04	5/10/04	7	6	42
		Cage	28/9/04	5/10/04	7	1	7
TN05	486919mE	Elliott	29/9/04	5/10/04	6	10	60
	7829218mN	Pit	29/9/04	5/10/04	6	6	36
		Cage	29/9/04	5/10/04	6	1	6
TN06	483899mE	Elliott	30/9/04	6/10/04	6	10	60
	7803272mN	Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN07	488050mE	Elliott	30/9/04	6/10/04	6	10	60
	7825593mN	Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN08	487799mE	Elliott	30/9/04	6/10/04	6	10	60
	7825992mN	Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN09	486409mE	Elliott	30/9/04	6/10/04	6	10	60
	7833993mN	Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	6	1	6
TN10	485447mE	Elliott	30/9/04	6/10/04	6	10	60
	7833496mN	Pit	30/9/04	6/10/04	6	6	36
		Cage	30/9/04	6/10/04	-	0	0
TN11	485839mE	Elliott	1/10/04	6/10/04	-	0	0
	7834983mN	Pit	1/10/04	6/10/04	5	6	30
		Cage	1/10/04	6/10/04	-	0	0
TN12	485359mE	Elliott	1/10/04	6/10/04	-	0	0
	7833943mN	Pit	1/10/04	6/10/04	5	6	30
		Cage	1/10/04	6/10/04	-	0	0
						Elliott nights	780
						Pit nights	444
						Cage nights	65

Table 3.5: Site* location and trap effort for the Tanami Gold proposal during Phase 2.

Site	Location (WGS 84)	Trap Type	Date Opened	Date Closed	Nights Open	No. of Traps	Total Effort
TN01	481903mE	Elliott	15/6/05	21/6/05	6	10	60
	7799594mN	Pit	15/6/05	21/6/05	6	6	36
		Cage	-	-	-	-	-
		Funnel	-	-	-	-	-
TN02	485351mE	Elliott	14/6/05	21/6/05	7	25	175
	7800754mN	Pit	14/6/05	21/6/05	7	6	42
		Cage	14/6/05	21/6/05	7	2	14
		Funnel	-	-	-	-	-
TN03	485974mE	Elliott	15/6/05	21/6/05	6	10	60
	7799699mN	Pit	15/6/05	21/6/05	6	6	36
		Cage	-	-	-	-	-
		Funnel	-	-	-	-	-
TN04A	484353mE	Elliott	-	-	-	-	-
	7804184mN	Pit	15/6/05	21/6/05	6	6	36
		Cage	-	-	-	-	-
		Funnel	-	-	-	-	-
TN05	486919mE	Elliott	14/6/05	21/6/05	7	20	140
	7829218mN	Pit	14/6/05	21/6/05	7	6	42
		Cage	-	-	-	-	-
		Funnel	14/6/05	21/6/05	7	6	42
TN06	483899mE	Elliott	14/6/05	21/6/05	7	10	70
	7803272mN	Pit	14/6/05	21/6/05	7	6	42
		Cage	14/6/05	21/6/05	7	2	14
		Funnel	14/6/05	21/6/05	7	6	42
TN07	488050mE	Elliott	14/6/05	21/6/05	7	10	70
	7825593mN	Pit	14/6/05	21/6/05	7	6	42
		Cage	14/6/05	21/6/05	7	2	14
		Funnel	-	-	-	-	-
TN08A	488002mE	Elliott	14/6/05	21/6/05	7	10	70
	7826034mN	Pit	14/6/05	21/6/05	7	6	42
		Cage	14/6/05	21/6/05	7	2	14
		Funnel	14/6/05	21/6/05	7	6	42
TN09	486409mE	Elliott	14/6/05	20/6/05	6	10	60
	7833993mN	Pit	14/6/05	20/6/05	6	6	36
		Cage	14/6/05	20/6/05	6	2	12
		Funnel	14/6/05	20/6/05	6	6	36
TN10	485447mE	Elliott	14/6/05	20/6/05	6	10	60
	7833496mN	Pit	14/6/05	20/6/05	6	6	36
		Cage	14/6/05	20/6/05	6	4	24
		Funnel	14/6/05	20/6/05	6	4	24
TN11	485839mE	Elliott	14/6/05	20/6/05	6	10	60
	7834983mN	Pit	14/6/05	20/6/05	6	6	36
		Cage	-	-	-	-	-
		Funnel	14/6/05	20/6/05	6	6	36
TN12	485359mE	Elliott	14/6/05	20/6/05	6	10	60
	7833943mN	Pit	14/6/05	20/6/05	6	6	36
		Cage	14/6/05	20/6/05	6	2	12
		Funnel	14/6/05	20/6/05	6	6	36
Mound 1	485753mE 7835419mN	Elliott	18/6/05	21/6/05	3	4	12
Mound 2	485812mE 7835420mN	Elliott	18/6/05	21/6/05	3	3	9
Mound 3	485753mE 7835388mN	Elliott	18/6/05	21/6/05	3	3	9
						Elliott nights	915
						Pit nights	456
						Cage nights	104
						Funnel nights	294

*Note that two of the sites established in Phase 1 (TN04 and TN08) were not re-trapped during Phase 2. Rather, new sites (TN04A and TN08A) were established in the general vicinity but closer to the proposed centre-line of the haul road.

Twenty-nine and twenty-two avifauna censuses were conducted across 13 sites during the Phase 1 and Phase 2 surveys respectively (Table 3.6). Censuses were started as early as possible in the day (from 5:40 a.m.) and lasted until 11:30 a.m. at the latest, with the exception of one census carried out in the afternoon. Individual censuses were confined to discrete habitat types corresponding to vegetation types. The number varied due both to logistical constraints brought about by rainfall and poor road access, and the degree to which habitats were likely to yield previously unrecorded species. In addition, opportunistic records were made of species that were either not recorded during the censuses or that were uncommon.

Table 3.6: Systematic avifauna censuses undertaken at each of the fauna sites.

Site	1/10/04	2/10/04	3/10/04	4/10/04	5/10/04	15/06/05	16/06/05	17/06/05	21/06/05
TN01	06:06-06:40	09:03-09:43	10:00-10:40	-	-	-	06:05-06:35	-	05:45-06:00
TN02	07:04-07:44	08:10-08:50	09:04-09:44	-	-	-	07:35-08:05	-	07:00-07:30
TN03	07:52-08:32	07:09-07:49	08:22-09:02	-	-	-	06:48-07:18	-	06:30-06:50
TN04	09:55-10:35	05:58-06:38	05:37-06:17	-	-	-	-	-	-
TN04A	-	-	-	-	-	-	09:08-09:38	-	08:30-08:50
TN05	-	08:33-09:13	-	-	06:37-07:17	09:47-10:17	-	08:14-08:44	-
TN06	09:08-09:48	-	07:23-08:03	-	-	-	08:32-9:02	-	07:40-08:00
TN07	-	06:45-07:25	-	07:48-08:28	-	-	-	06:40-07:10	09:00-09:20
TN08	-	07:16-07:56	-	07:07-07:47	07:33-08:13	-	-	-	-
TN08A	-	-	-	-	-	-	-	07:30-08:00	-
TN09	-	09:05-09:45	-	-	09:13-09:43	06:45-07:25	-	09:18-09:48	-
TN10	-	10:50-11:30	-	09:43-10:23	-	09:00-09:30	-	-	-
TN11	-	-	07:58-08:38	08:52-09:32	-	07:39-08:09	-	-	-
TN12	-	-	06:25-07:05	-	09:53-10:33	08:21-08:51	-	10:07-10:37	-
TN15	-	-	-	-	-	-	-	13:30-14:00	-

3.5 Bats

Bats were sampled by recording echolocation calls only. A comprehensive survey of bats, which would include trapping to determine the presence of bats not readily recorded by microphones, was not undertaken during this survey.

Echolocation calls were recorded with an Anabat II bat detector, which detects and transforms the ultrasonic echolocation that bats emit whilst foraging. On all occasions a delay switch was connected to the detector to maximise the time that calls could be collected. The calls were stored on a compact flash card after being processed by an Anabat CF ZCAIM.

Sampling was undertaken on two nights (30/09/04 and 01/10/04) at two sites (TN02 and TN04). Two surveyors arrived on site before dark and placed Anabat detectors and the linked time delay units at two specific locations that appeared suitable for bat foraging and commuting. These locations were the grid trapping areas TN02 (485351 mE, 7800754 mN) and TN04 (484092 mE, 7804316 mN) surveyed for vertebrate fauna as part of the overall fauna survey work. These were *Triodia* hillslope and minor drainage line sites respectively. The habitat within these areas is described in more detail in Table 3.7.

One unit was situated at each location for the duration of the night on the 30/09/04 and 01/10/04. The units were retrieved at first light whilst undertaking fauna trap emptying activities. Information from these units was later downloaded to a personal computer for analysis using the associated Analook software.

Calls were visualised on Analook 4.3f software. Identifications were made by comparing values of minimum frequency (measured directly from Analook) with those in Fullard et al. (1991), Bullen and McKenzie (2002) and Bullen (2003). Only sequences containing good quality search phase calls were considered for identification.

3.5.1 Invertebrate Sampling

Targeted invertebrate groups were sampled through opportunistic and systematic collections during the survey. Prior to field work, WA Museum staff were consulted to confirm invertebrate groups of interest and to identify any specific curation methods (eg. the preservation of Wolf Spiders for DNA analyses).

- Invertebrate groups targeted during the survey included:
- Araneae (Spiders, in particular Trapdoor and Wolf Spiders);
- Pseudoscorpionida (Pseudoscorpions);
- Scorpionida (Scorpions);
- Diplopoda (Millipedes); and
- Pulmonata (Land Snails)

Trapdoor and Wolf Spiders were preserved in 70% ethanol, with one or two legs removed and placed in 100% ethanol for future molecular studies.

Hand foraging was undertaken for pseudoscorpions, involving peeling bark and lifting rocks. The latter technique was also used to search for scorpions, with additional specimens collected from pit traps. The remaining two groups (millipedes and land snails) were searched for whilst raking leaf litter and other debris. Representatives of other invertebrates from pit traps were also collected, placed in 70% ethanol and lodged with the WA Museum.

3.5.2 Non-systematic Sampling

A range of non-systematic fauna survey activities was undertaken by the survey team to supplement the trapping and investigate additional habitats identified during the course of the survey. These included:

- habitat specific searches for Schedule and Priority listed fauna species;
- searching (including head-torching) of microhabitats for reptile, frog and small mammal species;
- opportunistic sightings and records;
- identification of road kills and other animal remains; and
- recording and identification of secondary signs (where possible) including tracks, scats and diggings.

3.6 Vegetation Types and Fauna Habitat Classification at each Survey Site

Six primary habitats were identified within the project area. These were largely based on vegetation structure and soil types as depicted in Table 3.7. Photographs of each trapping site are presented in Plate 3.1 to Plate 3.12.

Table 3.7: Habitat, vegetation and soil descriptions for each of the sites within the Western Tanami project area.

Site	Vegetation Description	Soils Description
	Triodia hillslope	
TN02	Scattered *Eucalyptus* over mixed Acacia low shrubland/*Triodia* hummock grassland	Laterite gravelly sandy loam
TN07	Relatively open ground layer of *Triodia* with an open overstorey of *Acacia*	Pale brown clayey loam with much calcrete in the profile
TN11	Ground layer of *Triodia* with an open overstorey of eucalypts, primarily in the minor drainage lines	Red-brown loam with numerous small rocks on the surface and in the profile
	Triodia sandplain	
TN03	Dense but patchy *Acacia* and *Grevillea* over a *Triodia* hummock grassland	Red-brown loamy sand
TN06	Recently burnt site with a ground layer dominated by tussock grasses and a midstorey of *Acacia* and *Grevillea* (mostly dead) and a very scattered overstorey of eucalypts	Red-brown loamy sand
	Triodia flat	
TN05	Dense ground layer of *Triodia* interspersed with scattered large termite mounds and essentially no overstorey	Dark brown loamy clay
TN09	Open overstorey of scattered eucalypts with a midstorey of *Acacia* and an open ground layer of *Triodia*	Red-brown loamy sand
TN10	Relatively dense ground layer of *Triodia* with an open midstorey of *Acacia* and *Grevillea* and a very open overstorey of eucalypts	Red-brown sandy loam
	Triodia dune	
TN08	Scattered *Acacia* and *Grevillea* over a dense ground layer of *Triodia* and herbs which became more open on the dune crest	Red-brown sand
	Savanna	
TN01	Open *Eucalyptus* woodland over open *Acacia* over *Triodia* and grasses in unburnt/disturbed areas	Red-brown clayey loam
	Minor drainage line	
TN04	Scattered eucalypts over *Melaleuca*, *Acacia* and *Grevillea* over a relatively dense ground layer of *Triodia longiceps*	Red-brown loamy sand
TN12	Dense thicket of *Acacia* along a drainage line. There were occasional scattered eucalypts in the overstorey and the ground layer was sparse and consisted primarily of *Triodia*	Red-brown sandy loam

3.7 Survey Limitations

Sampling was targeted around the mine areas and the nominal centreline of the proposed haul road as indicated by Tanami Gold NL at the time of survey.

Parts of the proposed haul road were remote from access tracks that would have permitted regular checking of fauna traps. Though the entire haul road was traversed by vehicle, remote areas were not systematically trapped.

Systematic fauna sampling, the primary component of the study, was completed on the basis of trapping grid installation in habitats considered to be representative of the range of units present within the study area. Not all sections of the study area were therefore ground-truthed or equally sampled for fauna.

The frequent threat of rain meant that bat detectors could be deployed on only a few nights. This meant that some bat species could have been missed.

Terrestrial invertebrate sampling was targeted at specific groups, and was otherwise largely opportunistic. As the WA Museum is currently undergoing relocation, it was not possible to complete identifications of the collected invertebrates in the timeframe for finalising this report.


Plate 3.1: Fauna Site TN01.


Plate 3.2: Fauna Site TN02.


Plate 3.3: Fauna Site TN03.


Plate 3.4: Fauna Site TN04.


Plate 3.5: Fauna Site TN05.


Plate 3.6: Fauna Site TN06.


Plate 3.7: Fauna Site TN07.


Plate 3.8: Fauna Site TN08.

Plate 3.9: Fauna Site TN09.

Plate 3.10: Fauna Site TN10.

Plate 3.11: Fauna Site TN11.

Plate 3.12: Fauna Site TN12.

4.0 Vertebrate Fauna Inventory Survey

4.1 Background

The survey of the Western Tanami project area recorded a total of 123 vertebrate species. Table 4.1 provides a summary of the number of species recorded from each major vertebrate group during the survey.

Table 4.1: Number of species recorded from the Western Tanami project area.

Fauna Group		Total
Avifauna		58
Introduced mammals		4
Native mammals		14*
Bats		2
Reptiles		44
Amphibians		1
	Total	123*

* Note that this number includes the record of *Pseudomys ?laborifex;* the identification of this species is currently pending, and it may prove to be *P. hermannsburgensis*, reducing the tally by one species.

4.2 Birds

4.2.1 Assemblage

A total of 58 avifauna species was recorded across both phases of the Coyote/Bald Hill survey (Table 4.2 and Table 4.3). This total comprised 27 families and included 21 non-passerine and 37 passerine species (Table 4.2 and Table 4.3). This tally compares with the 152 species recorded from the Tanami Region in the Northern Territory (Gibson 1986).

The assemblage varied between the two survey phases, with 702 records across 44 species during Phase 1 and 207 records across 49 species during Phase 2. Differences in total abundances reflecting in part the disparate sampling efforts (29 censuses versus 22 censuses) but also the wet/windy and overcast conditions experienced over several days during Phase 2. Thirty-five species (60% of the total assemblage) were common to both phases.

During Phase 1 the most abundant and widespread species was the Grey-headed Honeyeater, with 196 records representing 27.9% of all avifauna records for the survey. The next most abundant species was the Zebra Finch, with 105 records representing 14.9% of all records. The most speciose group of birds was the honeyeaters (Meliphagidae), with eight species representing 18% of all species recorded for the survey. The richest habitats were the minor drainage line at TN04 (18 species), the savanna at TN01 (17 species), and the *Triodia* flat at TN10 (15 species). The sites poorest in species were the *Triodia* flat at TN05 and the *Triodia* dune at TN08, both with only eight species recorded.

During Phase 2 the Grey-headed Honeyeater was again the most commonly recorded species, with 35 records representing 16.9% of all avifauna records for the survey. The next two most abundant species were also honeyeaters; the Singing Honeyeater (23 records) and the Spiny-cheeked Honeyeater (13 records). The large expanses of flowering *Grevillea wickhamii* probably contributed to the numerical dominance of honeyeaters during Phase 2. Similarly, with 10 species (20% of all species recorded) the Meliphagidae was also the most speciose avifauna family.

4.2.2 Discussion

Overview
The two phase survey recorded 58 species of avifauna, compared with 43 species recorded during an earlier site inspection (MBS Environmental 2004). When both datasets are combined, a total of 66 species have been recorded from the Western Tanami project area.

The number of species common to all three surveys (27) is 40.9% of the total and reflects the nomadic, irruptive and migratory status of many of the species occurring or potentially occurring in the project area (eg. the Rainbow Bee-eater, Pied Honeyeater, Red-capped Robin etc).

Of particular note are the sightings of Striated Pardalote and Golden-headed Cisticola. Although neither species is considered to be of conservation significance, the Striated Pardalote records represent a southerly range extension of the northern race *melanocephalus*. Other subspecies are found to the south and east of the study area in other parts of the arid zone and southern Australia. The Golden-headed Cisticola sighting similarly represents a southerly range extension of this Kimberley species. Also of interest are the records of Red-capped Robins which are known to winter in the north-east interior and Kimberley region of Western Australia (Johnstone and Storr 2004).

The most comprehensive regional survey of the Tanami Desert was undertaken by Gibson (1986) within the Northern Territory. Gibson (1986) recorded a total of 152 species from the Tanami Desert study area, including all those recorded by the current survey.

Regional Endemism and Restricted Taxa
Schodde and Mason (1999) discuss proposed historic geographic boundaries that have initiated ultrataxa (ie. subspecies) differentiation in Australian perching birds. The Tanami bioregion is geographically distant from any boundaries and, as a result, no taxa or ultrataxa are confined to this bioregion.

Conservation Significant Taxa
Two species of conservation significance were recorded from the Western Tanami project area; the Australian Bustard *Ardeotis australis* and Major Mitchell's Cockatoo *Cacatua leadbeateri*. A total of 17 Australian Bustards were seen in a variety of habitats (Table 4.2 and Table 4.3), and three Major Mitchell's Cockatoos were seen on a *Triodia* flat (TN09) and savanna (TN01). Although these were the only species of conservation significance recorded, several other species may occur (see Section 6.1).

Whilst it is acknowledged that the species highlighted above are of elevated conservation significance, it is noted that the threatening processes identified for these species are of less concern in the Tanami region (Mr Ron Johnstone, WA Museum, pers comm. August 2005). Specifically, extensive land clearing of woodlands in the WA Agricultural zone (replacement with cereal monoculture) and other parts of the south-west has been implicated in the decline of the Major Mitchell's Cockatoo in that region (Higgins 1999), whilst the relative abundance of foxes in combination with land clearing in the south west has been implicated in the decline of the Australian Bustard in that region. In contrast, populations of both species in the Kimberley region, including the section of the Tanami Desert investigated by the recent surveys, are not deemed Threatened.

Table 4.2: Avifauna recorded from the Western Tanami project area during surveys in 2004 and 2005 (Sites TN01 – TN08A).

Family	TN01		TN02		TN03		TN04		TN04A		TN05		TN06		TN07		TN08		TN08A	
Common Name - Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Casuariidae																				
Emu - *Dromaius novaehollandiae*														2						
Accipitridae																				
Black-shouldered Kite - *Elanus caeruleus*											1									
Wedge-tailed Eagle - *Aquila audax*																				
Spotted Harrier - *Circus assimilis*																				
Falconidae																				
Brown Falcon - *Falco berigora*	3		1										1	1		1				
Australian Kestrel - *Falco cenchroides*						1							1							
Australian Hobby - *Falco longipennis*																				
Otididae																				
Australian Bustard - *Ardeotis australis*			2	2	1					1	1	1			1	2				1
Turnicidae																				
Little Button-quail - *Turnix velox*													2							
Charadriidae																				
Oriental Plover - *Charadrius veredus*																				
Columbidae																				
Crested Pigeon - *Ocyphaps lophotes*	1	3											1		1					
Spinifex Pigeon - *Geophaps plumifera*																	2			
Diamond Dove - *Geopelia cuneata*																				
Psittacidae																				
Little Corella - *Cacatua sanguinea*																				
Major Mitchell's Cockatoo - *Cacatua leadbeateri*		1																		
Cockatiel - *Nymphicus hollandicus*																				
Australian Ringneck - *Platycercus zonarius*	6																			
Budgerigar - *Melopsittacus undulatus*		2								1										
Cuculidae																				
Horsfield's Bronze Cuckoo - *Chrysococcyx basalis*															1	2	3			
Strigidae																				
Boobook Owl - *Ninox novaeseelandiae*																				
Alcedinidae																				
Red-backed Kingfisher - *Todiramphus pyrrhopygia*	2																			
Maluridae																				
Variegated Fairy-wren - *Malurus lamberti*					18		4					2	4	2						
White-winged Fairy-wren - *Malurus leucopterus*			1	1	4	2					6	3	4	1	3					
Rufous-crowned Emu-wren - *Stipiturus ruficeps*											3				2		6			1
Pardalotidae																				
Red-browed Pardalote - *Pardalotus rubricatus*	4						1													
Striated Pardalote - *Pardalotus striatus*	2		1				1													
Acanthizidae																				
Broad-tailed Thornbill - *Acanthiza apicalis*														1						

Table 4.2: continued.

Family	TN01		TN02		TN03		TN04		TN04A		TN05		TN06		TN07		TN08		TN08A	
Common Name - Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Meliphagidae																				
Brown Honeyeater - *Lichmera indistincta*							12									2	7			
Black Honeyeater - *Certhionyx niger*							1													
Singing Honeyeater - *Lichenostomus virescens*		1	2	7	7	6	4				2		2	3	10	2	21			3
Grey-headed Honeyeater - *Lichenostomus keartlandi*	18		20	13	17	11	50			1			12	3	3		18			
White-plumed Honeyeater - *Lichenostomus penicillatus*	4																			
Black-chinned Honeyeater - *Melithreptus gularis*	2	1	2				7						3	1	2	1	3			
White-fronted Honeyeater - *Phylidonyris albifrons*				2																
Yellow-throated Miner - *Manorina flavigula*	12	1	2	3			2			1				1						
Spiny-cheeked Honeyeater - *Acanthagenys rufogularis*				9			2									1				1
Crimson Chat - *Epthianura tricolor*						1														
Petroicidae																				
Red-capped Robin - *Petroica goodenovii*																				
Hooded Robin - *Petroica cucullata*																				
Pachycephalidae																				
Crested Bellbird - *Oreoica gutturalis*	2						2				1				2	4	2			
Rufous Whistler - *Pachycephala rufiventris*							2			1						1				
Grey Shrike-thrush - *Colluricincla harmonica*	1				1		2													
Dicruridae																				
Willie Wagtail - *Rhipidura leucophrys*					3															1
Magpie-lark - *Grallina cyanoleuca*	2																			
Campephagidae																				
Black-faced Cuckoo-shrike - *Coracina novaehollandiae*																				
White-winged Triller - *Lalage tricolor*							8						1		1					
Artamidae																				
Black-faced Woodswallow - *Artamus cinereus*	3		15	3	8	2	9			1	2		6	1						
Little Woodswallow - *Artamus minor*																				
Cracticidae																				
Pied Butcherbird - *Cracticus nigrogularis*	3					1	1													
Corvidae																				
Little Crow - *Corvus bennetti*					1					1										
Sylviidae																				
Spinifex-bird - *Eremiornis carteri*					2															
Rufous Songlark - *Cincloramphus mathewsi*	2																			
Brown Songlark - *Cincloramphus cruralis*																				
Golden-headed Cisticola - *Cisticola exilis*											1			3						
Alaudidae																				
Singing Bushlark - *Mirafra javanica*		2	3									3	1	2						
Dicaeidae																				
Mistletoebird - *Dicaeum hirundinaceum*	4	1					1								1					
Estrildidae																				
Zebra Finch - *Taeniopygia guttata*							1			2		6								

Table 4.2: continued.

Family	TN01		TN02		TN03		TN04		TN04A		TN05		TN06		TN07		TN08		TN08A	
Common Name - Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Motacillidae																				
Australian Pipit - *Anthus australis*														1						
Abundance	71	12	49	40	62	24	110	0	0	9	17	15	38	22	27	16	62	0	0	7
Species Richness	17	8	10	8	10	7	18	0	0	8	8	5	12	13	11	9	8	0	0	5

Table 4.3: Avifauna recorded from the Western Tanami Project Area during surveys in 2004 and 2005 (remaining sites).

Family	TN09		TN10		TN11		TN12		TN15		Coyote Camp		Bald Hill		Opp		Total	
Common Name - Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Casuariidae																		
Emu - *Dromaius novaehollandiae*																		2
Accipitridae																		
Black-shouldered Kite - *Elanus caeruleus*				1													1	1
Wedge-tailed Eagle - *Aquila audax*																1		1
Spotted Harrier - *Circus assimilis*										1								1
Falconidae																		
Brown Falcon - *Falco berigora*	1				2					1							8	3
Australian Kestrel - *Falco cenchroides*																	1	1
Australian Hobby - *Falco longipennis*												1						1
Otididae																		
Australian Bustard - *Ardeotis australis*		1				1		1								2	5	12
Turnicidae																		
Little Button-quail - *Turnix velox*																	2	
Charadriidae																		
Oriental Plover - *Charadrius veredus*															2		2	
Columbidae																		
Crested Pigeon - *Ocyphaps lophotes*												1					3	4
Spinifex Pigeon - *Geophaps plumifera*																	2	
Diamond Dove - *Geopelia cuneata*					1							1					1	1
Psittacidae																		
Little Corella - *Cacatua sanguinea*					2												2	
Major Mitchell's Cockatoo - *Cacatua leadbeateri*	2																2	1
Cockatiel - *Nymphicus hollandicus*																1		1
Australian Ringneck - *Platycercus zonarius*														1			6	1
Budgerigar - *Melopsittacus undulatus*																		3
Cuculidae																		
Horsfield's Bronze Cuckoo - *Chrysococcyx basalis*																	4	2
Strigidae																		
Boobook Owl - *Ninox novaeseelandiae*								2										2
Alcedinidae																		
Red-backed Kingfisher - *Todiramphus pyrrhopygia*		1															2	1

Table 4.3: continued.

Family	TN09		TN10		TN11		TN12		TN15		Coyote Camp		Bald Hill		Opp		Total	
Common Name - Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Maluridae																		
Variegated Fairy-wren - *Malurus lamberti*			3				15	1									44	5
White-winged Fairy-wren - *Malurus leucopterus*		2	7													1	25	10
Rufous-crowned Emu-wren - *Stipiturus ruficeps*			3		1												15	1
Pardalotidae																		
Red-browed Pardalote - *Pardalotus rubricatus*	1		1				1										8	
Striated Pardalote - *Pardalotus striatus*																	4	
Acanthizidae																		
Broad-tailed Thornbill - *Acanthiza apicalis*																		1
Meliphagidae																		
Brown Honeyeater - *Lichmera indistincta*			2		1		2										24	2
Black Honeyeater - *Certhionyx niger*	1									1							2	1
Singing Honeyeater - *Lichenostomus virescens*										1							48	23
Grey-headed Honeyeater - *Lichenostomus keartlandi*	18	2	25		10		5			5							196	35
White-plumed Honeyeater - *Lichenostomus penicillatus*												1					4	1
Black-chinned Honeyeater - *Melithreptus gularis*			5		1							1					25	4
White-fronted Honeyeater - *Phylidonyris albifrons*																		2
Yellow-throated Miner - *Manorina flavigula*	1		2														19	6
Spiny-cheeked Honeyeater - *Acanthagenys rufogularis*							3			2							5	13
Crimson Chat - *Epthianura tricolor*										2								3
Petroicidae																		
Red-capped Robin - *Petroica goodenovii*								3										3
Hooded Robin - *Petroica cucullata*		1																1
Pachycephalidae																		
Crested Bellbird - *Oreoica gutturalis*			2														11	4
Rufous Whistler - *Pachycephala rufiventris*								2									2	4
Grey Shrike-thrush - *Colluricincla harmonica*			2		1		2	1									9	1
Dicruridae																		
Willie Wagtail - *Rhipidura leucophrys*					1					1							4	2
Magpie-lark - *Grallina cyanoleuca*												1		1			2	2
Campephagidae																		
Black-faced Cuckoo-shrike - *Coracina novaehollandiae*	1				2												3	
White-winged Triller - *Lalage tricolor*																	10	
Artamidae																		
Black-faced Woodswallow - *Artamus cinereus*	8	2	11	1	1							1					63	11
Little Woodswallow - *Artamus minor*			2				2										4	
Cracticidae																		
Pied Butcherbird - *Cracticus nigrogularis*			1	2	1	1		1									6	5
Corvidae																		
Little Crow - *Corvus bennetti*						1											1	2

Table 4.3: continued.

Family	TN09		TN10		TN11		TN12		TN15		Coyote Camp		Bald Hill		Opp		Total	
Common Name - Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Sylviidae																		
Spinifex-bird - *Eremiornis carteri*		1					4										6	1
Rufous Songlark - *Cincloramphus mathewsi*														1			2	1
Brown Songlark - *Cincloramphus cruralis*																1		1
Golden-headed Cisticola - *Cisticola exilis*																	1	3
Alaudidae																		
Singing Bushlark - *Mirafra javanica*			1														5	7
Dicaeidae																		
Mistletoebird - *Dicaeum hirundinaceum*	1																7	1
Estrildidae																		
Zebra Finch - *Taeniopygia guttata*			19	1	43	1	42	1		1	1						106	12
Motacillidae																		
Australian Pipit - *Anthus australis*																		1
Abundance	34	10	86	5	67	4	76	12	0	15	1	7	0	3	2	6	702	207
Species Richness	9	7	15	4	13	4	9	8	0	9	1	7	0	3	1	5	44	49

4.3 Mammals

4.3.1 Assemblage

The survey recorded 14 native and four introduced species of mammals, comprising five dasyurids (carnivorous marsupials), one thylacomyid (bilbies), two macropods[3] (kangaroos and wallabies), six native and one introduced murid rodents (mice), one canid (dogs), one felid (cats) and one camelid (camels).

4.3.2 Discussion

The tally of 14 native and four introduced species of mammals included two species, *Pseudomys laborifex* (though see below) and *P. nanus*, for which the records extended southwards the documented distribution for these species in Western Australia (FaunaBase; Strahan 1995). The range extension for *P. laborifex* appears quite substantial when current distribution maps are reviewed (Strahan 1995), as these suggest that this taxon is confined to the Northern Kimberley. However, there is an undated or pre-1850 record for an area just to the north of the Tanami Desert on the WA Museum's FaunaBase. This species is poorly represented in the museums of Australia, with only 42 specimens lodged. In contrast, *Pseudomys nanus* is represented by more than 430 specimens in collections across Australia.

The study area lies close to the southern extent of the tropical zone of northern Australia. This is reflected in the mammal assemblage, with some species (eg. *Pseudomys laborifex* and *P. nanus*) displaying a mostly tropical distribution, and others (such as *Ningaui ridei*, *Dasycercus cristicauda*, *Notomys alexis* and *Pseudomys hermannsburgensis*) displaying a predominantly arid zone distribution.

It should be noted that Biota is waiting on final confirmation of the identity of several *Pseudomys* spp. lodged with the WA Museum. These include, an unidentified pebble-mound building species that appears closely related to *P. chapmani* (Mr Roy Teale, Biota, pers. obs.), several possible *P. laborifex* specimens, and several probable *P. hermannsburgensis*. Comparisons of skull morphology suggest that the mound-builder is *P. calabyi* (Ms Norah Cooper, WA Museum, pers comm. 2005), previously only known from the Northern Territory. Historically all mound-builders in the Kimberley region have been called *P. laborifex*, though this now seems in doubt (Ms. Norah Cooper, pers comm. 2005). Based on skull morphology alone, it appears as though several *P. calabyi* specimens have been recorded from the Kimberley Region of Western Australia, with a known distribution that extends from Argyle in the north to Bald Hill in the south. The skull morphology of the possible *P. laborifex* suggests that they are in fact *P. hermannsburgensis* (Ms Norah Cooper, WA Museum, pers. comm. 2005), despite obvious pelage differences (Mr Roy Teale, Biota, pers. obs.). It is anticipated that current molecular studies at the South Australian Museum will help resolve these taxonomic uncertainties.

Gibson recorded a total of 34 mammals for the Tanami region of the Northern Territory but does not mention *P. laborifex* or *P. calabyi*.

Regional Endemism and Restricted Taxa
None of the mammal species recorded during the current survey are considered endemic to the Tanami desert, nor to the State, though *Pseudomys laborifex*[4] is nearly so.

Unresolved Species Complexes
Sminthopsis macroura is a widespread species across arid WA and according to Ms Norah Cooper (WA Museum, pers. comm. 2004) may be a species complex of at least two taxa and possibly three, although this work is unresolved.

[3] Mr Ric Southgate recorded tracks which he considered most likely to be the Spectacled Hare-wallaby *Lagorchestes conspicillatus*.

[4] There is some indication that *Pseudomys laborifex* and *P. johnstonei* may be synonymised.

Pseudomys hermannsburgensis also appears to comprise a species complex (Mr Roy Teale, Biota, pers. obs.). Mr Mark Cowan (CALM Kalgoorlie, pers. comm. 2005) also suspects two taxa at several of his study sites in the Goldfields region of Western Australia.

Pebble-mound building *Pseudomys* collected during the second phase were tentatively identified as having affinities with *P. chapmani* and as being distinct from *P. laborifex*. As noted above, resolution of the specimens collected from the Western Tanami Project is being undertaken as a collaboration between the Western Australian Museum and South Australian Museum.

Conservation Significant Taxa
Three mammal species of conservation significance were recorded in the project area during the surveys. These were the Mulgara *Dasycercus cristicauda*, Bilby *Macrotis lagotis* and Spectacled Hare-wallaby *Lagorchestes conspicillatus*.

The Bilby is listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003.* The former range of the Bilby included most of the semi-arid areas of mainland Australia, however it is now confined to *Triodia* hummock grassland and *Acacia* scrub across parts of northern Australia (see Section 6.1).

The Mulgara is also listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003.* This species apparently prefers mature spinifex (*Triodia* spp.) associations on sandy substrates (see Section 6.1).

The Spectacled Hare-wallaby *Lagorchestes conspicillatus* (Priority 3 listed) has been recorded in the area from a roadkill in 2003 on the Tanami Road near the Balgo Hills community and from tracks during the Phase 2 survey (Mr Ric Southgate, pers. comm.). Sightings of small wallabies in the area have been attributed to the Spectacled Hare-wallaby, as a number of targeted surveys have failed to turn up any more populations of the Rufous Hare-wallaby in the Tanami region.

The conservation status of the unresolved mound-building *Pseudomys* is difficult to determine in the absence of the results from the South Australian Museum's molecular studies. However, on the basis of skull morphology it appears as though the specimens represent the Arnhem Land Pebble-mound Mouse *Pseudomys calabyi*. Though not previously recorded in WA this species occurs in the Northern Territory, where it is listed as Near Threatened. In Western Australia, recently lodged specimens that also appear to be *P. calabyi* have come from near Kununurra (Ms Norah Cooper, WA Museum, pers. comm. 2005).

4.3.3 Bats

Results
Over the two nights on which the Anabat units were deployed, bat calls were recorded from one Anabat unit at the grid site TN02. Three calls were recorded on the evening of 30/09/04 and the early morning of 01/10/04. In all cases, the calls were recorded within an area of scattered *Eucalyptus* over mixed *Acacia* low shrubland/*Triodia* hummock grassland.

Two species were identified, the first being Gould's Wattled Bat *Chalinolobus gouldii* and the second a Long-eared Bat *Nyctophilus* sp., probably the Lesser Long-eared Bat *Nyctophilus geoffroyi*. The call signatures are presented as Figure 4.1 and Figure 4.2.

Discussion
The activity recorded is considered in proportion with that of open sand plains, as these provide limited regional roosting, foraging habitat and water. In addition, the weather during the duration of the field survey was unsettled, with some rain and wind and consistent high temperatures.

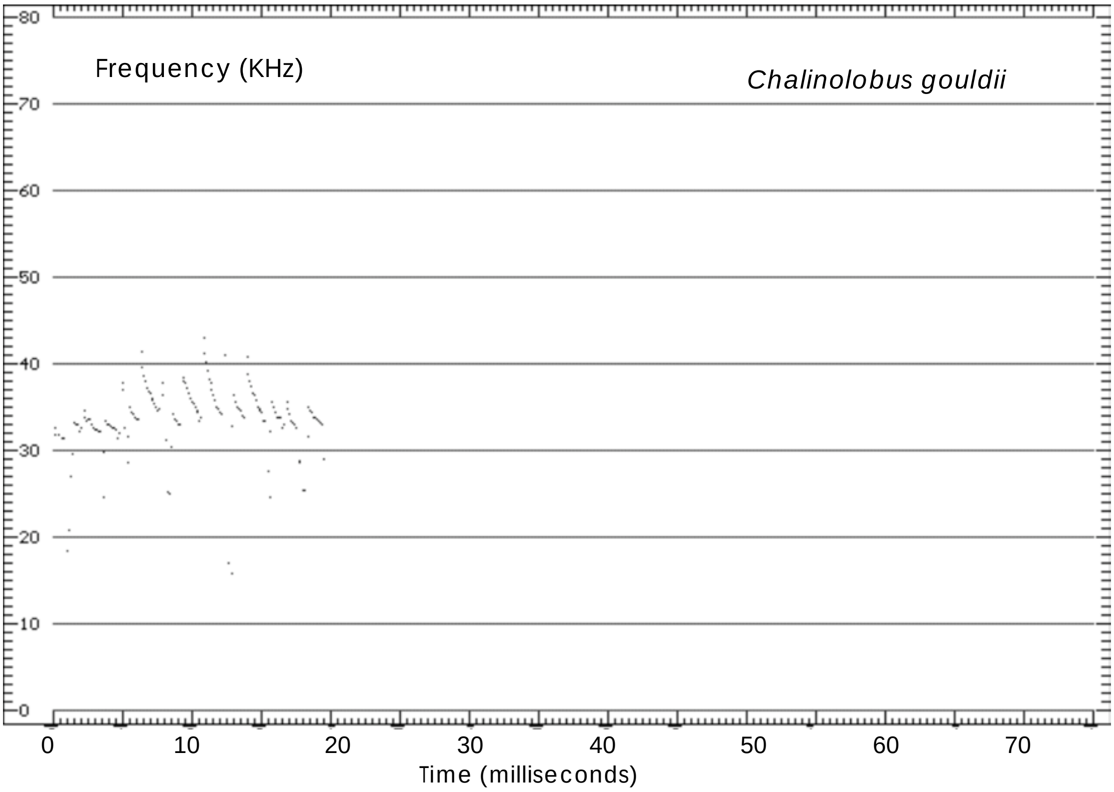

Figure 4.1: Search mode call of Gould's Wattled Bat *Chalinolobus gouldii*. (Recorded at GPS bearing 485351mE, 7800754mN on 30/09/04 at 22.21 hrs.)

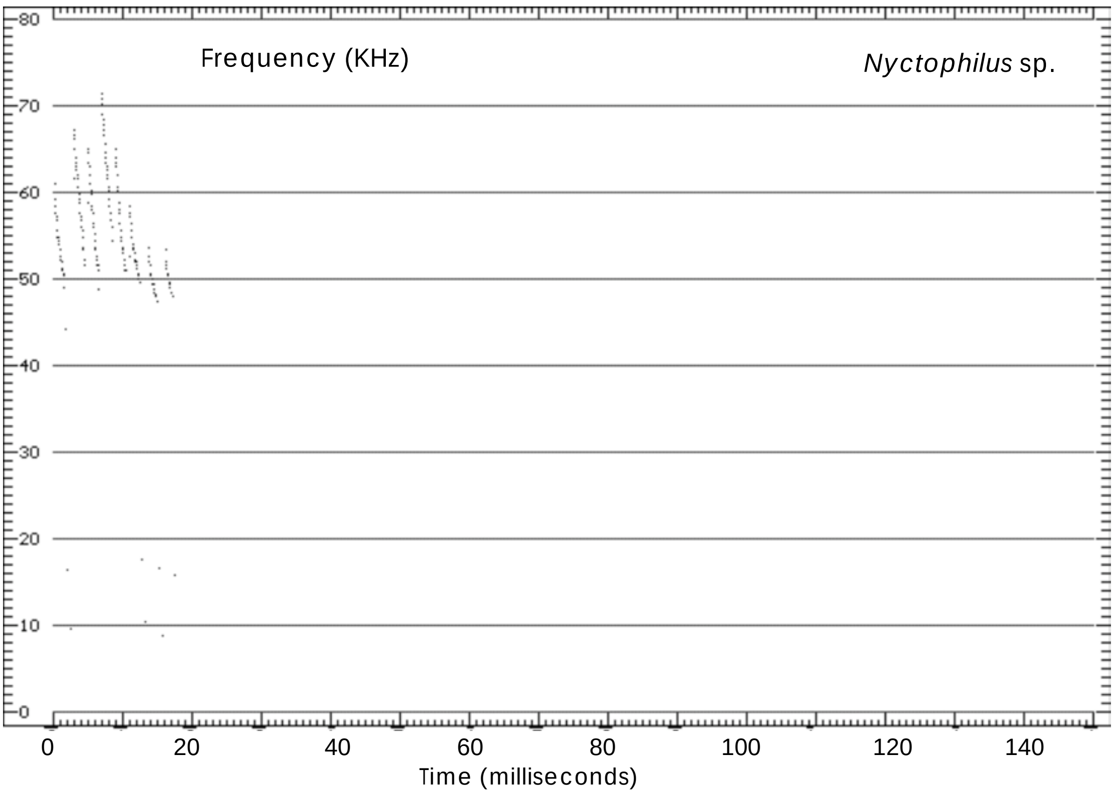

Figure 4.2: Call sequence of a Long-eared Bat, probably the Lesser Long-eared Bat *Nyctophilus geoffroyi*. (Recorded at GPS bearing 485351mE, 7800754mN, on 30/09/04 at 21.41 hrs.)

Table 4.4: Mammals recorded from the Western Tanami project area during the 2004 and 2005 surveys (sites TN01 – TN07).

Family	TN01		TN02		TN03		TN04		TN04A		TN05		TN06		TN07	
Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Dasyuridae																
Ningaui ridei	1	1														
Sminthopsis macroura											1					
Sminthopsis youngsoni					1		1			1	1	2		1	6	2
Dasycercus cristicauda				1		1						1				
Pseudantechinus sp												1				
Thylacomyidae																
Macrotis lagotis				1	1	1										
Macropodidae																
Macropus rufus													1	2		
Lagorchestes conspicillatus																
Muridae																
Mus musculus	4	3	1				2				1		3	2		
Notomys alexis			1		4								3			
Pseudomys desertor	3	4			3	2				3		3				
Pseudomys hermannsburgensis	2	2	6	2	1	1	1				2	1		2	2	5
Pseudomys nanus	1											1				
Pseudomys ?laborifex	1	1	2		1					1				1		
Pseudomys aff. *chapmani*																
Canidae																
Canis lupus dingo	1	1				1				1				1		
Felidae																
Felis catus	1	1				1										
Camelidae																
Camelus dromedarius			1		2	1	1			1	1	2		1	1	2

Table 4.5: Mammals recorded from the Western Tanami project area during the 2004 and 2005 surveys (remaining sites).

Family	TN08		TN08A		TN09		TN10		TN11		TN12		Opportunistic		Total	
Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Dasyuridae																
Ningaui ridei	1														2	1
Sminthopsis macroura															1	0
Sminthopsis youngsoni	1			1		2		1		1	1				11	11
Dasycercus cristicauda				2									26		26	5
Pseudantechinus sp															0	1
Thylacomyidae																
Macrotis lagotis						2									1	4
Macropodidae																
Macropus rufus															1	2
Lagorchestes conspicillatus														1	0	1
Muridae																
Mus musculus										1		2		1	11	9
Notomys alexis				1									2		10	1
Pseudomys desertor	3					1			1						10	13
Pseudomys hermannsburgensis				1	2	1		3				3	1		17	21
Pseudomys nanus												1			1	2
Pseudomys ?laborifex													1		5	3
Pseudomys aff. *chapmani*										1				1	0	2
Canidae																
Canis lupus dingo						1		1		1		2			1	9
Felidae																
Felis catus				1		1		1		1	1	1			2	7
Camelidae																
Camelus dromedarius								1	1	1		1			7	10

4.4 Herpetofauna

4.4.1 Species Assemblage

One frog and 44 reptile species were recorded from the trapping sites established during the Western Tanami surveys (see Table 4.6 and Table 4.7). These comprised one myobatrachid frog (Australasian ground frogs), nine gekkonids (geckos), three pygopodids (legless lizards), six agamids (dragons), 16 scincids (skinks), five varanids (goannas), two typhlopids (blind snakes) and three elapids (front-fanged snakes). Specimens lodged with the WA Museum have been assigned R numbers and are tabulated in Appendix 6.

The most abundant group encountered during Phase 1 were the Scincidae, with 142 records comprising 36.5% of all the herpetofauna records for the survey. The most common species was *Lerista bipes*, with 69 occurrences comprising 17.7% of all records. During Phase 2, the Scincidae were again the most commonly trapped group, with 47 records comprising 45.2% of all herpetofauna records. *Notaden nichollsi* was the most frequently trapped species, with 19 records reflecting the unseasonal rainfall recorded during Phase 2.

4.4.2 Discussion

The survey recorded 45 species of herpetofauna from the study area, which is less than half the number yielded from the FaunaBase search. Clearly there are many additional species still unrecorded by the two surveys that could potentially occur in the study area, however few are of elevated conservation significance (see Section 6.1). Gibson (1986) recorded 70 reptile species from the Tanami region in the Northern Territory, and included the majority of species recorded by the survey of the Western Tanami Project Area with the exception of *Carlia munda* and *Brachyurophis roperi* (see also Horner 1991).

Regional Endemism and Restricted Taxa
One species, *Ctenotus tanamiensis*, is considered endemic to the Tanami Desert.

Range Extension
This work extended the known distribution of five herpetofauna taxa in this State, including *Pogona minor* (Figure 4.3) (subspecies to be confirmed by the WA Museum), *Carlia munda*, *Ctenotus schomburgkii*, *Lerista greeri* and *Brachyurophis roperi* (Figure 4.4); this is rarely achieved elsewhere in the State. The range extension for *Pogona minor* was particularly significant, as the species had never been recorded near the area previously.

The survey also collected only the second *Ctenotus tanamiensis* to be lodged in the Western Australian Museum's collection, as well as contributing important specimens of *Diplodactylus stenodactylus* and *Eremiascincus* sp. to current taxonomic revisions.

The findings above reflect the paucity of previous survey effort in this region of the State, an observation supported by Cowan and How (submitted).

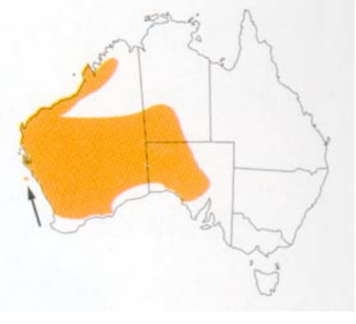

Figure 4.3: Distribution of *Pogona minor* (from Wilson and Swan 2003).

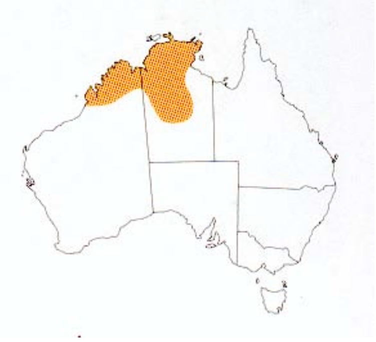

Figure 4.4: Distribution of *Brachyurophis roperi* (from Wilson and Swan 2003).

Unresolved Species Complexes

Diplodactylus stenodactylus is recognised as a species complex, with a number of new taxa recognised (Mr Laurie Smith, WA Museum, pers. comm. 2004). Other taxa belonging to known species complexes recorded during the current survey include *Heteronotia binoei* (Aplin and Smith 2001), *Eremiascincus* sp., *Ctenotus schomburgkii* (Aplin et al. submitted; Mr Paul Doughty, WA Museum, pers. comm. 2005), *Menetia greyii* (Aplin and Smith 2001; Aplin et al. submitted) and *Lerista bipes*. The *Eremiascincus* sp. recorded within the study area could not be assigned to either of the two currently described taxa. In addition, there is strong evidence to suggest that *Moloch horridus* may comprise two species (Aplin et al. submitted).

It is difficult to comment on the conservation status of the Tanami forms of these taxa while their taxonomic status remains unresolved.

Table 4.6: Herpetofauna recorded from the Western Tanami project area during the 2004 and 2005 surveys (sites TN01 – TN06).

Family	Opp		TN01		TN02		TN03		TN04	TN04A	TN05		TN06	
Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Myobatrachidae														
Notaden nichollsi	1										1			
Gekkonidae														
Diplodactylus conspicillatus	2						2	2	1					
Diplodactylus stenodactylus	1	1	6		5		1		6				7	
Gehyra purpurascens	1													
Gehyra variegata	2		1							2				
Heteronotia binoei			1											
Nephrurus levis levis	1													
Rhynchoedura ornata	1					1								
Strophurus ciliaris ciliaris	7			1	2		3		1			2	5	
Strophurus jeanae	2													
Pygopodidae														
Delma borea			4				1							
Lialis burtonis					1								2	
Pygopus nigriceps nigriceps	2													
Agamidae														
Ctenophorus isolepis isolepis			4		9		16			2	1		10	
Ctenophorus nuchalis			1								4			
Diporiphora lalliae	2					1	3		6	1			3	
Lophognathus longirostris									1					
Moloch horridus	1													
Pogona minor minor	1													

Table 4.6: continued.

Family	Opp		TN01		TN02		TN03		TN04	TN04A	TN05		TN06	
Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Scincidae														
Carlia munda														
Carlia triacantha			1									1		
Cryptoblepharus sp										1				
Ctenotus grandis titan			1											
Ctenotus helenae			1								1			
Ctenotus pantherinus ocellifer	1					1	2	1	2	1	4	1	1	2
Ctenotus piankai					2									
Ctenotus quattuordecimlineatus														
Ctenotus schomburgkii														
Ctenotus tanamiensis														
Eremiascincus sp	2								2				3	
Lerista bipes			1		8		22	1	13	2			5	
Lerista greeri								1					1	
Menetia greyii			3	1					1		1		1	
Morethia ruficauda ruficauda											2	3		
Tiliqua multifasciata	2									1		1		
Varanidae														
Varanus acanthurus	1													
Varanus brevicauda										1				1
Varanus eremius			1				3				2		1	
Varanus gilleni										2				
Varanus gouldii	1	1							2					
Elapidae														
Brachyurophis roperi														
Simoselaps anomalus	1													
Suta punctata	1													
Typhlopidae														
Ramphotyphlops diversus					2		2							
Ramphotyphlops grypus	1								1				1	

Table 4.7: Herpetofauna recorded from the Western Tanami project area during the 2004 and 2005 surveys (remaining sites).

Family	TN07		TN08	TN08A	TN09		TN10		TN11		TN12		Total	
Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Myobatrachidae														
Notaden nichollsi			27	29									29	29
Gekkonidae														
Diplodactylus conspicillatus	1												6	2
Diplodactylus stenodactylus				1	4		3						33	2
Gehyra purpurascens													1	0
Gehyra variegata													3	2
Heteronotia binoei											1		2	0
Nephrurus levis levis													1	0
Rhynchoedura ornata			1		5					1			7	2
Strophurus ciliaris ciliaris	1	1											19	4
Strophurus jeanae													2	0
Pygopodidae														
Delma borea									2			1	7	1
Lialis burtonis	1										1		5	0
Pygopus nigriceps nigriceps			1			1							3	1
Agamidae													0	0
Ctenophorus isolepis isolepis	4		2		8	3	3	1	3		1		61	6
Ctenophorus nuchalis									1				6	0
Diporiphora lalliae					1		2				1		18	2
Lophognathus longirostris					2						2		5	0
Moloch horridus													1	0
Pogona minor minor			1				2						4	0

Table 4.7: continued.

Family	TN07		TN08	TN08A	TN09		TN10		TN11		TN12		Total	
Species Name	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005	2004	2005
Scincidae														
Carlia munda		1									1		1	1
Carlia triacantha											3		4	1
Cryptoblepharus sp													0	1
Ctenotus grandis titan					1								2	0
Ctenotus helenae			2								2		6	0
Ctenotus pantherinus ocellifer	1	1	2	3	2	8	3	3	2			3	20	24
Ctenotus piankai									4				6	0
Ctenotus quattuordecimlineatus				1									0	1
Ctenotus schomburgkii		1					3				1		4	1
Ctenotus tanamiensis					2								2	0
Eremiascincus sp			1										8	0
Lerista bipes	2		6	2	4		6				2		69	5
Lerista greeri					1		2	4			1		5	5
Menetia greyii	1	1									1		8	2
Morethia ruficauda ruficauda				1	1								3	4
Tiliqua multifasciata			1								1		4	2
Varanidae														
Varanus acanthurus							1						2	0
Varanus brevicauda													0	2
Varanus eremius	1		4				1						13	0
Varanus gilleni													0	2
Varanus gouldii													3	1
Elapidae														
Brachyurophis roperi							2				2		4	0
Simoselaps anomalus													1	0
Suta punctata													1	0
Typhlopidae														
Ramphotyphlops diversus													4	0
Ramphotyphlops grypus							1				1		5	0

5.0 Invertebrate Fauna Inventory Survey

5.1 Overview

The survey of the Western Tanami project area recorded a large number of invertebrate taxa (not all of which have been sorted). Many of these taxa were not identified beyond family level and are not discussed here. Only those taxa belonging to groups known to include short-range endemics (eg. mygalomorphs, millipedes, land snails; see Harvey 2002), that were otherwise of conservation significance (eg. Buprestidae) or for which expertise was otherwise available at the WA Museum (eg. pseudoscorpions, wolf spiders and other spider groups) were identified to genus or species level.

5.2 Short Range Endemics

Many recent publications have highlighted taxonomic groups of invertebrates with naturally small distributions (less than 10, 000 km^2) (general reference, Harvey 2002; freshwater snails, Ponder and Colgan 2002; land snails, Clark and Richardson 2002). These taxa are variously described as narrow range endemics or short-range endemics (see Harvey 2002) and are in part characterised by poor dispersal capabilities, confinement to disjunct habitats and low fecundity (Harvey 2002, Ponder and Colgan 2002). Given the importance of short-range endemism to the conservation of biodiversity, the assessment of such invertebrate taxa is a potentially important component of impact assessment. Examples of taxonomic groups that show high levels of short-range endemism in this respect include millipedes, mygalomorph spiders, and freshwater and terrestrial molluscs.

5.2.1 Mygalomorph Spiders (Trapdoor Spiders)

A total of 116 mygalomorph spiders across three species were captured in pit-traps during Phase 1 (Table 5.1). Captures were recorded predominantly during the nights when rain occurred, or when moisture was still around. Three morphotypes were identified and confirmed as probable species by Dr Mark Harvey (WA Museum). All three species belong to the genus *Aname*, a widespread arid zone genus.

Table 5.1: *Aname* species recorded from the Tanami trapping sites during 2004.

Species	TN01	TN02	TN03	TN04	TN05	TN06	TN07	TN08	TN09	TN10	TN11	TN12	Totals
Aname sp A		1	19	8		7	30	1	8	11	1	2	88
Aname sp B				2		2			6	12		3	25
Aname sp C	3												3
													116

During Phase 2, six separate mygal taxa were collected from the Western Tanami Project area (Table 5.2), including only one (*Aname* sp. B) that appears to have been collected during 2004.

Table 5.2: Mygalomorph spiders collected from the Western Tanami Project Area during 2005 (note that *Aname* sp B is equivalent to sp B from the 2004 survey).

	TN01	TN02	TN03	TN04a	TN05	TN06	TN07	TN08a	TN09	TN10	TN11	TN12	Opp
Aname sp B				6				3					
Aname sp D					1	1							
Aname sp E			1						1				
Idiopidae Sp A							1						
Barychelidae sp A												1	
Selenocosmia		3											1

The conservation status of these putative taxa cannot be determined without additional regional surveys and detailed taxonomic studies.

5.2.2 Terrestrial Molluscs (Land Snails)

No pulmonates were recorded during the current survey.

5.3 Other Invertebrate Taxa

5.3.1 Scorpionida

Two species of scorpionids were collected during the current survey. These are awaiting identification from the WA Museum.

5.3.2 Pseudoscorpionida

An unnamed species of *Synsphyronus* was recorded from beneath *Melaleuca* bark at the southern end of the haul road and within the Coyote study area. It belongs to the *S. paradoxus* group but differs from all named species of the genus in a couple of features (Dr Mark Harvey, WA Museum, pers. comm. 2004).

Typically, it is the rock-inhabiting species belonging to this genus that appear most restricted (Dr Mark Harvey, pers. comm. 2004), particularly where rocky habitat is discontinuous (eg. granite outcrops in the Wheatbelt region). There is virtually no data on the extent of distribution of bark-inhabiting *Synsphyronus* in arid WA. Elsewhere in Australia, the bark-inhabiting species *Synsphyronus paradoxus* is known to have a distribution that coincides with the Murray-Darling catchment (Dr Mark Harvey, pers. comm. 2004) and a second species, *Synsphyronus heptatrichus*, previously known from the Roper River in the Northern Territory, was also recorded from Marillana Creek in the Pilbara (Biota 2004).

5.3.3 Scolopendridae (Centipedes)

Two species of Scolopendrid centipede were recorded from the project area. One species of Scutigerid was also recorded.

5.3.4 Spiders

Araneomorph spiders have been sorted to morphotypes, with final identification by WA Museum staff still pending. Families represented include the Gnaphosidae, Lycosidae, Miturgidae, Salticidae and Zodariidae.

5.4 Insecta

Insect specimens were identified to order or family level where possible. A summary of the representation of the insect orders and families collected is given in Table 5.3.

Table 5.3: Summary of insect taxa recorded during the survey.

Order	Family	Common Name
Orthoptera		Crickets, grasshoppers
Hymenoptera		Ants, Bees, Wasps
Coleoptera		Beetles
Hemiptera		Bugs
Thysanura	Lepismatidae	Silverfish
Blattodea	Blattidae	Cockroaches
Mantodea	Mantidae	Praying Mantids
Dermaptera		Earwigs

Given that it is unlikely that these insect groups contain any short-range endemics, they will not form a focus for ongoing identification work.

6.0 Conservation Significance

6.1 Threatened Fauna

Native fauna species which are rare, threatened with extinction, or have high conservation value are specially protected by law under the Western Australian *Wildlife Conservation Act 1950.* In addition, some species of fauna are covered under the 1991 ANZECC convention, while certain birds are listed under the Japan & Australia Migratory Bird Agreement (JAMBA) and the China & Australia Migratory Bird Agreement (CAMBA).

Classification of rare and endangered fauna under the *Wildlife Conservation (Specially Protected Fauna) Notice 1998* recognises four distinct schedules of taxa:

1. Schedule 1 taxa are fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection;
2. Schedule 2 taxa are fauna which are presumed to be extinct and are declared to be fauna in need of special protection;
3. Schedule 3 taxa are birds which are subject to an agreement between the governments of Australia, Japan and China relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection; and
4. Schedule 4 taxa are fauna that are in need of special protection, otherwise than for the reasons mentioned in paragraphs (1), (2) and (3).

In addition to the above classification, fauna are also classified under five different Priority codes:

Priority One Taxa with few, poorly known populations on threatened lands.
Taxa which are known from a few specimens or sight records from one or a few localities on lands not managed for conservation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Two Taxa with few, poorly known populations on conservation lands, or taxa with several, poorly known populations not on conservation lands.
Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Three Taxa with several, poorly known populations, some on conservation lands.
Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

Priority Four Taxa in need of monitoring.
Taxa which are considered to have been adequately surveyed or for which sufficient knowledge is available and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands. Taxa which are declining significantly but are not yet threatened.

Priority Five Taxa in need of monitoring
Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

A search of the CALM Schedule and Priority Fauna database for species potentially occurring in the area yielded two Schedule 1 species, two Schedule 4 species and three Priority species. An additional two Schedule 1 and two Priority 4 species may occur in the area based on other information (see Table 6.1). The 11 conservation significant species potentially occurring in the area are discussed briefly below.

Table 6.1: Species of State level conservation significance recorded from or that may occur within the Western Tanami survey area. The "*" denotes species recorded during the current survey.

Species	State Level	Federal Level
Mulgara *Dasycercus cristicauda**	Schedule 1	Vulnerable
Bilby *Macrotis lagotis**	Schedule 1	Vulnerable
Southern Marsupial Mole *Notoryctes typhlops*	Schedule 1	Endangered
Giant Desert Skink *Egernia kintorei*	Schedule 1	Vulnerable
Peregrine Falcon *Falco peregrinus*	Schedule 4	-
Major Mitchell's Cockatoo *Cacatua leadbeateri**	Schedule 4	-
Gravel Dragon *Cryptagama aurita*	Priority 1	-
Ctenotus uber johnstonei	Priority 2	-
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	Priority 3	-
Bush Stonecurlew *Burhinus grallarius*	Priority 4	-
Australian Bustard *Ardeotis australis**	Priority 4	-

Schedule 1 Fauna

Mulgara *Dasycercus cristicauda* (Schedule 1, Vulnerable)

Distribution: The Mulgara is a medium-sized (60-120 g) carnivorous marsupial occurring in spinifex sandplain habitat across the arid zone of Western Australia.

Ecology: It is listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003*. This species apparently prefers mature spinifex (*Triodia* spp.) associations on sandy substrates. Populations are thought to contract to core habitat areas during harsh years and have also been documented as undergoing rapid expansions in response to good conditions (Woolley 1995).

Likelihood of occurrence: Evidence (burrows, diggings, scats and tracks) of Mulgaras was recorded from several locations in the project area along and adjacent to the haul road (Figure 6.1). During Phase 2, a single female was excavated from a burrow and vouchered with the WA Museum. Additional locations were recorded by Mr Ric Southgate and reported elsewhere (Southgate 2005).

Potential Impacts: The major potential impact to the local population of this species arises from the planned construction of the mine haul road between Bald Hill and Coyote. The primary impact here is in relation to habitat loss (particularly of *Triodia* sandplain and some areas within the paleochannel). In addition, there may be some low frequency individual mortality events due to road kill resulting from increase traffic usage.

Altered fire regimes that homogenise large areas of potential habitat may also negatively impact this species. Heterogeneity of different fire age classes within *Triodia* associations appears most favourable for the local persistence of Mulgara. An increase in human activities can arguably result in an increase in the frequency of fires, and these can homogenise large areas when uncontrolled. Whilst tracks have an obvious negative impact on the area and integrity of available habitat, they can also serve as fire breaks, potentially contributing to a mosaic of different age classes. This is not intended as a justification for constructing additional tracks, rather to point out that the existing and proposed network of roads and tracks may in part offset the risk of an increase in fire frequency.

A variety of human activities have the potential to increase introduced predator abundance (eg. creation of uncaged refuse, additional water points and additional shelter) and habitat penetration (ie. along cleared tracks and roads). These potential negative impacts are readily managed through caging and regular burning of refuse, minimise or eliminating unnatural water points, and reducing available shelter (particularly for cats around camps and mine infrastructure).

The Mulgara is apparently more widespread and common in both the Northern Territory and Western Australia than previously thought (Mr Roy Teale, Biota, pers. obs.; Ms Pip Masters, pers. comm. 2004). In both the NT and WA, the species conservation status could probably be revised downwards (Mr Roy Teale, pers. obs.; Ms Pip Masters, pers. comm. 2004).

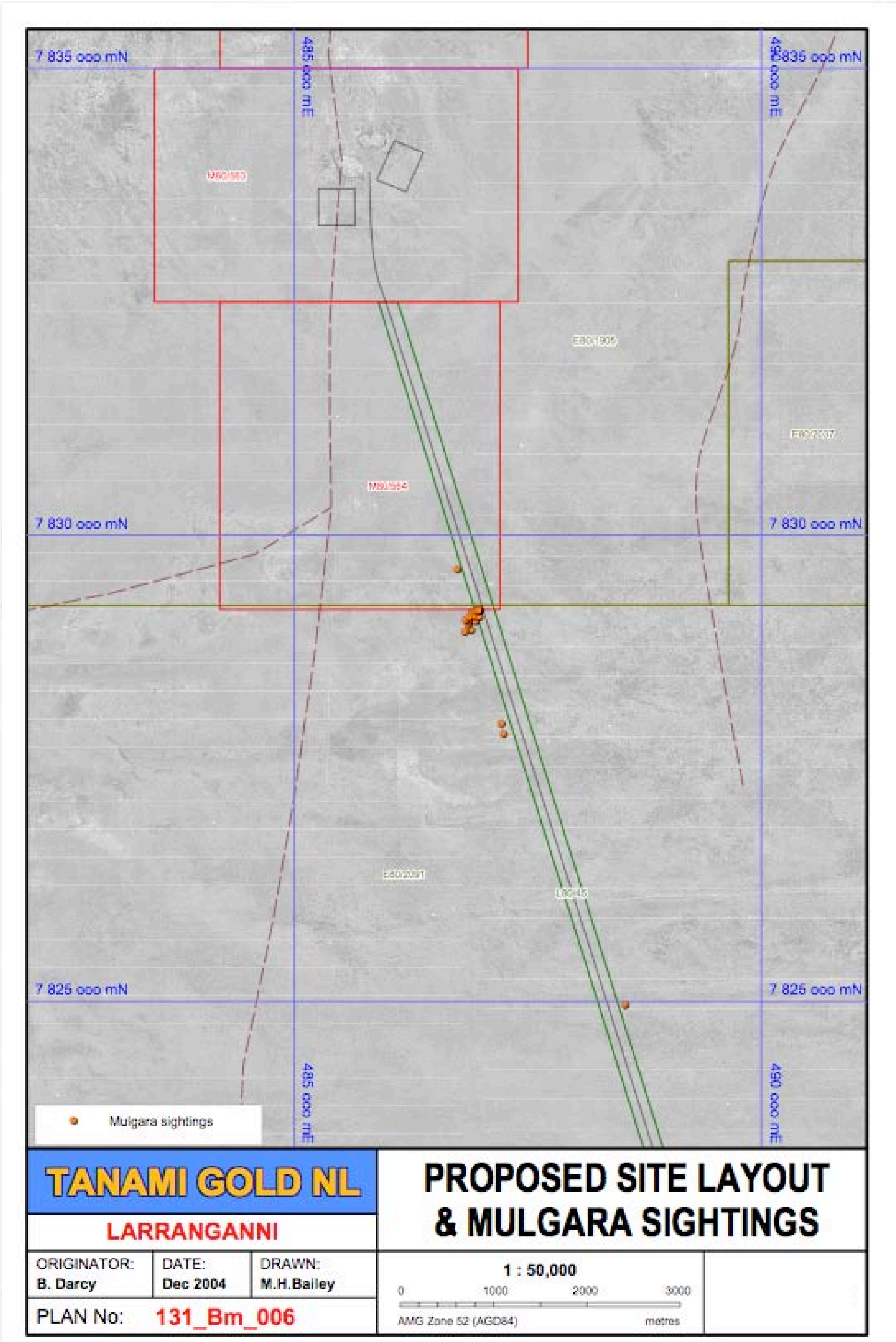

Figure 6.1: Location of Mulgara records (diggings, scats and burrows) (represented as circles) within and adjacent to the proposed haul road[5].

Bilby *Macrotis lagotis* (Schedule 1, Vulnerable)
Distribution: The former range of the Bilby included most of the semi-arid areas of mainland Australia, however, it is now confined to *Triodia* hummock grassland and *Acacia* scrub across parts of northern Australia.

Ecology: The Bilby *Macrotis lagotis* is a medium-sized ground mammal, ranging in weight from 1.0 - 2.5 kg. The species is apparently strictly nocturnal and constructs a substantial burrow system, which may be up to 3 m in length (Flannery 1990). Similar to the Mulgara, the species has been documented as holding temporary home ranges and showing relatively rapid

[5] Additional sites were recorded during Phase 2 and are detailed by Southgate (2005).

changes in distribution in response to variation in habitat resources (Johnson 1995). Whilst fox and cat predation and the effect of rabbits and stock are thought to be the principal factors in the decline of this species, fire has also been suggested as an important factor in maintaining habitat diversity for this species (Johnson 1995). In the Tanami, it appears that the species is most commonly associated with low lateritic rise habitats adjacent to drainages or wetter areas, although site fidelity is often low and individual movements large (Mr Ric Southgate, pers. comm. 2004). This habitat type is though to account for approximately 8% of the Tanami Desert (Ric Southgate, pers. comm. 2004).

Likelihood of occurrence: Scratchings of the Bilby were recorded from the Coyote project area, coinciding with the proposed airstrip and several other locations. An unused burrow and several diggings were located in the adjacent sandplain at the proposed camp site. Diggings and a burrow were also noted near the existing Bald Hill camp. Additional records are presented in Southgate (2005).

Potential Impacts: The principal impact on this local Bilby population will arise from the construction of the project airstrip and part of the camp area. This will utilise the more elevated laterite unit to provide for better all-weather access to the site and will result in the removal of approximately 31 ha of lateritic habitat.

Clearing of lateritic substrates for individual proposals may contribute to cumulative impacts in the Tanami region, and may in turn affect the status of Bilbies within this region as a whole. To place this habitat removal in context, a review of lateritic habitats was undertaken, both within the project lease area and the wider locality (a 50 km radius around the project area). The results of this initial analysis indicate that a relatively small proportion of core Bilby habitat will be disturbed by the proposed action at both the project area (Figure 6.2) and wider locality scales (Figure 6.3). Locally, the proposed action of clearing for the camp and airstrip will result in the removal of approximately 31 ha (3.5%) of the 884 ha of lateritic habitat in the lease area. This accounts for a much smaller proportion of the habitat at the wider scale (Figure 6.3).

Other potential impacts relating to altered fire regimes and predator increase have been discussed above under Potential Impacts to Mulgaras.

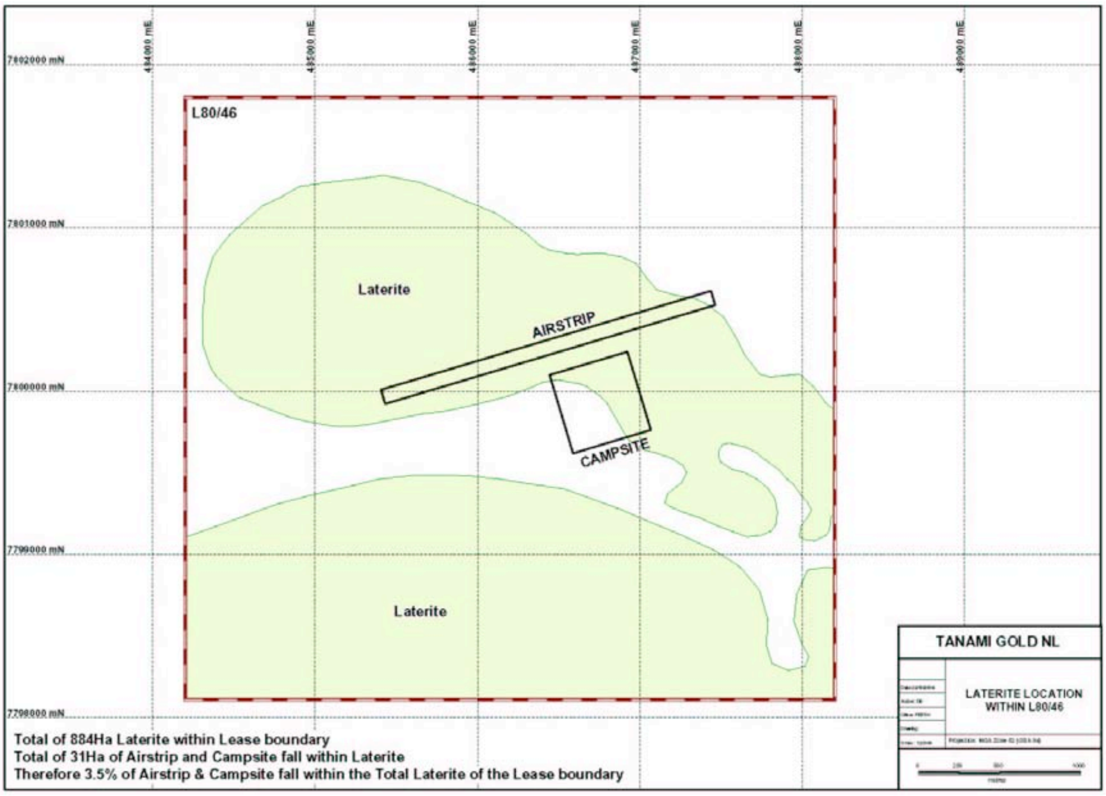

Figure 6.2: Lateritic habitat in the project lease area.

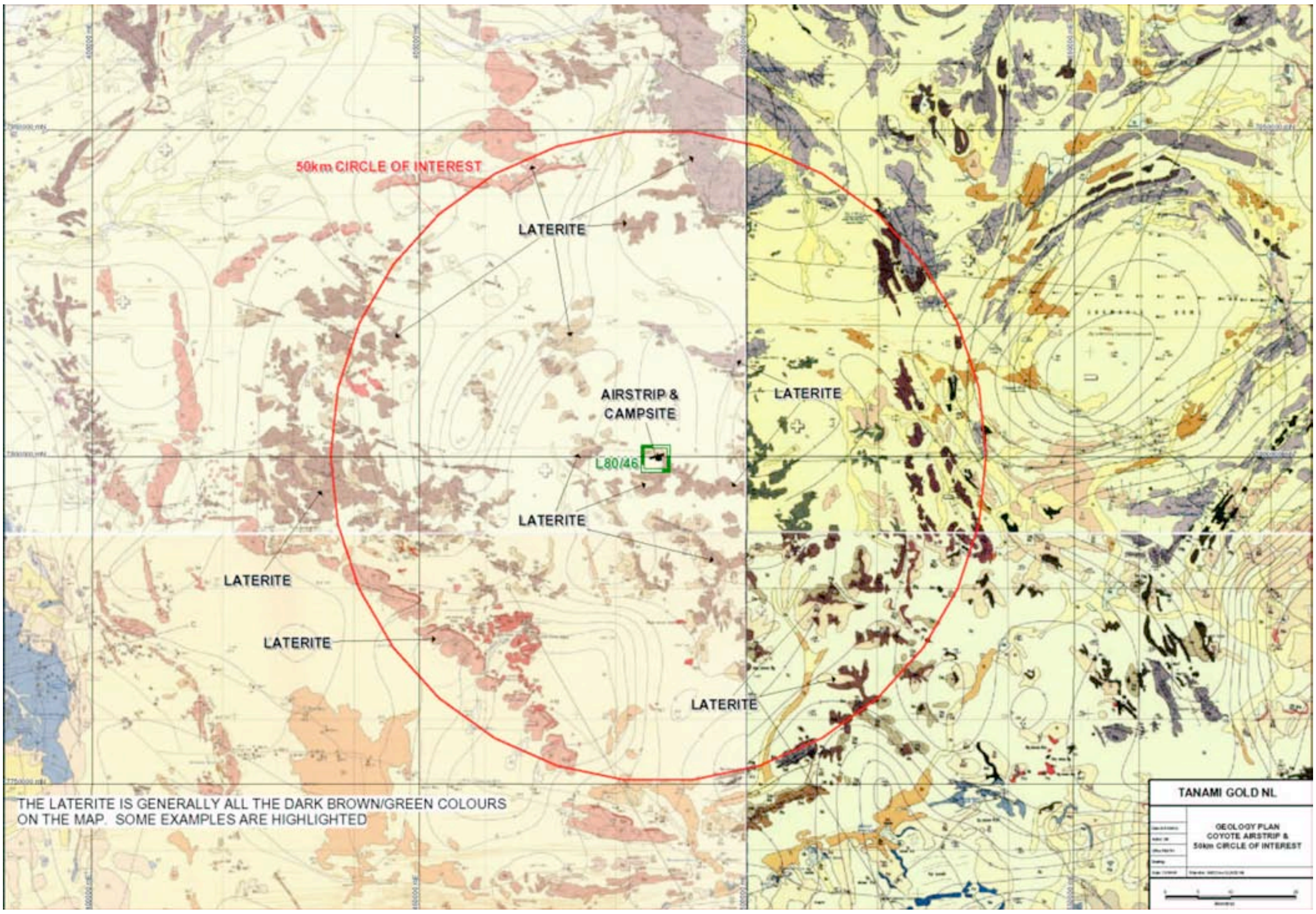

Figure 6.3: Lateritic habitat in the wider locality (50 km radius of the site) (lateritic units indicated by darker brown/green colours).

Southern Marsupial Mole *Notoryctes typhlops* (Schedule 1)
Ecology: A small burrowing species about which very little is known.

Likelihood of occurrence: Not recorded from the project area. According to the CALM database search there are two records of this species from the Tanami Desert, though FaunaBase shows only one record (either undated or prior to 1850). FaunaBase does, however, show records of the Northern Marsupial Mole from the vicinity of the Tanami Desert.

Potential Impacts: The major threatening process for this species has been identified as feral cats and foxes. It is difficult to gauge what impact, if any, the proposed mines and haul road would have on this species.

Giant Desert Skink *Egernia kintorei* (Schedule 1)
Distribution: The distribution of the Giant Desert Skink encompasses the western desert regions of arid Australia. The stronghold for this species appears to be the Tanami Desert.

Ecology: Within the Recovery Plan for the Great Desert Skink (*Egernia kintorei*) 2001-2011, the preferred habitat within the Tanami Desert is listed as "paleodrainage lines characterised by giant termite mounds and titree (*Melaleuca* spp.) shrubs." In general this species inhabits sandplains vegetated with *Triodia* species, typically *T. basedowii*, but also *T. pungens* and *T. schinzii*.

The major threatening process appears to be inappropriate burning regimes. In a survey in the Tanami Desert, Masters et al. (1997) found Great Desert Skinks present at seven of 165 sites, including four sites that had been recently burnt. At the Uluru study site, most burrows were found in habitat that had been burnt within the last 15 years.

Likelihood of occurrence: Not recorded from the study area, however the CALM database search indicates that there is a record from an area nearby (Appendix 4). It is considered likely that this species occurs within the study area, particularly within the Bald Hill area and along the northern section of the haul road where habitat seems most suitable.

Potential Impacts: As mentioned above, the key threatening process for this species appears to be changed burning regimes and, to a lesser extent, foxes and cats.

Schedule 4 Fauna
Peregrine Falcon *Falco peregrinus* (Schedule 4)
Distribution: The Peregrine Falcon has an almost cosmopolitan distribution. The only subspecies in Australia (*macropus*) is widespread throughout Australia and Tasmania (Marchant and Higgins 1993). The Australian population has been estimated at 3,000 to 5,000 pairs (Cade 1982).

Ecology: This species inhabits a wide range of habitats including forest, woodlands, wetlands and open country. The availability of prey is apparently more important than habitat in determining its distribution. Home ranges are probably defended year round and are variable in size, though typically not less than 480 ha (Marchant and Higgins 1993).

This species typically nests on cliffs (81% of nests Australia-wide) but also on stick nests (11%) and in tree hollows (8%). Breeding typically occurs from August to November (Johnstone and Storr 1998). Food is almost exclusively birds, such as pigeons, parrots and passerines, which are captured in flight (Johnstone and Storr 1998). Mammals such as possums and rabbits have been recorded as rare prey items (Marchant and Higgins 1993).

Likelihood of occurrence: Not recorded from the study area. It is likely that this species would occur in the woodland habitats within the Western Tanami project area.

Potential Impacts: The reason for initially listing this species was a global decline associated with the use of DDT. It is unlikely that the project will affect the conservation status of this species at either the regional or subregional level.

Major Mitchell's Cockatoo *Cacatua leadbeateri* (Schedule 4)
Distribution: A species endemic to arid Australia (Higgins 1999) with a patchy and disjunct distribution in Western Australia. The most significant decline in WA has occurred in the Wheatbelt region associated with land clearing (Higgins 1999), though trapping and nest robbing for aviculture have also been contributing factors (Higgins 1999).

Ecology: This species inhabits lightly or sparsely wooded country near water (Johnstone and Storr 1998).

Likelihood of occurrence: There were three records of this species from within the project area and a number of observations of pairs or small groups outside the project area.

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. Local movements away from mining activities possible due to increased noise.

Priority Taxa
Gravel Dragon *Cryptagama aurita* (Priority 1)
Distribution: In Western Australia, this species is only known from Halls Creek and Wolf Creek Crater (source: FaunaBase). It has also been collected from an additional locality, Wave Hill in the Northern Territory.

Ecology: It would appear that little is known of the ecology of this species, other than it occurs on lateritic soils supporting *Triodia*.

Likelihood of occurrence: Not recorded from the study area. Areas of lateritic soils dominated with *Triodia* were recorded predominantly in the Coyote project area (see account under Bilby above).

Potential Impacts: This species may be affected by clearing of lateritic soils associated with the construction of the airstrip and camp and for use as base material on roads.

Ctenotus uber johnstonei (Priority 2)
Distribution: Known only from the Balgo Hills area of Western Australia. However, Biota (2002) have collected specimens from the western edge of the Fortescue Marshes that have tentatively been identified as *C.* affin. *uber johnstonei*.

Ecology: According to Wilson and Knowles (1988), this species is only known from "an area of chenopod shrubland at the base of a sandstone hill in the vicinity of Balgo…". Specimens collected by Biota (2002) in the Pilbara belonging to possibly the same taxon were recorded from *Acacia xiphophylla* over chenopods south of the Fortescue Marsh, and from *Acacia xiphophylla* scattered tall shrubs to high open shrubland over *Sclerolaena cuneata* herbland and open chenopods on the western edge of the Fortescue Marsh.

Likelihood of occurrence: Not recorded from the study area. Only small areas with very occasional chenopods were noted in the project area, all in the vicinity of the Bald Hill deposit.

Potential Impacts: It is unlikely that the project would affect the conservation status of this species.

Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti* (Priority 3)
Distribution: There are scattered records of this species from the Kimberley and Pilbara regions of Western Australia.

Ecology: Apparently prefers large spinifex (*Triodia*) clumps in which to shelter during the day.

Likelihood of occurrence: The Spectacled Hare-wallaby *Lagorchestes conspicillatus* (which is considered Near Threatened in the Northern Territory) has been recorded in the area from a roadkill in 2003 on the Tanami Road near the Balgo Hills community and from tracks during the Phase 2 survey (Mr Ric Southgate, pers. comm.). Sightings of small wallabies in the area have been attributed to this species, as a number of targeted surveys have failed to turn up any more populations of the Rufous Hare-wallaby.

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. A possible increase in mortality associated with increased road traffic, including along the haul road.

Bush Stonecurlew *Burhinus grallarius* (Priority 4)
Distribution: This species is widespread in Australia and southern New Guinea. It remains common in tropical Australia but has declined alarmingly in temperate Australia and has disappeared from many regions (Marchant and Higgins 1993). Populations are apparently secure in the Pilbara and Kimberley (Mr Ron Johnstone, WA Museum, pers. comm. 2003), however this species is considered Near Threatened in the Northern Territory. The Australian population has been estimated at c. 15,000 individuals. This species was once found throughout most of the south-west of Western Australia, but has disappeared from many areas.

Ecology: Bush Stone-curlews inhabit sparsely grassed, lightly timbered forest or woodland. In southern Australia, they persist most often where there is a well-structured litter layer and fallen timber debris. Individuals have an estimated home range of about 250 ha (Johnson and Baker-Gabb 1993). This species breeds from July to January. The eggs are either laid directly on the ground or in a small scrape (Johnstone and Storr 1998). This species is a terrestrial feeder and is quite wide-ranging in its diet. It feeds primarily on invertebrates, particularly beetles, but also eats small lizards, frogs, snakes, vegetation and seeds (Marchant and Higgins

1993). Foxes are usually considered to be the primary cause for their decline, hence their relative abundance in the tropics, but habitat clearance has also been identified as a threatening process (Garnett and Crowley 2000).

Likelihood of occurrence: Not recorded from the study area. It is likely that this species would occur within the project area.

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. Increased mortality associated with increased road traffic, including along the haul road. Project impacts are unlikely to change the conservation status of this species.

Australian Bustard *Ardeotis australis* (Priority 4)
Distribution: The Australian Bustard occurs over much of Western Australia, with the exception of the more heavily wooded southern portions of the state (Johnstone and Storr 1998). Its wider distribution includes eastern Australia and New Guinea.

Ecology: This species prefers open or lightly wooded grassland including *Triodia* sandplains (Johnstone and Storr 1998), and is considered scarce to common depending on season and habitat. It has an omnivorous diet and occurs in a relatively broad range of habitats, but appears to have some preference for grasshoppers and is often attracted to recently burnt areas (Marchant and Higgins 1993). This species breeds from March to September and the eggs are laid on bare, preferably stony, ground (Johnstone and Storr 1998).

Likelihood of occurrence: There were 17 records of this species from a variety of sites, including opportunistic records noted along the Tanami Track (see also Southgate 2005).

Potential Impacts: Small scale habitat loss associated with the construction of the mines, haul road and additional infrastructure. Potentially altered fire regimes. Increased mortality associated with increased road traffic, including along the haul road.

6.2 Other Vertebrate Species of Potential Conservation Significance

Though not formally listed as such, several species may be of conservation significance by virtue of the fact that they are new to science or have not previously been recorded in this State.

A Pebble-mound Mouse *Pseudomys* aff. *chapmani* (not previously recognised in WA)
Background: The taxonomic status of this species is not completely resolved. An individual (M56155) recorded from a pit trap (TN11 at the Bald Hill study site) during the 2005 survey was identified in the field as having strong affinities with the Western Pebble-mound Mouse *Pseudomys chapmani*. Subsequent ground searches were then undertaken in the surrounding area (see Plate 6.1) to locate mounds to determine if it was indeed a mound-building species. Three mounds were located (all close to 485745mE 7835431mN WGS84) however, unlike those typically constructed by *P. chapmani,* they were small in size with pebbles localised around the entrances (Plate 6.2). All three mounds were trapped using Elliotts and another individual was recorded (M56176).

Both specimens were euthanased in the field with liver samples taken and stored in liquid nitrogen. The specimens and tissue were then lodged with the WA Museum with a request that Ms Norah Cooper compare the skull morphology with other known mound builders including *P. calabyi*, *P. chapmani*, *P. johnstonei* and *P. laborifex*. The tissue samples were forwarded to Dr Mark Adams at the Evolutionary Biology Unit of the South Australian Museum for comparison with the same mound builders noted above.

Taxonomy: The preliminary morphological studies suggest that the specimens collected from Bald Hill are *P. calabyi* (Ms Norah Cooper, WA Museum, pers comm. 2005), previously only known from the Arnhem Land region of the Northern Territory. A subsequent re-examination of several previously unidentified Kimberley *Pseudomys* within the WA Museum's collection by Ms Norah Cooper revealed several additional likely *P. calabyi*. These specimens came from as far north as Argyle Mine. The molecular work is due to be completed by early November.

Distribution: On the basis of preliminary morphological studies the *Pseudomys* appears to be *Pseudomys calabyi*. Within WA, this species has a tentative distribution from Argyle Mine in the north to Bald Hill in the south, extending as far inland as Cadjebut. *P. calabyi* also occurs in the Arnhem Land of the Northern Territory, where it is considered Near Threatened.

Conservation Status: The conservation status of this species in Western Australia is difficult to determine and it would probably be considered data deficient. In the Northern Territory it is considered Near Threatened. As the project area lies at the southern end of the Gardener Range, it is likely that Bald Hill is near the southern limit of this species distribution in inland WA.

Plate 6.1: Bald Hill and habitat of *Pseudomys* aff. *chapmani*.

Plate 6.2: Burrow entrance of *Pseudomys* aff. *chapmani*.

6.3 SRE Taxa

The surveys recorded eight different taxa of mygalomorph spiders, a group known to support species with narrow distributions. Without detailed regional collections and taxonomic reviews, it is unclear as to whether any of the taxa collected by this survey have restricted distributions.

7.0 Potential Impacts and Management

7.1 Generic impacts and Management

Below is a list of generic impacts that are typically associated with mining and associated infrastructure proposals of a similar scale to the proposed Western Tanami project.

Direct fauna habitat disturbance and modification
The principal impacts arising from the proposed development are associated with the clearing of fauna habitat associated with establishment of:

- new mine pits;
- a processing plant;
- associated mine infrastructure (e.g. waste dumps, haul roads);
- a haul road between the Bald Hill deposits and processing plant (approximately 40 km in length); and
- associated infrastructure (a new camp, mine offices, new airstrip, power transmission lines, bulk fuel storage, vehicle workshops, etc).

Indirect fauna habitat disturbance and modification
A number of indirect modifications may also occur to fauna habitat as a result of the construction and operation of the mines and haul road. These include changes to surface hydrology, increased erosion, and weed introduction or spread. There are no apparent areas of sheet flow dependent habitat in the study area, nor any creeks.

Direct loss of habitat
Habitat supporting two Schedule 1 taxa will be cleared as part of this proposal. It is considered unlikely that the loss of habitat will affect the conservation status of the Mulgara. With regards to the effects of habitat clearing on the Bilby, and potential offsets, see Southgate (2005).

Direct loss of individual fauna
It is inevitable that there will be some localised loss of fauna due to direct mortality arising from construction activities, including that which may occur during the clearing of habitat. Ongoing impacts may also arise from more frequent vehicle movements, haulage movements and machinery operation. For all vertebrate and the majority of invertebrate taxa, it is unlikely that the loss of individuals associated with such direct mortalities would be significant enough to affect the overall conservation status of any of the species recorded from the study area.

We have not fully established the distribution of the potential short range taxa (mygalomorph spiders) recorded from the study area to determine whether impacts may be significant. However, the habitat type from which they were recorded appears widespread.

In relation to both habitat loss and direct loss of fauna, it is noted that cumulative effects of a variety of disturbances (eg. mining proposals; road construction and maintenance; wildfires; increased road usage associated with tourism; ferals and grazing etc) in the Tanami region may impact negatively on some species.

Noise
Noise from mining activities including blasting, haulage and general mining operations may impact on fauna. However, we did not record any particularly sensitive habitats or communities within the study area that may be at particular risk (eg. significant bat roosts or breeding populations of birds).

Weed Spread
Ground disturbance associated with construction and operation of the mines and haul road provides an opportunity for the infiltration and spread of weeds. The consequences of weed infiltration on the biodiversity of fauna is not well documented.

7.2 Recommendations

The following recommendations arise from the two phase fauna survey of the Western Tanami study area:

- Tanami Gold has already commissioned a systematic fauna survey of their site and defined the key habitats for Bilby and Mulgara within the lease. These areas will be identified as control areas to be left undisturbed as far as practicable within the context of developing the mine and associated infrastructure.
- An exploration Management Plan should be developed to ameliorate potential impacts to either Bilbies or Mulgaras and their habitat arising from proposed future exploration activities.
- All members of the work force on site will be provided with an environmental induction to ensure they are familiarised with the presence of Bilby and Mulgara in the area. This will include driving speed restrictions, ensuring that off-road driving is minimised, and fire risk minimisation.
- Prior to completion of the project, airstrip and camp lateritic areas (Bilby habitat) will be subject to an investigation to determine specific fauna habitat reconstruction methodologies to maximise the potential for future use by Bilbies.
- Tanami Gold, in collaboration with relevant agencies (eg. CALM), will communicate the findings of the Bilby habitat study to other stakeholders in the Tanami region. This is currently poorly understood (Mr Ric Southgate, pers. comm.), and will assist in the wider conservation of this species.

In addition, a recommendation to investigate the taxonomic identity of a mound building *Pseudomys*[6] collected during Phase 2 has already been acted upon (see Section 6.2). More specifically, this recommendation suggested that Tanami Gold engage Ms Norah Cooper of the Western Australian Museum to examine the skull morphology of the specimens collected from the Bald Hill project area and compare them to *P. johnstonei*, *P calabyi*, *P. chapmani* and *P laborifex*. It was also recommended that Dr. Steve Donellan of the South Australian Museum undertake genetic studies to supplement these morphological analyses.

[6] There appears to be some confusion over the taxonomy of this group, with *P. laborifex* and *P. johnstonei* possibly synonymous, and *P. calabyi* not previously known from this State.

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Appendix 1

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(ROY JOHN)

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2/186 SCARBOROUGH BEACH RD.,
MT.HAWTHORN
WA 6016

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4 NO ENTRY OR COLLECTION OF FAUNA TO BE UNDERTAKEN ON ANY PRIVATE PROPERTY OR PASTORAL LEASE WITHOUT THE CONSENT IN WRITING OF THE OWNER OR OCCUPIER, OR FROM ANY ABORIGINAL RESERVE WITHOUT THE WRITTEN APPROVAL OF THE DEPARTMENT OF INDIGENOUS AFFAIRS.

5 NO FAUNA OR THEIR PROGENY SHALL BE RELEASED IN ANY AREA WHERE IT DOES NOT NATURALLY OCCUR, NOR HANDED OVER TO ANY OTHER PERSON OR AUTHORITY UNLESS APPROVED BY THE EXECUTIVE DIRECTOR, NOR SHALL THE REMAINS OF SUCH FAUNA BE DISPOSED OF IN SUCH MANNER AS TO CONFUSE THE NATURAL OR PRESENT DAY DISTRIBUTION OF THE SPECIES.

6 THIS LICENCE AND THE WRITTEN PERMISSION REFERRED TO AT CONDITIONS 3 & 4 MUST BE CARRIED BY THE LICENSEE OR AUTHORISED AGENT AT ALL TIMES FOR THE PURPOSE OF PROVING THEIR AUTHORITY TO TAKE FAUNA WHEN QUESTIONED AS TO THEIR RIGHT TO DO SO BY A WILDLIFE OFFICER, ANY OTHER STATE OR LOCAL GOVERNMENT EMPLOYEE OR ANY MEMBER OF THE PUBLIC.

7 **********ANY INTERACTION INVOLVING GAZETTED THREATENED FAUNA THAT MAY BE HARMFUL AND/OR INVASIVE MAY REQUIRE APPROVAL FROM THE COMMONWEALTH GOVERNMENT DEPARTMENT , "ENVIRONMENT AUSTRALIA", PHONE 02 6274 1111. INTERACTION WITH SUCH SPECIES IS CONTROLLED BY THE COMMONWEALTH GOVERNMENT'S "ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999" & "ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION REGULATIONS 2000" AS WELL AS CALM'S WILDLIFE CONSERVATION ACT & REGULATIONS.**********

8 NO BIOPROSPECTING INVOLVING THE REMOVAL OF SAMPLE AQUATIC AND TERRESTRIAL ORGANISMS (BOTH FLORA AND FAUNA) FOR CHEMICAL EXTRACTION AND BIOACTIVITY SCREENING IS PERMITTED TO BE CONDUCTED WITHOUT SPECIFIC WRITTEN APPROVAL BY THE EXECUTIVE DIRECTOR OF C.A.L.M.

9 FURTHER CONDITIONS (NUMBERED 1 TO 10) ARE ATTACHED.

PURPOSE	FAUNA SURVEY FOR ENVIRONMENTAL IMPACT ASSESSMENT TANAMI DESERT PROJECT.
AUTHORISED PERSONS	GARTH HUMPHREYS, MIKE CRAIG, GREG HAROLD, ZOE HAMILTON.

WILDLIFE CONSERVATION ACT 1950
WILDLIFE CONSERVATION REGULATIONS

Regulation 17:- Licence to Take Fauna for Scientific Purposes

FURTHER CONDITIONS (OF LICENCE NUMBER SF 4664)

1. The licensee shall ensure that all due care is taken in the capture and handling of fauna to prevent injury or mortality resulting from that capture or handling. Where traps or other mechanical means or devices are used to capture fauna these shall be inspected at regular intervals throughout each day of their use. At the conclusion of research all markers etc and signs erected by the licensee and all traps shall be removed, all pitfalls shall be refilled or capped and the study area returned to the condition it was in prior to the research/capture program. During any break in research, cage traps should be removed and pitfalls either removed, capped or filled with sand.

2. No collecting is to be undertaken in areas where it would impinge on pre-existing scientific research programs.

3. Any form of colour marking of birds or bats to be coordinated by the Australian Bird and Bat Banding Schemes.

4. Any inadvertently captured specimens of fauna which is declared as likely to become extinct, rare or otherwise in need of special protection is to be released immediately at the point of capture. Where such a specimen is injured or deceased, the licensee shall contact CALM licensing staff at Kensington (08 9334 0434) for advice on disposal. Records are to be kept of any fauna so captured and details included in the report required under further condition 6 below.

5. Prior to any renewal of this research licence the licensee shall submit a summary report outlining work conducted under this licence and work proposed for the next research period.

6. Within one month of the expiration of this licence (or at such other time or times as the Executive Director may determine) the holder shall furnish to the Executive Director [ATTENTION: WILDLIFE CLERK] a return setting out in full detail the number of each species of fauna taken during the currency of the licence, the localities where the species was/were taken and the method of handling of such fauna and disposal of specimens. A copy of any paper or report resulting from this research should be lodged in due course with the Executive Director. In the case of consultants, a list of the fauna handled, the localities involved and a copy of the interpretive data prepared should be lodged.

7. As a general rule not more than ten specimens of any one protected species shall be permanently taken from any location less than 20km apart. Where exceptional circumstances make it necessary to take large series in order to obtain adequate statistical data the collector will proceed with circumspection and justify their actions to the Executive Director in advance.

8. No fauna, whether dead or alive, may be taken out of Western Australia without the necessary export permit issued under the *Wildlife Conservation Act 1950*. It should be noted that the permit will not be issued unless the State to which the fauna is going has approved that fauna entering that State. In addition to the requirements of the Australian States, the Commonwealth controls exports overseas through Commonwealth legislation administered by the Australian Nature Conservation Agency.

9. All holotypes and syntypes and a half share of paratypes of species or subspecies permitted to be permanently taken under this licence shall be donated to the Western Australian Museum. Duplicates (one pair in each case) of any species collected which represents a significant extension of geographic range shall be donated on request to the Western Australian Museum.

10. To prevent any unnecessary collecting in this state, all specimens and material collected under the authority of this license shall, on request, be loaned to the Western Australian Museum. Also, the unused portion or portions of any specimen collected under the authority of this license shall be offered for donation to the Western Australian Museum or made available to other scientific workers if so required.

a:&t:\calm forms\liccond\faunalicences\regul17.doc

Appendix 2

CALM Import Licence

DEPARTMENT OF CONSERVATION AND LAND MANAGEMENT

Enquiries: 17 DICK PERRY AVE, KENSINGTON, WESTERN AUSTRALIA
Telephone: 08 9334 0333
Facsimile: 08 9334 0242

Correspondence: **Locked Bag 30**
Bentley Delivery Centre WA 6983

PAGE 1
NO. IS000187

RECEIPT NO.	**AMOUNT**
	$0.00

WILDLIFE CONSERVATION ACT 1950
REGULATION 19

LICENCE TO IMPORT SKINS OF FAUNA (OR OTHER DEAD FAUNA)

THE LICENSEE MAY IMPORT INTO WESTERN AUSTRALIA, SUBJECT TO THE CONDITIONS ENDORSED HEREON, THE SPECIFIED CONSIGNMENT OF FAUNA. THIS LICENCE IS ISSUED SUBJECT TO AN EXPORT PERMIT (WHERE APPLIC-ABLE) BEING GRANTED BY THE STATE FROM WHICH THE CONSIGNMENT IS BEING EXPORTED. THIS LICENCE IS VALID FOR ONE CONSIGNMENT ONLY.

EXECUTIVE DIRECTOR

CONDITIONS

1 THIS LICENCE AND THE CORRESPONDING INTERSTATE LICENCE (IF APPLICABLE) ARE BOTH TO BE ATTACHED TO OR ACCOMPANY THE CONTAINER(S) IN WHICH THE CONSIGNMENT IS HELD. IF, DUE TO UNFORESEEN CIRCUMSTANCES, THESE LICENCES CANNOT BE ATTACHED, THEN BOTH LICENCE NUMBERS ARE TO BE CLEARLY WRITTEN ON THE CONTAINER(S).

SPECIES REPTILES **AS PER ATTACHED LIST**
(Reptilia)

IMPORT FROM MR R TEALE
NORTHERN TERRITORY

DATE OF ISSUE 12/10/2004
DATE OF EXPIRY 12/10/2004
VALID FROM 07/10/2004

DPStefoni
LICENSING OFFICER
(ROY JOHN)

LICENSEE: MR RJ TEALE
ADDRESS BIOTA ENVIRONMENTAL SERVICES
2/186 SCARBOROUGH BEACH RD.,
MT.HAWTHORN
WA 6016

Job # 282

(08 93340278)

List of Specimens from Tanami

Varanus eremius 9
V. acanthurus 1
Ctenophorus isolepis 12
C. nuchalis 2
Diporiphora winneckei 11
D. lalliae 1
Lophognathus longirostris 4
~~[illegible]~~
Diplodactylus conspicillatus 4
D. stenodactylus 24
Gehyra variegata 4
Heteronotia binoei 2
Nephrurus levis 1
Strophurus jeanae 2
S ciliaris 12
Rhynchoedura ornata 6
Delma borea 6
Lialis burtonis 4
P. nigriceps 3 3
Carlia munda 1
Carlia triacantha 3
Ctenotus grandis 1
C. pantherinus 13
C. schomburgkii 2
C. helenae 5

C. tanamiensis 1
C piankai 6
Eremiascincus sp. 7
Lerista bipes 26
M. greyii 7
Tiliqua multifasciata 2
Brachyurophis roperi x 3
Suta punctata x 1
Simoselaps anomalus x 1
Ramphotyphlops sp. 4
R grypus 4
Notaden nichollsi 13
Ningaui ridei 2
Sminthopsis youngsoni 12
Notomys alexis 7
Pseudomys desertor 7
P. nanus 1
P. hermannsburgensis 13
Pseudomys sp 4
Mus musculus 7

Regards Ray

08/10 '04 FRI 11:19 [TX/RX NO 5093] 001

Appendix 3

Records from WA Museum Database Search

Amphibia collected between -18.5666, 127.6833 and -20.9000, 130.01666

Hylidae
Cyclorana australis
Cyclorana longipes
Cyclorana maini
Litoria caerulea
Litoria coplandi
Litoria inermis
Litoria pallida
Litoria rubella
Litoria wotjulumensis

Myobatrachidae
Neobatrachus aquilonius
Neobatrachus sp
Notaden nichollsi
Uperoleia borealis
Uperoleia micromeles
Uperoleia sp

Reptiles collected between -18.5666, 127.683333 and -20.90000, 130.0166

Agamidae
Amphibolurus gilberti
Cryptagama aurita
Ctenophorus caudicinctus
Ctenophorus caudicinctus macropus
Ctenophorus isolepis
Ctenophorus isolepis isolepis
Ctenophorus nuchalis
Diporiphora bennettii
Diporiphora lalliae
Diporiphora sp
Diporiphora winneckei
Lophognathus gilberti
Lophognathus longirostris
Tympanocryptis lineata centralis

Boidae
Antaresia stimsoni stimsoni
Aspidites ramsayi

Elapidae
Acanthophis pyrrhus
Demansia olivacea
Furina ornata
Pseudechis australis
Pseudonaja modesta
Pseudonaja nuchalis
Suta ordensis
Suta punctata

Gekkonidae
Diplodactylus ciliaris
Diplodactylus stenodactylus
Diplodactylus taeniatus
Gehyra australis
Gehyra montium
Gehyra pilbara
Gehyra purpurascens
Gehyra sp
Gehyra variegata
Heteronotia binoei
Nephrurus laevissimus
Nephrurus levis
Rhynchoedura ornata
Strophurus ciliaris aberrans
Strophurus ciliaris ciliaris
Strophurus jeanae

Pygopodidae
Delma borea
Delma butleri
Delma haroldi
Delma nasuta
Delma tincta
Lialis burtonis
Pygopus nigriceps

Scincidae
Carlia munda
Carlia rufilatus
Carlia triacantha
Cryptoblepharus plagiocephalus
Ctenotus brooksi brooksi
Ctenotus grandis
Ctenotus greeri
Ctenotus helenae
Ctenotus inornatus
Ctenotus leonhardii
Ctenotus militaris
Ctenotus pantherinus acripes
Ctenotus pantherinus ocellifer
Ctenotus piankai
Ctenotus quattuordecimlineatus
Ctenotus robustus
Ctenotus saxatilis
Ctenotus schomburgkii
Ctenotus tanamiensis
Ctenotus uber johnstonei
Cyclodomorphus melanops melanops
Egernia striata
Eremiascincus fasciolatus
Eremiascincus richardsonii
Lerista aericeps
Lerista bipes
Lerista greeri
Lerista orientalis
Lerista vermicularis
Menetia greyii
Morethia ruficauda
Morethia ruficauda ruficauda
Notoscincus ornatus

Notoscincus ornatus ornatus
Proablepharus reginae
Tiliqua multifasciata

Typhlopidae
Ramphotyphlops diversus
Ramphotyphlops grypus
Ramphotyphlops guentheri

Varanidae
Varanus acanthurus
Varanus brevicauda
Varanus eremius
Varanus gilleni
Varanus tristis tristis

Mammals collected between-18.5666, 127.683333 and -20.90000, 130.0166

Canidae
Canis lupus familiaris

Dasyuridae
Dasycercus cristicauda
Pseudantechinus macdonnellensis
Sminthopsis macroura
Sminthopsis youngsoni

Emballonuridae
Saccolaimus flaviventris
Taphozous hilli

Felidae
Felis catus

Macropodidae
Lagorchestes conspicillatus leichardti
Macropus robustus
Onychogalea unguifera

Molossidae
Chaerephon jobensis
Tadarida australis

Muridae
Leggadina forresti
Leggadina lakedownensis
Mus musculus
Notomys alexis
Pseudomys desertor
Pseudomys hermannsburgensis
Pseudomys laborifex
Pseudomys nanus
Pseudomys sp_nov
Rattus villosissimus

Notoryctidae
Notoryctes caurinus
Notoryctes typhlops

Phalangeridae
Trichosurus vulpecula arnhemensis

Pteropodidae
Pteropus scapulatus

Thylacomyidae
Macrotis lagotis

Vespertilionidae
Chalinolobus gouldii
Nyctophilus geoffroyi
Scotorepens balstoni
Scotorepens greyii
Vespadelus finlaysoni

Birds collected between -18.5666, 127.683333 and -20.90000, 130.0166 (Families presented in alphabetical order)

Acanthizidae
Gerygone fusca
Gerygone fusca mungi
Smicrornis brevirostris

Accipitridae
Accipiter cirrocephalus cirrocephalus
Accipiter fasciatus
Elanus caeruleus axillaris
Haliastur sphenurus
Hamirostra melanosternon
Hieraaetus morphnoides

Alaudidae
Mirafra javanica horsfieldii

Anatidae
Anas gracilis

Artamidae
Artamus cinereus
Artamus cinereus melanops

Campephagidae
Coracina novaehollandiae

Coracina novaehollandiae novaehollandiae
Lalage tricolor

Caprimulgidae
Eurostopodus argus

Charadriidae
Charadrius melanops
Erythrogonys cinctus
Vanellus miles

Columbidae
Geopelia cuneata
Geopelia striata
Geopelia striata placida
Geophaps plumifera
Ocyphaps lophotes

Corvidae
Corvus orru

Cracticidae
Cracticus nigrogularis

Cuculidae
Chrysococcyx basalis
Cuculus pallidus

Dicaeidae
Dicaeum hirundinaceum

Dicruridae
Rhipidura leucophrys
Rhipidura leucophrys leucophrys
Rhipidura rufiventris isura

Falconidae
Falco berigora
Falco cenchroides cenchroides

Gruidae
Grus rubicunda

Halcyonidae
Todiramphus pyrrhopygia
Todiramphus sanctus sanctus

Hirundinidae
Hirundo ariel
Hirundo nigricans nigricans

Maluridae
Malurus lamberti
Malurus lamberti assimilis
Malurus leucopterus
Malurus leucopterus leuconotus
Malurus melanocephalus cruentatus
Stipiturus ruficeps ruficeps

Meliphagidae
Acanthagenys rufogularis
Certhionyx niger
Certhionyx variegates
Conopophila rufogularis
Epthianura tricolor
Lichenostomus keartlandi
Lichenostomus penicillatus
Lichenostomus plumulus
Lichenostomus unicolor unicolor
Lichenostomus virescens
Lichenostomus virescens forresti
Lichmera indistincta indistincta
Manorina flavigula
Manorina flavigula lutea
Melithreptus gularis laetior
Philemon citreogularis citreogularis
Phylidonyris albifrons

Meropidae
Merops ornatus

Motacillidae
Anthus australis australis

Pachycephalidae
Colluricincla harmonica brunnea
Oreoica gutturalis
Pachycephala rufiventris
Pachycephala rufiventris rufiventris

Pardalotidae
Pardalotus rubricatus
Pardalotus striatus uropygialis

Passeridae
Emblema pictum
Neochmia phaeton
Taeniopygia bichenovii
Taeniopygia guttata

Petroicidae
Microeca fascinans fascinans

Phalacrocoracidae
Phalacrocorax sulcirostris

Podargidae
Podargus strigoides brachypterus

Pomatostomidae
Pomatostomus temporalis rubeculus

Psittacidae
Aprosmictus erythropterus
Cacatua leadbeateri
Cacatua roseicapilla
Cacatua roseicapilla roseicapilla
Cacatua sanguinea
Cacatua sanguinea sanguinea

Platycercus spurius
Platycercus zonarius
Platycercus zonarius zonarius
Trichoglossus haematodus

Ptilonorhynchidae
Ptilonorhynchus nuchalis nuchalis

Recurvirostridae
Himantopus himantopus leucocephalus
Recurvirostra novaehollandiae

Scolopacidae
Calidris acuminata
Gallinago megala

Strigidae
Ninox novaeseelandiae boobook

Sylviidae
Cincloramphus cruralis
Cincloramphus mathewsi
Eremiornis carteri

Turnicidae
Turnix velox

Tytonidae
Tyto alba
Tyto alba delicatula

Fishes collected between -18.5666, 127.683333 and -20.90000, 130.0166

No records found

Appendix 4

Records from the CALM Rare Fauna Database Search

VKC 15/9/04

DEPARTMENT OF Conservation AND LAND MANAGEMENT
Conserving the nature of WA

Your Ref:
Our Ref: 2001F001096V09
Enquiries: Christine Freegard
Phone: (08) 9334 0579
Fax: (08) 9334 0278
Email: christinef@calm.wa.gov.au

FILE REFERENCE No 2001F001096V09

1. Finance, please raise invoice for $150 (plus GST) INV 5422
2. File

Mr Michael Craig
Biota Environmental Sciences Pty Ltd
2/186 Scarborough Beach Rd
MT HAWTHORN WA 6016

D045602

Dear Mr Craig

REQUEST FOR THREATENED FAUNA INFORMATION

I refer to your request of 1 September for information on threatened fauna occurring ~~near~~ around the proposed Coyote Gold mine in the Tanami Desert.

#684

A search was undertaken for this area of the Department's Threatened Fauna database, which includes species which are declared as '*Rare or likely to become extinct* (Schedule 1)', '*Birds protected under an international agreement* (Schedule 3)', and '*Other specially protected fauna* (Schedule 4)'. Attached are print outs from these databases where records were found.

Attached also are the conditions under which this information has been supplied. Your attention is specifically drawn to the sixth point that refers to the requirement to undertake field investigations for the accurate determination of threatened fauna occurrence at a site. The information supplied should be regarded as an indication only of the threatened fauna that may be present.

An invoice for $150.00 (plus GST), being the set charge for the supply of this information, will be forwarded.

It would be appreciated if any populations of threatened fauna encountered by you in the area could be reported to this Department to ensure their ongoing management.

If you require any further details, or wish to discuss threatened fauna management, please contact my Senior Zoologist, Dr Peter Mawson on 08 93340421.

Yours sincerely

C.F.

....

for Keiran McNamara
EXECUTIVE DIRECTOR

8 September, 2004

RECEIVED 14 SEP 2004

DEPARTMENT OF CONSERVATION & LAND MANAGEMENT
24 SEP 2004
KENSINGTON W.A.

Wildlife Branch: 17 Dick Perry Avenue, Technology Park, Kensington
Postal address: Locked Bag 104, Bentley Delivery Centre, Bentley, Western Australia 6983
Phone: (08) 9334 0455 Fax: (08) 9334 0278 Website: www.naturebase.net

Threatened and Priority Fauna Database

Page 1 of 2

18.5666°S 127.6833°E / 20.9°S 130.0166°E Coyote Gold mine in the Tanami Desert

* Date	Certainty	Seen	Location Name	Method

Schedule 1 - Fauna that is rare or is likely to become extinct

Notoryctes typhlops **Southern Marsupial Mole (Itjaritjari)** *2 records*

This species is an inhabitant of sandy desert areas and is rarely observed or recorded.

1964	1	1	Tanami Desert	Dead
1979	1	1	Tanami Desert	Dead

Egernia kintorei **Giant Desert Skink** *0 records*

A burrowing species of skink found in a variety of desert habitats on sandy, clay and loamy soils. A nearby record suggests that this species could possibly occur in the area in question.

Schedule 4 - Other specially protected fauna

Falco peregrinus **Peregrine Falcon** *0 records*

This species is uncommon and prefers areas with rocky ledges, cliffs, watercourses, open woodland or margins with cleared land. It may occur in the area in question.

Cacatua leadbeateri **Major Mitchell's Cockatoo** *2 records*

This species is sporadically distributed through arid and semi-arid Australia and may occur in sparsely timbered grasslands and shrublands and rocky outcrops.

1980	1	15	Tanami Desert	Day sighting
1995	1	2	Sturt Creek	Day sighting

Priority One

Cryptagama aurita **Cryptagama aurita** *0 records*

This reptile has only been collected from a few locations in arid north eastern Western Australia. Records in surrounding areas suggest that this species may occur in the area in question.

Priority Two

Ctenotus uber johnstonei **Ctenotus uber johnstonei** *1 records*

This species of skink is associated with small rock outcrops on open sandy and stony plains.

1979	1	1	Balgo Hill	

Priority Three

Lagorchestes conspicillatus leichardti **Spectacled Hare-wallaby (mainland)** *1 records*

This species has declined in many parts of its range and is vulnerable to cat and fox predation. It inhabits tropical grasslands and also suffers from the impacts of frequent fires.

1997	1	1	Sturt Creek	Day sighting

Priority Four

0 records

Wednesday, 8 September 2004 Department of Conservation and Land Management

Threatened and Priority Fauna Database

18.5666°S 127.6833°E / 20.9°S 130.0166°E Coyote Gold mine in the Tanami Desert

* *Date*	*Certainty*	*Seen*	*Location Name*	*Method*

Priority Five

0 records

* Information relating to any records provided for listed species:-
Date: date of recorded observation
Certainty (of correct species identification): 1=Very certain; 2=Moderately certain; and 3=Not sure.
Seen: Number of individuals observed.
Location Name: Name of reserve or nearest locality where observation was made
Method: Method or type of observation

Appendix 5

Specimens Vouchered with the Western Australian Museum

Species Name	Museum Number
Brachyurophis roperi	R110598
Brachyurophis roperi	R157427
Brachyurophis roperi	R157428
Brachyurophis roperi	R157438
Carlia munda	R110911
Carlia munda	R157468
Carlia triacantha	R110905
Carlia triacantha	R157406
Carlia triacantha	R157417
Carlia triacantha	R157466
Cryptoblepharus sp	R110930
Ctenophorus isolepis isolepis	R110631
Ctenophorus isolepis isolepis	R157349
Ctenophorus isolepis isolepis	R157376
Ctenophorus isolepis isolepis	R157379
Ctenophorus isolepis isolepis	R157380
Ctenophorus isolepis isolepis	R157382
Ctenophorus isolepis isolepis	R157390
Ctenophorus isolepis isolepis	R157422
Ctenophorus isolepis isolepis	R157442
Ctenophorus isolepis isolepis	R157453
Ctenophorus isolepis isolepis	R157454
Ctenophorus isolepis isolepis	R157455
Ctenophorus nuchalis	R157354
Ctenophorus nuchalis	R157414
Ctenotus grandis titan	R157473
Ctenotus helenae	R157342
Ctenotus helenae	R157418
Ctenotus helenae	R157423
Ctenotus helenae	R157451
Ctenotus helenae	R157469
Ctenotus pantherinus ocellifer	R
Ctenotus pantherinus ocellifer	R
Ctenotus pantherinus ocellifer	R157340
Ctenotus pantherinus ocellifer	R157383
Ctenotus pantherinus ocellifer	R157387
Ctenotus pantherinus ocellifer	R157389
Ctenotus pantherinus ocellifer	R157409
Ctenotus pantherinus ocellifer	R157410
Ctenotus pantherinus ocellifer	R157411
Ctenotus pantherinus ocellifer	R157424
Ctenotus pantherinus ocellifer	R157425
Ctenotus pantherinus ocellifer	R157452
Ctenotus pantherinus ocellifer	R157461
Ctenotus pantherinus ocellifer	R157462
Ctenotus piankai	R110581
Ctenotus piankai	R110627
Ctenotus piankai	R110628
Ctenotus piankai	R157412
Ctenotus piankai	R157440
Ctenotus piankai	R157494
Ctenotus quattuordecimlineatus	R110902
Ctenotus schomburgkii	R110590
Ctenotus schomburgkii	R110922
Ctenotus schomburgkii	R157443
Ctenotus schomburgkii	R157443
Ctenotus tanamiensis	R110634
Delma borea	R110606
Delma borea	R110607
Delma borea	R110608
Delma borea	R110910
Delma borea	R157426
Delma borea	R157430
Delma borea	R157435
Delma borea	R157447
Diplodactylus conspicillatus	R110589
Diplodactylus conspicillatus	R110626
Diplodactylus conspicillatus	R110915
Diplodactylus conspicillatus	R157350
Diplodactylus conspicillatus	R157395

Diplodactylus conspicillatus	R157431
Diplodactylus stenodactylus	R
Diplodactylus stenodactylus	R
Diplodactylus stenodactylus	R
Diplodactylus stenodactylus	R
Diplodactylus stenodactylus	R110588
Diplodactylus stenodactylus	R110591
Diplodactylus stenodactylus	R110592
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Diplodactylus stenodactylus	R110603
Diplodactylus stenodactylus	R110604
Diplodactylus stenodactylus	R110609
Diplodactylus stenodactylus	R110610
Diplodactylus stenodactylus	R110615
Diplodactylus stenodactylus	R110616
Diplodactylus stenodactylus	R110617
Diplodactylus stenodactylus	R110618
Diplodactylus stenodactylus	R110619
Diplodactylus stenodactylus	R110620
Diplodactylus stenodactylus	R110624
Diplodactylus stenodactylus	R110625
Diplodactylus stenodactylus	R110630
Diplodactylus stenodactylus	R110854
Diplodactylus stenodactylus	R110906
Diplodactylus stenodactylus	R110928
Diplodactylus stenodactylus	R157366
Diporiphora lalliae	R110586
Diporiphora lalliae	R110587
Diporiphora lalliae	R110907
Diporiphora lalliae	R110912
Diporiphora lalliae	R157339
Diporiphora lalliae	R157345
Diporiphora lalliae	R157346
Diporiphora lalliae	R157353
Diporiphora lalliae	R157371
Diporiphora lalliae	R157372
Diporiphora lalliae	R157396
Diporiphora lalliae	R157432
Diporiphora lalliae	R157436
Diporiphora lalliae	R157445
Eremiascincus sp	R110585
Eremiascincus sp	R110605
Eremiascincus sp	R110611
Eremiascincus sp	R110612
Eremiascincus sp	R110613
Eremiascincus sp	R157335
Eremiascincus sp	R157450
Gehyra purpurascens	R110580
Gehyra variegata	R
Gehyra variegata	R110924
Gehyra variegata	R110925
Gehyra variegata	R157465
Gehyra variegata	R157471
Heteronotia binoei	R157419
Heteronotia binoei	R157433
Lerista bipes	R110918
Lerista bipes	R157341
Lerista bipes	R157356
Lerista bipes	R157357
Lerista bipes	R157358
Lerista bipes	R157359
Lerista bipes	R157360
Lerista bipes	R157361
Lerista bipes	R157362
Lerista bipes	R157363

Lerista bipes	R157364
Lerista bipes	R157367
Lerista bipes	R157368
Lerista bipes	R157369
Lerista bipes	R157370
Lerista bipes	R157373
Lerista bipes	R157374
Lerista bipes	R157375
Lerista bipes	R157385
Lerista bipes	R157388
Lerista bipes	R157407
Lerista greeri	R110908
Lerista greeri	R110917
Lerista greeri	R110919
Lerista greeri	R110920
Lerista greeri	R157404
Lerista greeri	R157405
Lerista greeri	R157416
Lerista greeri	R157420
Lerista greeri	R157470
Lialis burtonis	R110621
Lialis burtonis	R157415
Lialis burtonis	R157429
Lialis burtonis	R157434
Lialis burtonis	R157446
Lophognathus longirostris	R110629
Lophognathus longirostris	R157377
Lophognathus longirostris	R157378
Lophognathus longirostris	R157437
Menetia greyii	R110623
Menetia greyii	R110913
Menetia greyii	R157337
Menetia greyii	R157343
Menetia greyii	R157344
Menetia greyii	R157348
Menetia greyii	R157397
Menetia greyii	R157408
Morethia ruficauda ruficauda	R110595
Morethia ruficauda ruficauda	R110596
Morethia ruficauda ruficauda	R110909
Morethia ruficauda ruficauda	R110921
Morethia ruficauda ruficauda	R110923
Morethia ruficauda ruficauda	R110929
Morethia ruficauda ruficauda	R157472
Nephrurus levis levis	R110633
Notaden nichollsi	R
Notaden nichollsi	R
Notaden nichollsi	R157474
Notaden nichollsi	R157475
Notaden nichollsi	R157476
Notaden nichollsi	R157477
Notaden nichollsi	R157478
Notaden nichollsi	R157479
Notaden nichollsi	R157480
Notaden nichollsi	R157481
Notaden nichollsi	R157482
Notaden nichollsi	R157483
Notaden nichollsi	R157484
Notaden nichollsi	R157485

Notaden nichollsi	R157486
Pogona minor minor	R
Pogona minor minor	R157335
Pogona minor minor	R157386
Pogona minor minor	R157421
Pygopus nigriceps nigriceps	R110632
Pygopus nigriceps nigriceps	R110927
Pygopus nigriceps nigriceps	R157455
Pygopus nigriceps nigriceps	R157460
Ramphotyphlops diversus	R
Ramphotyphlops diversus	R157402
Ramphotyphlops diversus	R157464
Ramphotyphlops diversus	R157495
Ramphotyphlops grypus	R157334
Ramphotyphlops grypus	R157381
Ramphotyphlops grypus	R157399
Ramphotyphlops grypus	R157403
Ramphotyphlops sp	R110916
Rhynchoedura ornata	R
Rhynchoedura ornata	R110583
Rhynchoedura ornata	R110903
Rhynchoedura ornata	R110904
Rhynchoedura ornata	R157392
Rhynchoedura ornata	R157393
Rhynchoedura ornata	R157398
Rhynchoedura ornata	R157400
Rhynchoedura ornata	R157458
Simoselaps anomalus	R157336
Strophurus ciliaris ciliaris	R
Strophurus ciliaris ciliaris	R
Strophurus ciliaris ciliaris	R
Strophurus ciliaris ciliaris	R110622
Strophurus ciliaris ciliaris	R157347
Strophurus ciliaris ciliaris	R157351
Strophurus ciliaris ciliaris	R157352
Strophurus ciliaris ciliaris	R157365
Strophurus ciliaris ciliaris	R157391
Strophurus ciliaris ciliaris	R157394
Strophurus ciliaris ciliaris	R157439
Strophurus ciliaris ciliaris	R157441
Strophurus ciliaris ciliaris	R157467
Strophurus jeanae	R110614
Strophurus jeanae	R157338
Suta punctata	R110635
Tiliqua multifasciata	R157413
Varanus acanthurus	R157385
Varanus brevicauda	R110914
Varanus brevicauda	R110926
Varanus eremius	R
Varanus eremius	R
Varanus eremius	R
Varanus eremius	R157401
Varanus eremius	R157444
Varanus eremius	R157448
Varanus eremius	R157449
Varanus eremius	R157456
Varanus eremius	R157457
Varanus eremius	R157463

Species Name	Museum Number
Dasycercus cristicauda	M56169
Mus musculus	M56130
Mus musculus	M56103
Mus musculus	M56106
Mus musculus	M56116
Mus musculus	M56162
Mus musculus	M56163
Mus musculus	M56111
Mus musculus	M56117
Mus musculus	M56135
Mus musculus	M56157
Mus musculus	M56139
Ningaui ridei	M56123
Ningaui ridei	M
Notomys alexis	M56113
Notomys alexis	M56102
Notomys alexis	M56096
Notomys alexis	M56108
Notomys alexis	M56136
Notomys alexis	M56112
Notomys alexis	M56134
Pseudantechinus sp	M56164
Pseudomys aff. chapmani	M56167
Pseudomys aff. chapmani	M56155
Pseudomys desertor	M56132
Pseudomys desertor	M56101
Pseudomys desertor	M56133
Pseudomys desertor	M56161
Pseudomys desertor	M56138
Pseudomys desertor	M56129
Pseudomys desertor	M56131
Pseudomys desertor	M56110
Pseudomys desertor	M56165
Pseudomys desertor	M56166
Pseudomys desertor	M56105
Pseudomys desertor	M56097
Pseudomys desertor	M56118
Pseudomys desertor	M56322
Pseudomys desertor	M56330
Pseudomys desertor	M56156
Pseudomys hermannsburgensis	M56143
Pseudomys hermannsburgensis	M56114
Pseudomys hermannsburgensis	M56160
Pseudomys hermannsburgensis	M56121
Pseudomys hermannsburgensis	M56159
Pseudomys hermannsburgensis	M
Pseudomys hermannsburgensis	M56327
Pseudomys hermannsburgensis	M56329
Pseudomys hermannsburgensis	M56331
Pseudomys hermannsburgensis	M56158
Pseudomys hermannsburgensis	M
Pseudomys hermannsburgensis	M56146
Pseudomys laborifex	M56141
Pseudomys laborifex	M56140
Pseudomys laborifex	M56125
Pseudomys laborifex	M56145
Pseudomys laborifex	M56107
Pseudomys laborifex	M56099
Pseudomys laborifex	M56100
Pseudomys laborifex	M56098
Pseudomys laborifex	M56142
Pseudomys nanus	M
Pseudomys nanus	M56321
Pseudomys nanus	M56168
Pseudomys sp	M
Pseudomys sp	M
Pseudomys sp	M56137
Pseudomys sp	M56325
Pseudomys sp	M56328
Pseudomys sp	M56326
Sminthopsis macroura	M56144
Sminthopsis youngsoni	M
Sminthopsis youngsoni	M56128
Sminthopsis youngsoni	M
Sminthopsis youngsoni	M56115
Sminthopsis youngsoni	M56324
Sminthopsis youngsoni	M
Sminthopsis youngsoni	M56323
Sminthopsis youngsoni	M56109
Sminthopsis youngsoni	M56126
Sminthopsis youngsoni	M56119
Sminthopsis youngsoni	M56120
Sminthopsis youngsoni	M56122
Sminthopsis youngsoni	M56104

Appendix 6

Annotated Lists of Vertebrate Species Recorded from the Western Tanami Project Area During Phase 1

ACCIPITRIDAE

Black-shouldered Kite – *Elanus caeruleus axillaris*
Recorded from just one individual from the *Triodia* flat at TN05.

FALCONIDAE

Brown Falcon – *Falco berigora berigora*
Eight records from the project area during the survey; three from the savanna at TN01, three from *Triodia* hillslopes at TN02 (n=1) and TN11 (n=2), one from the *Triodia* sandplain at TN06, and one from the *Triodia* flat at TN09.

Australian Kestrel – *Falco cenchroides cenchroides*
Recorded from a single individual from the *Triodia* sandplain at TN06.

OTIDIDAE

Australian Bustard – *Ardeotis australis*
Recorded from five individuals from the *Triodia* hillslopes at TN02 (n=2) and TN07 (n=1), the *Triodia* sandplain at TN03 (n=1) and the *Triodia* flat at TN05 (n=1).

TURNICIDAE

Little Button-quail – *Turnix velox*
Recorded on two occasions from sightings on the *Triodia* sandplain at TN06.

CHARADRIIDAE

Oriental Plover – *Charadrius veredus*
A pair of individuals was seen on a track within the project area west of the Coyote deposit.

COLUMBIDAE

Crested Pigeon – *Ocyphaps lophotes*
Three single individuals were recorded from the savanna at TN01 (n=1), the *Triodia* sandplain at TN06 (n=1), and the *Triodia* hillslope at TN07 (n=1).

Spinifex Pigeon – *Geophaps plumifera*
Two individuals sighted at the *Triodia* dune (TN08).

Diamond Dove – *Geopelia cuneata*
Recorded from a single individual from the *Triodia* hillslope at TN11.

PSITTACIDAE

Little Corella – *Cacatua sanguinea*
A pair was observed at the *Triodia* hillslope (TN11).

Major Mitchell's Cockatoo – *Cacatua leadbeateri*
A pair was sighted on the *Triodia* flat at TN09.

Australian Ringneck – *Platycercus zonarius zonarius*
Six individuals recorded; three pairs from the savanna (TN01).

CUCULIDAE

Horsfield's Bronze Cuckoo - *Chrysococcyx basalis*
Four individuals sighted; recorded from the *Triodia* hillslope at TN07 (n=1) and *Triodia* dune at TN08 (n=3).

HALCYONIDAE

Red-backed Kingfisher – *Todiramphus pyrrhopygia*
Two individuals recorded from the savanna at TN01.

MALURIDAE

Variegated Fairy-wren – *Malurus lamberti assimilis*
The fifth most commonly recorded species (n=44). Typically recorded as sightings, but also as calls. Recorded from the minor drainage lines at TN12 (n=15) and TN04 (n=4), the *Triodia* sandplain at TN03 (n=18) and TN06 (n=4), and the *Triodia* flat at TN10 (n=3).

White-winged Fairy-wren – *Malurus leucopterus leucopterus*
Moderately common, recorded on 25 occasions both as sightings and calls. Recorded from the *Triodia* hillslope at TN02 (n=1) and TN07 (n=3), the *Triodia* sandplain at TN03 (n=4) and TN06 (n=4), and the *Triodia* flat at TN05 (n=6) and TN10 (n=7).

Rufous-crowned Emu-wren – *Stipiturus ruficeps ruficeps*
Recorded on 15 occasions from the *Triodia* flat at TN05 (n=3) and TN10 (n=3), the *Triodia* hillslopes at TN07 (n=2) and TN11 (n=1), and the *Triodia* dune at TN08 (n=6).

PARDALOTIDAE

Red-browed Pardalote – *Pardalotus rubricatus*
Recorded on eight occasions from the savanna at TN01 (n=4), the minor drainage lines at TN03 (n=1) and TN12 (n=1), and the *Triodia* flat at TN09 (n=1) and TN10 (n=1).

Striated Pardalote – *Pardalotus striatus uropygialis*
Recorded on just four occasions, all from calls, from the savanna at TN01 (n=2), the *Triodia* hillslope at TN02 (n=1) and the minor drainage line at TN04 (n=1).

MELIPHAGIDAE

Brown Honeyeater – *Lichmera indistincta indistincta*
Moderately common, with 24 records. Recorded mostly from the minor drainage lines at TN04 (n=12) and TN12 (n=2); also recorded from the *Triodia* dune at TN08 (n=7), the *Triodia* flat at TN10 (n=2), and the *Triodia* hillslope at TN11 (n=1).

Black Honeyeater – *Certhionyx niger*
Only recorded on two occasions, from a call at the minor drainage line at TN04 (n=1) and a sighting from the *Triodia* flat at TN09 (n=1).

Singing Honeyeater – *Lichenostomus virescens*
The fourth most commonly recorded species (n=48). Recorded as both calls and sightings, most commonly from the *Triodia* dune at TN08 (n=21). Also recorded from the *Triodia* hillslope at TN02 (n=2) and TN07 (n=10), the *Triodia* sandplain at TN03 (n=7) and TN06 (n=2), the *Triodia* flat at TN05 (n=2), and the minor drainage line at TN04 (n=4).

Grey-headed Honeyeater – *Lichenostomus keartlandi*
The most commonly recorded species in the area with 196 records. Recorded from every site except the *Triodia* flat at TN05.

White-plumed Honeyeater – *Lichenostomus penicillatus*
Recorded as a pair and two singles from the savanna at TN01 (n=4).

Black-chinned Honeyeater – *Melithreptus gularis laetior*
Moderately common, with 25 records. Recorded from all except four sites (TN03, TN05, TN09, and TN12).

Yellow-throated Miner – *Manorina flavigula*
Recorded mainly as singles but also as a group of five. Recorded from the savanna at TN01 (n=12), the *Triodia* hillslope at TN02 (n=2), the minor drainage line at TN04 (n=2), and the *Triodia* flats at TN09 (n=1) and TN10 (n=2).

Spiny-cheeked Honeyeater – *Acanthagenys rufogularis*
Only recorded from the minor drainage lines at TN04 (n=2) and TN12 (n=3).

PACHYCEPHALIDAE

Crested Bellbird – *Oreoica gutturalis*
Recorded on 11 occasions as singles from the savanna at TN01 (n=2), the minor drainage line at TN04 (n=2), the *Triodia* flat at TN05 (n=1) and TN10 (n=2), the *Triodia* hillslope at TN07 (n=2), and the *Triodia* dune at TN08 (n=2).

Rufous Whistler – *Pachycephala rufiventris rufiventris*
Only recorded from the minor drainage line at TN04 (n=2).

Grey Shrike-thrush – *Colluricincla harmonica brunnea*
Recorded on nine occasions from the savanna at TN01 (n=1), the *Triodia* sandplain at TN03 (n=1), the minor drainage lines at TN04 (n=2) and TN12 (n=2), the *Triodia* flat at TN10 (n=2) and the *Triodia* hillslope at TN11 (n=1).

DICRURIDAE

Willie Wagtail – *Rhipidura leucophrys leucophrys*
Only recorded on four occasions from the *Triodia* sandplain at TN03 (n=3) and the *Triodia* hillslope at TN11 (n=1).

Magpie-lark – *Grallina cyanoleuca*
Just two records from the savanna at TN01.

CAMPEPHAGIDAE

Black-faced Cuckoo-shrike – *Coracina novaehollandiae subpallida*
Recorded on three occasions from the *Triodia* flat at TN09 (n=1) and the *Triodia* hillslope at TN11 (n=2).

White-winged Triller – *Lalage tricolor*
Ten records, most from the minor drainage line at TN04 (n=8), but also from the *Triodia* sandplain at TN06 (n=1) and the *Triodia* hillslope at TN07 (n=1).

ARTAMIDAE

Black-faced Woodswallow – *Artamus cinereus melanops*
This was the third most commonly recorded species with 63 records. Recorded from all except three sites (TN07, TN08 and TN12).

Little Woodswallow – *Artamus minor*
Only observed on two occasions, both as pairs, from the *Triodia* flat at TN10 and the minor drainage line at TN12.

CRACTICIDAE

Pied Butcherbird – *Cracticus nigrogularis*
Recorded on six occasions, all as singles, from the savanna at TN01 (n=3), the minor drainage line at TN04 (n=1), the *Triodia* flat at TN10 (n=1), and the *Triodia* hillslope at TN11 (n=1).

CORVIDAE

Little Crow – *Corvus bennetti*
Recorded from a single individual from the *Triodia* sandplain at TN03.

SYLVIIDAE

Spinifex-bird – *Eremiornis carteri*
Recorded on six occasions, mostly as sightings from the *Triodia* sandplain at TN03 (n=2) and the minor drainage line at TN12 (n=4).

Rufous Songlark – *Cincloramphus mathewsi*
Only one pair recorded from the savanna at TN01.

Golden-headed Cisticola – *Cisticola exilis exilis*
A single individual recorded from the *Triodia* flat at TN05.

ALAUDIDAE

Singing Bushlark – *Mirafra javanica horsfieldii*
Five individuals recorded, typically as singles, but one pair also noted. Records from the *Triodia* hillslope at TN02 (n=3), the *Triodia* sandplain at TN06 (n=1) and the *Triodia* flat at TN10 (n=1).

DICAEIDAE

Mistletoebird – *Dicaeum hirundinaceum hirundinaceum*
Recorded on seven occasions, mostly as singles from the savanna at TN01 (n=4), the minor drainage line at TN04 (n=1), the *Triodia* hillslope at TN07 (n=1) and the *Triodia* flat at TN09 (n=1).

PASSERIDAE

Zebra Finch – *Taeniopygia guttata castanotis*
This was the second most commonly recorded bird species with 105 records. Recorded from the minor drainage lines at TN04 (n=1) and TN12 (n=42), the *Triodia* flat at TN10 (n=19), and the *Triodia* hillslope at TN11 (n=43).

DASYURIDAE

Forty individuals of four species were recorded from this family during the current survey.

Ningaui ridei
Recorded from two individuals, one each from the savanna site at TN01 (specimen lodged with the WA Museum, M number pending) and the *Triodia* dune site at TN08 (M56123).

Sminthopsis macroura
Recorded from a single individual pit-trapped from the *Triodia* flat at TN05 (M56144).

Sminthopsis youngsoni
This species was recorded on 11 occasions, all from pit-traps. Recorded from the *Triodia* sandplain at TN03 (n=1) (M56115), the minor drainage lines at TN04 (n=1) (M56109) and TN12 (n=1) (M56128), the *Triodia* flat at TN05 (n=1), the *Triodia* hillslope at TN07 (n=6) (M56119, M56120, M56122, M56126), and the *Triodia* dune site at TN08 (n=1).

Dasycercus cristicauda
All 26 records of this species were from diggings, burrows or scats. All were opportunistic records, mostly found by surveying the suitable habitats on foot. Records were scattered across three locations.

THYLACOMYIDAE

One species from this family was recorded during the current survey.

Macrotis lagotis
Recorded from the *Triodia* sandplain at TN03, where a number of diggings and an inactive burrow were observed. Also recorded from the proposed airstrip, where a number of diggings and an active burrow were located.

MACROPODIDAE

A single individual from one species was recorded from this family during the current survey.

Macropus rufus
Recorded from only one sighting from the *Triodia* sandplain at TN06.

MURIDAE

A total of 54 individuals of six species were recorded from this family during the current survey.

Mus musculus
This species was recorded on 11 occasions, from the savanna site TN01 (n=4, all from Elliott traps) (M56111, M56130), the *Triodia* hillslope at TN02 (n=1, also from an Elliott trap) (M56106), TN04 (n=2) (M56103), the *Triodia* flat at TN05 (n=1) (M56117), and the *Triodia* sandplain at TN06 (n=3) (M56116, M56139).

Notomys alexis
Recorded on 10 occasions from the *Triodia* hillslope at TN02 (n=1) (M56102), the *Triodia* sandplains at TN03 (n=4)(M56096, M56112, M56113) and TN06 (n=3) (M56108, M56134), and two individuals recorded opportunistically.

Pseudomys desertor
This species was also recorded on 10 occasions, from both pit-traps and Elliott traps, from the savanna at TN01 (n=3) (M56105, M56138), the *Triodia* sandplain at TN03 (n=3) (M56097, M56101, M56133), the *Triodia* dune at TN08 (n=3) (M56118, M56129, M56132) and the *Triodia* hillslope at TN11 (n=1) (M56131).

Pseudomys ?hermannsburgensis
This was the second most commonly recorded mammal species with 17 records from the savanna at TN01 (n=2) (M56107), the *Triodia* hillslopes at TN02 (n=6) (M56098 – M56100, M56125, M56145) and TN07 (n=2) (M56143), the *Triodia* sandplain at TN03 (n=1), the minor drainage line at TN04 (n=1) (M56114), the *Triodia* flats at TN05 (n=2) (M56142) and TN09 (n=2) (M56121), and one individual caught at an opportunistic site (M56141).

Pseudomys nanus
Recorded from a single individual from the savanna at TN01 from an Elliott trap (specimen lodged with the WA Museum, M number pending).

Pseudomys ?laborifex
Recorded on five occasions from the savanna at TN01 (n=1) (M56140), the *Triodia* hillslope TN02 (n=2) (specimen lodged with the WA Museum, M number pending), the *Triodia* sandplain at TN03 (n=1) (M56146) and from an opportunistic site (n=1) (specimen lodged with the WA Museum, M number pending).

CANIDAE

A single individual from one species was recorded from this family during the current survey.

Canis lupus dingo
One individual was observed at the savanna site TN01.

FELIDAE

A single individual from one species was recorded from this family during the current survey.

Felis catus
Recorded from one observation at the savanna site TN01.

CAMELIDAE

Seven individuals from one species were recorded from this family during the current survey.

Camelus dromedarius
This species was recorded on seven occasions from the *Triodia* hillslopes at TN02 (n=1), TN07 (n=1) and TN11 (n=1), the *Triodia* sandplain at TN03 (n=2), the minor drainage line at TN04 (n=1), and the *Triodia* flat at TN05 (n=1).

MYOBATRACHIDAE

A total of 29 individuals from one species were recorded from this family during the current survey.

Notaden nichollsi
Only recorded from the *Triodia* dune site (TN08) (n=27) (R157474 - R157486), the *Triodia* flat at TN05 (n=1) (R number pending) and an opportunistic location within the project area (n=1) (R number pending). Likely to be present throughout the project area in suitable habitat.

GEKKONIDAE

A total of 74 individuals of nine species were recorded from this family during the current survey.

Diplodactylus conspicillatus
Six individuals recorded from the *Triodia* sandplain at TN03 (n=2) (R157350, R157431), the minor drainage line at TN04 (n=1) (R110589), the *Triodia* hillslope at TN07 (n=1) (R157395) and two individuals hand caught from opportunistic locations within the project area (R110626).

Diplodactylus stenodactylus
This species was relatively common in the project area with 33 records, mostly from pit-traps from the savanna at TN01 (n=6) (R110593, R110594, R110604, R110610, R110615, R110616), the *Triodia* hillslope at TN02 (n=5) (R110625, R110854, R157366), the *Triodia* sandplains at TN03 (n=1) (R110591) and TN06 (n=7) (R110600, R110609, R110618 - R110620), the minor drainage line at TN04 (n=6) (R110588, R110597, R110601, R110602, R110617, R110624), the *Triodia* flats at TN09 (n=4) (R110630) and TN10 (n=3) (R110592, R110599, R110603), with one individual hand-caught whilst road-spotting within the project area.

Gehyra purpurascens
Just a single individual hand captured whilst head-torching (R110580).

Gehyra variegata
Recorded from only three individuals; two hand caught from opportunistic locations (R157471) and one individual pit-trapped at the savanna at TN01 (R157465).

Heteronotia binoei
Just two individuals pit-trapped from the savanna at TN01 (n=1) (R157433) and the minor drainage line at TN12 (n=1) (R157419).

Nephrurus levis levis
Recorded from a single specimen hand caught whilst road spotting within the project area (R110633).

Rhynchoedura ornata
This species was recorded on seven occasions. Six individuals were pit-trapped from the *Triodia* dune at TN08 (n=1) (R157392) and the *Triodia* flat at TN09 (n=5) (R157393, R157398, R157400, R157458) and one specimen was hand-caught from an opportunistic location within the project area (R110583).

Strophurus ciliaris ciliaris
Recorded on 19 occasions, seven of which were opportunistic hand-captures within the project area. The remainder were caught from the *Triodia* hillslopes at TN02 (n=2) (R157441, R157467) and TN07 (n=1) (R157391), the *Triodia* sandplains at TN03 (n=3) (R157347, R157365) and TN06 (n=5) (R110622, R157351, R157352, R157394), and the minor drainage line at TN04 (n=1) (R157439).

Strophurus jeanae
Recorded from just two specimens, both of which were hand-caught at opportunistic locations within the project area (R110614, R157338).

PYGOPODIDAE

A total of 15 individuals of three species were recorded during the current survey.

Delma borea
This species was recorded on seven occasions from the savanna at TN01 (n=4) (R110608, R157426, R157430, R157447), TN03 (n=1) (R157435) and TN11 (n=2) (R110606, R110607). Records included one gravid female.

Lialis burtonis
Recorded on five occasions from pit traps from the *Triodia* hillslopes at sites TN02 (n=1) (R157434) and TN07 (n=1) (R157415), the *Triodia* sandplain at TN06 (n=2) (R110621, R157429), and from an Elliott trap at the minor drainage line at TN12 (n=1) (R157446).

Pygopus nigriceps
Recorded on three occasions; one from a pit-trap from the *Triodia* dune at TN08 (n=1) (R157455) and two individuals hand-caught from opportunistic locations within the project area (R110632, R157460).

AGAMIDAE

A total of 95 individuals of six species were recorded from this family during the current survey.

Ctenophorus isolepis isolepis
This was the second most commonly recorded herpetofauna species after *Lerista bipes*, with 61 records. This species was recorded from all sites except TN04. It was recorded from the savanna at TN01 (n=4), the *Triodia* hillslopes at sites TN02 (n=9) (R157349, R157376), TN07 (n=4) (R110631, R157422, R157442, R157454) and TN11 (n=3), the *Triodia* sandplains at sites TN03 (n=16) and TN06 (n=10) (R157380), the *Triodia* flats at sites TN05 (n=1) (R157453), TN09 (n=8) (R157379, R157382, R157390) and TN10 (n=3), the *Triodia* dune at TN08 (n=2) (R157455) and the minor drainage line at TN12 (n=1).

Ctenophorus nuchalis
Recorded on 6 occasions from the savanna at TN01 (n=1) (R157354), the *Triodia* flat at TN05 (n=4) (R157414) and the *Triodia* hillslope at TN11 (n=1).

Diporiphora lalliae
This species was recorded on 18 occasions from the *Triodia* sandplains at sites TN03 (n=3) (R157339, R157345) and TN06 (n=3) (R157353, R157436), the minor drainage lines at sites TN04 (n=6) (R110586, R157372, R157396, R157432) and TN12 (R110587), the *Triodia* flats at sites TN09 (n=1) and TN10 (n=2) (R157445), and two individuals from an opportunistic site (R157346, R157371). All individuals except one were juveniles.

Lophognathus longirostris
Recorded on five occasions. One individual was hand-caught from the minor drainage line at TN04 (R157437), one individual was observed and one pit-trapped at TN12 (R110629), and two individuals were hand-caught from the *Triodia* flat at TN09 (R157377, R157378).

Moloch horridus
Recorded from one observation within the project area.

Pogona minor
This species was recorded from four individuals. Three were pit-trapped from the *Triodia* dune at TN08 (n=1) and the *Triodia* flat at TN10 (n=2) (R157386, R157421), and one was hand caught from an opportunistic location within the project area (R157335). These records were a range extension for the species.

SCINCIDAE

A total of 142 individuals of 14 species were recorded from this family during the current survey.

Carlia munda
Recorded from just a single male pit-trapped from the minor drainage line at TN12 (R157468).

Carlia triacantha
Recorded on four occasions from the savanna at TN01 (n=1) (R157466) and the minor drainage line at TN12 (n=3) (R157406, R157417).

Ctenotus grandis titan
This species was recorded on just two occasions from a pit-trap from the savanna at TN01 (n=1) and an Elliott trap from the *Triodia* flat at TN09 (n=1) (R157473).

Ctenotus helenae
A total of six individuals were recorded from the savanna at TN01 (n=1) (R157342), the *Triodia* flat at TN05 (n=1), the *Triodia* dune at TN08 (n=2) (R157423, R157451) and the minor drainage line at TN12 (n=2) (R157418, R157469).

Ctenotus pantherinus ocellifer
A total of 20 individuals were recorded, 19 of which were pit-trapped from the *Triodia* sandplains at sites TN03 (n=2) (R157461, R157462) and TN06 (n=1), the minor drainage line at TN04 (n=2) (R157340, R157389), the *Triodia* flats at sites TN05 (n=4) (R157387, R157410), TN09 (n=2) (R157383, R157411) and TN10 (n=3), the *Triodia* hillslopes at TN07 (n=1) and TN11 (n=2) (R157424), and the *Triodia* dune at TN08 (n=2) (R157409, R157452). In addition, one individual was caught in an Elliott trap at an opportunistic location (R157425).

Ctenotus piankai
This species was recorded on six occasions, all from pit-traps from the *Triodia* hillslopes at TN02 (n=2) (R110627, R110628) and TN11 (n=4) (R110581, R157412, R157440, R157494).

Ctenotus schomburgkii
Recorded on four occasions from the *Triodia* flat at TN10 (n=3) (R110590, R157443) and the minor drainage line at TN12 (n=1).

Ctenotus tanamiensis
Recorded from only two individuals, both from the *Triodia* flat at site TN09. One individual was pit trapped (R110634), the other individual observed.

Eremiascincus sp.
This species was recorded on eight occasions from the minor drainage line at TN04 (n=2) (R110605, R157335), the *Triodia* sandplain at TN06 (n=3) (R110611 - R110613), the *Triodia* dune site TN08 (n=1) (R157450) and two individuals from opportunistic locations; one from camp, the other whilst road spotting in the project area (R110585).

Lerista bipes
This was the most commonly recorded species, with 69 records from the savanna site at TN01 (n=1), the *Triodia* hillslopes at TN02 (n=8) (R157360, R157364, R157369, R157388) and TN07 (n=2), the *Triodia* sandplains at TN03 (n=22) (R157341, R157361 - R157363, R157367, R157407) and TN06 (n=5), the minor drainage lines at TN04 (n=13) (R157356, R157357, R157359, R157368, R157370, R157373- R157375) and TN12 (n=2), the *Triodia* dune site at TN08 (n=6) (R157358, R157385), and the *Triodia* flats at TN09 (n=4) and TN10 (n=6).

Lerista greeri
Recorded from five individuals from the *Triodia* sandplain at site TN06 (n=1) (R157470), the *Triodia* flats at TN09 (n=1) (R157416) and TN10 (n=2) (R157404, R157420), and the minor drainage line at TN12 (n=1) (R157405).

Menetia greyii
Recorded on eight occasions from the savanna site TN01 (n=3) (R157343, R157344, R157348), the minor drainage lines at TN04 (n=1) (R157337) and TN12 (n=1) (R157408), the *Triodia* flat at TN05 (n=1) (R157397), the *Triodia* sandplain at TN06 (n=1) (R110623) and the *Triodia* hillslope at TN07 (n=1).

Morethia ruficauda ruficauda
Recorded from only three individuals, all pit-trapped from the *Triodia* flats at TN05 (n=2) (R110595, R110596) and TN09 (n=1) (R157472).

Tiliqua multifasciata
This species was recorded on four occasions from the *Triodia* dune at site TN08 (n=1), the minor drainage line at TN12 (n=1) (R157413) and two individuals from Elliott traps from an opportunistic site within the project area.

VARANIDAE

Eighteen individuals of three species were recorded from this family during the current survey.

Varanus acanthurus
This species was only recorded from two individuals. One was pit-trapped from the *Triodia* flat at TN10 (R157385); the other was observed at an opportunistic location within the project area.

Varanus eremius
Recorded from a total of 13 individuals from the savanna at TN01 (n=1) (R157444), the *Triodia* sandplains at TN03 (n=3) (R157457) and TN06 (n=1) (R157401), the *Triodia* flats at TN05 (n=2) (R157456) and TN10 (n=1), the *Triodia* hillslope at TN07 (n=1) and the *Triodia* dune at TN08 (n=4) (R157448, R157449, R157463).

Varanus gouldii
This species was observed on three occasions from the minor drainage line at TN04 (n=2) and from an opportunistic location within the survey area. No individuals were vouchered.

TYPHLOPIDAE

Nine individuals of two species were recorded from this family during the current survey.

Ramphotyphlops diversus

This species was recorded on four occasions, all from pit-traps from the *Triodia* hillslope at TN02 (n=2) (R157464, R157495) and the *Triodia* sandplain at TN03 (n=2) (R157402). Specimens included a gravid female.

Ramphotyphlops grypus

Recorded on five occasions from the minor drainage lines at TN04 (n=1) (R157381) and TN12 (n=1), the *Triodia* sandplain at TN06 (n=1) (R157399), the *Triodia* flat at TN10 (n=1) (R157403), and from an opportunistic location within the survey area (R157334).

ELAPIDAE

Six individuals of three species were recorded from this family during the current survey.

Brachyurophis roperi

Recorded from four juveniles from the *Triodia* flat at TN10 (n=2) (R110598, R157438) and the minor drainage line at site TN12 (n=2) (R157428, R157427). These were the first records of this species in the area.

Simoselaps anomalus

Recorded from one specimen only (R157336), found on the road near the Coyote Balwina campsite.

Suta punctata

Recorded from one male individual only (R110635), found whilst road-spotting on the Tanami Track within the project area.

Appendix 13

Animal Track Sampling Report (Richard Southgate)

The results from animal track sampling in the Western Desert Tanami Project (Coyote and Larranganni Deposits)

Subconsultancy report
for Biota Environmental Services

Prepared by Richard Southgate
Envisage Environmental Services
October 2005

Summary

Introduction
Tanami Gold proposes to mine the Coyote and Larranganni Gold Deposits in the western Tanami Desert, located 30 km from the WA border on the Tanami Track. Biota Environmental Services was commissioned to undertake a fauna habitat and fauna assemblage survey of the Coyote and Larranganni Deposits and an associated haul road in September 2004. A number of species of conservation significance were found and an additional survey was conducted in June 2005 to focus on bilby *Macrotis lagotis* and mulgara *Dasycercus cristicauda* habitat utilisation and to make recommendations on a strategy to ameliorate the impacts of mining and the development of associated infrastructure on these species.

Results
Mulgara sign (tracks, burrows or digs) was recorded on or near five of the 25 plots sampled during the June 2005 survey and fresh bilby sign (tracks or burrows) was recorded on six plots. Sign of the spectacled hare-wallaby *Lagorchestes conspicillatus* was also recorded. The occurrence bilby sign in September 2004 and again in June 2005 plus the occurrence of mulgara sign indicate the proposed development site for the air strip and camp is particularly good habitat or a 'sweet spot' for both species. However, the general prevalence and dispersion of bilby and mulgara sign on the Coyote and Larranganni Deposit was typical for the region and similar to that recorded in 1999 on an adjacent area in the Northern Territory (Puurta Land Trust). Dingo and feral cat sign was common and widespread but no fox sign was observed. Camel sign was also widespread and common but no sign of rabbit was recorded. The absence of rabbits and foxes make this part of the Tanami Desert particularly important for bilby conservation.

Recommendations
The following recommendations arise from the survey of the study area:

1 Fire management

It is considered that the loss of key habitat associated within the construction of the airstrip, camp and associated infrastructure and the impact of road kill from vehicle movements could be offset by the implementation of a fire management program within the lease area to improve food availability and protect refuge habitat of the threatened taxa. Fire management would also reduce the threat to infrastructure from wildfire.

- Some areas would ideally be burnt in late spring or early summer in an effort to prepare the substrate for a high yield of *Yakirra* seed should adequate rainfall occur.
- A burning program could be administered by an organisation such as the Kimberley Regional Fire Management Project with the coordinated involvement of Aboriginal people from the Balgo community.

2 Predator management

It is considered that a build up of introduced predators on the leased area could occur from inappropriate management of garbage refuse and free-standing water. This would

have a negative impact on threatened species populations. In response, a predator management program needs to be developed and implemented.

- Refuse pits need to be caged or regularly covered with topsoil to exclude predators from gaining access to these resources.
- The provision of permanent or semi-permanent free-standing water accessible to introduced predators (and camels) should be discouraged and eliminated where possible.
- A program to specifically trap feral cats and foxes in the vicinity of infrastructure may need to be implemented. Baiting programs should **not** be adopted unless proven to not target dingoes.
- An induction course for members of the workforce should include information outlining the importance of maintaining dingoes within the region as a deterrent to foxes and feral cats. Tolerance of dingoes needs to be encouraged but not for camels, foxes or feral cats.

3 Intermittent monitoring of threatened and pest fauna

A monitoring program to intermittently assess the prevalence of both threatened taxa and introduced species and assess the efficacy of the fire and predator management programs needs to be implemented.

- A program to regularly monitor threatened taxa and introduced predator and herbivore species could be achieved with the coordinated involvement of Aboriginal people from the Balgo community. This program could also be managed by an organisation like the Kimberley Regional Management Fire Project.
- A register for opportunistic records of introduced species may allow Coyote workforce employees to play a role in monitoring the occurrence of threatened and introduced species.

Additionally, a number of the recommendations presented in the Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project Area (Coyote and Larrangani Desposits) (Teale and Hamilton 2005) are supported. These include:

- The key laterite and drainage line habitats for bilby and mulgara within the lease should be left undisturbed as far as practicable within the context of developing the mine and associated infrastructure. Overburden and tailing dumps should not be placed on laterite, surface drainage or paleodrainage lines.
- An exploration Management Plan should be developed to ameliorate potential impacts to either bilbies or mulgaras and their habitat arising from proposed future exploration activities.
- All members of the work force on site should be provided with an environmental induction to ensure they are familiarised with the presence of bilby and mulgara and other threatened species in the area.
- Prior to completion of the project, airstrip and camp lateritic areas will be subject to an investigation to determine specific fauna habitat reconstruction methodologies to maximise the potential for future use by bilbies and mulgaras.

1.0 Introduction

1.1 Project Background

Tanami Gold NL proposes to mine the Coyote and Larranganni Gold deposits. Biota Environmental Services was commissioned to undertake a fauna habitat and fauna assemblage survey of the Coyote and Laranganni Deposits to determine their conservation significance. This was conducted in June 2004. Results from this survey revealed a number of species of conservation significance, including the bilby *Macrotis lagotis* and the mulgara *Dasycercus cristicauda*. It was recommended that an additional seasonal survey be conducted with a particular focus on bilby and mulgara habitat utilisation. The development of a management plan and strategy to ameliorate the impacts of mining and the development of associated infrastructure was also recommended.

Further background to the project is outlined in a report prepared by Teale and Hamilton (2005)

1.2 Aims

The primary aims of the current survey were to:

- Further document the occurrence of threatened taxa, particularly the bilby and mulgara.
- Document the relative abundance or prevalence of these species
- Assess the impacts of mining and the development of infrastructure on the status of these species within the region
- Recommend measures to ameliorate or counteract potential impact.

2.0 Survey Methodology

2.1 Survey Timing and Weather

The survey was conducted over a 9 day period between 13 June-21 June 2005. Rain began on the 17 June and continued until 20 June. Some 50 mm of rain occurred over this period and roadways were very boggy limiting movement. The highly unseasonal rain affected track plot sampling from the 17 June to the end of the survey.

2.2 Survey Team

The survey team comprised Biota personnel including Roy Teale, Zoe Hamilton and Dan Kamien and sub-consultant Ric Southgate.

2.3 Systematic Sampling

2.3.1 Tracking plots

Tracking plots were sampled at 12 trapping grids sampled in September 1004 and at 13 additional locations. Each plot (300 x 200 m) was searched for animal tracks within 50-60 minute period. A GPS was used to define the dimensions of each plot. The species that could be potentially identified at each plot are listed in **Table 2.1**

Each species was recorded as either present or absent based on track identification. The age of the tracks were estimated as 1-2, 3-5 and >5 nights old and their occurrence on a plot were distinguished from those evident on a roadway or track. It has been shown that some species eg. dingoes preferentially use existing roadways to move through the landscape (Mahon *et al.* 1998).Variables that affect tracking conditions including the time of day, wind speed, cloud cover, substrate type (sand, lateritic/rock features, drainage), and litter and ground vegetation cover were recorded at each plot. The occurrence of other sign including diggings, burrows and faecal material associated with a species was also noted. In addition, the presence of food producing plants for the bilby was recorded in particular, the bulb *Cyperus bulbosus*, an annual grass *Yakirra australiense*, bush tomatoes *Solanum* spp. and *Acacia hilliana*, which commonly supports root-dwelling larvae. The time-since-fire was also estimated and classed as recent (<2 years since fire), intermediate (3-6 years since fire) and old (>6 years since fire) based on the size of spinifex clumps and shrubs.

Most plots were spaced at least 4 km apart to reduce the possibility of multiple assessments of bilby and *Dasycercus* individuals. This distance between plots was based on previous research that indicated that the longest axis of bilby nightly home range movements was generally less than 4 km (Southgate and Possingham 1995). Where bilby sign was encountered, five gait measurements were recorded from a sequence of tracks that were clearly produced by a single individual. These measurements can be used to determine if young individuals (3-6 months age) are present at a locality (Southgate, in press).

Data collected during the survey were compared with the data collected from 58 plots sampled in May 1999 to ground-truth an aerial survey of bilby sign (Southgate *et al.* 2005). Each ground-truth plot was 300 x 100m with the long edge aligned parallel to the roadway. Parts of the Puurta Land Trust east of Bald Hill and an area from the WA/NT border to the Granites were surveyed. This area contained a similar mix of habitat types but covered a larger area than the Coyote study area (**Fig. 2.1**).

3.0 Results

3.1 Physical environment

Twenty five plots were sampled in the Coyote survey region in June 2005 (**Fig.2.1**). The substrate at six plots had lateritic or quartzite particles (6-15 mm) with slight topography (TN02, TN10, TN12, A09, A10, B03) and another 13 had a fine wash of lateritic particles (1-6 mm). Three plots were in or adjacent to paleodrainage systems (TN05, TN08A and B05) (**Table 3.1**). The occurrence of *Melaleauca* spp., indicating increasing reliability of subsurface water, was also present at three additional plots (TN09, A08, B01).

Acacia hilliana was recorded on 11 plots but it was scarce on several plots. Sixty five percent of plots with a lateritic substrate or fine lateritic wash had *A. hilliana*. *Solanum* was recorded on one plot (TN06) and no sign of *Yakirra australiense* was evident on any of the plots. Bulbs from *Cyperus bulbosus* were found on plot TN05 and near plot TN08A in a drainage system but only desiccated husks were present.

A number of the plots had vegetation with a mixed fire age (**Table 3.1**). Recently burnt habitat (<2 years since fire) was evident on 52% of the plots, vegetation of intermediate age (3-6 years since fire) was evident on 56% and vegetation of old age (>6 years since fire) was evident on 24% of plots.

3.2 Faunal assemblage

Four marsupial species, three introduced mammal species and two native bird species were recorded. (**Table 3.2**). Fifty eight plots were sampled in the Puurta region of the Northern Territory in 1999. Five additional species were recorded including one marsupial, three introduced mammals and a threatened species of reptile. Goanna *Varanus* spp. and snake sign was recorded on both surveys but these data are not presented.

DASYURIDAE

Dasycercus spp. Mulgara or Ampurta

Dasycercus tracks were observed on three plots (TN02, TN03 and B2) and off-plot near another trapping grid (TN08A) (**Table 3.3**). These could have originated either *D. cristicauda* or *D. hillieri* but were most probably *D. cristicauda* considering a female of this species was excavated from a burrow complex at trapping grid (TN08A). Sign of *Dasycercus* will henceforth be referred to as mulgara. More mulgara sign (burrows and diggings) was found off-plot near TN05 by R. Teale (pers. com.).

Fresh mulgara tracks were encountered more commonly in the Coyote region (p=0.12) than in the Purrta region (p=0.02) (**Table 3.2**) and further north if the opportunistic records from near TN8A and TN05 are included (**Fig. 3.1**).

In the Coyote region, mulgara sign was located most commonly on or in the vicinity of drainage/dune substrates (p=0.33), followed by laterite/quartz substrates (p=0.17) and least commonly on substrates with sand/lateritic wash (p= 0.15 plots). The sign was seen on plots with an intermediate fire age (3-6 years since fire) or a mix of recent (<2 years since fire) and intermediate ages.

THYLACOMYIDAE

Macrotis lagotis Greater bilby

Bilby tracks were recorded from five plots during the Coyote survey (TN02, TN03, TN06, TN09, A09). Burrow activity was recorded at three of these plots and sign of fresh diggings from foraging activity was recorded at only one (TN02). Old diggings into the base of *Acacia hilliana* were recorded from an additional plot (A03) and a reasonably fresh burrow from a large individual (used within the last 2-3 weeks) was found near TN11 (**Table 3.4**).

The proportion of plots with fresh bilby tracks on the Coyote survey (p=0.20) was similar to that encountered on the Puurta survey (p=0.24) (**Table 3.2**) as was the general pattern of dispersion of bilby sign (**Fig. 3.2**). Data from the Puurta region indicated that bilby sign extended further north and south of the Coyote study area on the Northern Territory side of the border.

In the Coyote region, bilby sign was located most commonly on or in the vicinity of plots with laterite/quarts substrates (p=0.33), followed by sand/lateritic wash (p=0.31) and none of the plots located on drainage systems had sign. Bilby sign was seen on plots with an old fire age or on plots with a mix of recent (<2 years since fire) and intermediate ages.

MACROPODIDAE

Macropus rufus Red kangaroo

Red kangaroo tracks were recorded from 10 plots and fresh sign (1-2 nights old) was recorded from 3 plots (TN06, TN05A and A08) (**Table 3.5**). Sign was particularly common from plot A08 and ranging in age from fresh to old (>5 nights). Plot A08 was located in an area that had been burnt in the previous six months.

Sign of red kangaroo was broadly distributed in both the Coyote and the Purrta regions (**Table 3.2** and **Fig. 3.3**)

Lagorchestes conspicillatus Spectacled hare-wallaby

Tracks from what were most likely to be from the spectacled hare-wallaby *Lagorchestes conspicillatus* were recorded from one plot (BO4) (**Table 3.5**). Sign was less widespread and less common on the Coyote survey compared to the Puurta survey (**Fig. 3.4**)

CANIDAE

Canis lupus dingo Dingo

Fresh tracks from dingoes (1-2 nights old) were recorded from 9 plots during the current Coyote survey (**Table 3.6**). A further 5 plots had sign if tracks along roadways were included. The survey in Puurta region indicated dingoes were widespread (**Fig. 3.5**) and relatively common (p=0.57) compared to the sign in the Coyote (p=0.36) region (**Table 3.2**).

FELIDAE
Felis catus Feral cat
Feral cat tracks were recorded from 14 plots and 7 of these had fresh sign (1-2 nights old) (**Table 3.6)**. Sign was widespread (**Fig. 3.6**) and common in the Coyote (p=0.28) and the Puurta (p=0.57) region.

CAMELIDAE
Camelus dromedarius One humped camel
Camel tracks from were recorded from 11 plots during the current survey. However, fresh sign was restricted to five plots and most sign was observed on roadways (**Table 3.6**). Sign was more common and widespread on the Coyote survey compared to the Puurta survey (**Fig. 3.7**).

DROMAIIDAE
Dromaius novaehollandiae Emu
Two emus were seen 1 km from the Coyote camp on the 22 June. Fresh sign of the emu was recorded on two plots and older sign from another three plots was also evident (**Table 3.5**). Sign of emu in the Puurta survey area were also reasonably uncommon (**Fig. 3.8**).

OTIDIDAE
Ardeotis australis Australian bustard
Tracks of bustard were common and recorded from 19 plots but only 11 plots had fresh sign (**Table 3.5**). Sign of bustard was also very common in the Puurta survey region (**Fig. 3.9**).

Other species recorded
A number of species were recorded during the Puurta survey but not during the Coyote survey. Sign of donkey *Equus asinus* was common and reasonably widespread (**Table 3.2**). Sign of the northern nail-tail wallaby *Onychogalea unguifera* and giant desert skink *Egernia kintorei* was recorded along the Tanami Highway at a similar latitude to the Coyote deposit. Sign of the red fox *Vulpes vulpes* was also seen at this latitude plus just south of the Gardiner Range, north east of Laranganni. Sign of cattle *Bos taurus* was restricted to the proximity of the Gardiner Range. Similarly, most sign of donkey was seen in this area but some sign extended further south (**Fig. 3.10**)

4.0 Discussion

4.1 Monitoring techniques

The track plot technique is well suited to detect less common or neophobic species and has been used to monitor the relative abundance and distribution of a range of animal species (Engeman *et al.* 2000; Southgate *et al.* 2005). However, the technique is affected by disturbance from rainfall or strong wind that can eliminate tracks from the substrate surface. The problem is not limited to indirect survey techniques because aseasonal rain and cool temperatures can also affect the number and type of species captured using conventional trapping techniques. The rain received in the second half of the survey reduced the number of plots that could be sampled and the possibility of obtaining a reasonable number of samples to compare the species assemblage on plots with and without lateritic substrate from the Coyote and Larranganni Deposits and adjacent areas. A comparison of data from the Coyote region with that from the Puurta region does allow a broad view of the dispersion pattern and relative abundance or prevalence of select species within the north-west Tanami region. However, comparison of these data must be treated with extreme caution because of differences in the plot size and large gap in time between surveys.

4.2 Assemblage

The general prevalence and dispersion of bilby and mulgara sign on the Coyote survey was similar to that recorded on the Puurta survey. The Puurta survey indicated that bilby sign extended further north than the Laranganni deposit. This corresponds with reports of bilby sign extending as far north Gordon Downs station and Ruby Plains station in WA (Southgate 1990). Scattered sign of the bilby extends throughout the Tanami and Great Sandy Deserts (**Fig. 4.1**). Opportunistic sign of bilby diggings and burrows was reported from TN03 on the previous survey (Teale and Hamilton 2005). The persistence of fresh bilby sign at TN03 and evidence of fresh track and burrow sign in the near vicinity at TN02 and TN06 suggest this general area is important habitat for the bilby.

Both the Coyote and the Puutra surveys indicate that *Dasycercus* sign, most probably that of the mulgara *Dasycercus crsticauda*, was encountered less commonly than the bilby within the region. The records represent the current northern limit of distribution for mulgara in Western Australia (**Fig. 4.2**). Opportunistic sign of mulgara was reported from around TN05 and TN08A on the previous survey (Teale and Hamilton 2005). Additional records of mulgara sign obtained during the current survey suggest that the area where the paleodrainage system intersects with the haul road may provide important core habitat for the mulgara population. Mulgara sign was not restricted to the paleodrainage systems and was also found on TN02 substrates with a high lateritic component or sand substrates with a fine lateritic wash (TN03 and B02). The co-occurrence of the mulgara and bilby at TN02 and TN03 suggests that this area is particularly good habitat or a ‘sweet spot’ for both species.

The Coyote study area represents the northern limit for a number of other species that display an arid or temperate zone distribution including *Egernia kintorei* and the

European rabbit *Oryctolagus cuniculus*. While rabbits were not recorded on either the Coyote or Puurta surveys, sign has been recorded from plots sampled further to the east and south east near Rabbit Flat and the Granites in 1999 (Southgate, unpublished). Fox sign was also not recorded on the Coyote survey but was recorded north of the Larranganni latitude on the Puurta survey. In the Northern Territory there has been a noticeable northward expansion of fox distribution in recent times. Sign was regularly encountered at a latitude 19^{o} S during survey work 1996-1999 (Paltridge and Southgate 2001) but not previously by Gibson (1986) during survey work in the early 1980s. It is not known how variable the northern limit in distribution might be in response to changes in annual rainfall and temperature among years. The abundance and distribution of the camel has also dramatically increased since the early 1980s. Sign was recorded commonly on the Coyote survey but less so on the Puurta survey. It was rare to encounter camel sign further south around the Granites in the 1980s (Gibson 1986).

Both the Coyote and Puurta surveys indicated that red kangaroo, bustard, feral cat and dingo were common and widespread whereas the emu was widely distributed but not as common. The spectacled hare-wallaby and donkey were reasonably common and widespread in 1999 in the Puurta survey area compared to the Coyote area suggesting that the population size or dispersion may vary considerable among years. No sign of hare-wallaby was recorded during the September 2004 survey (Teale and Hamilton 2005) but they indicated that sightings of a small macropod matching the description of this species had been reported by exploration personnel on the Tanami site and a road kill had been reported from near Balgo. The northern nail-tail wallaby was neither widely distributed nor common in the two study areas and is typically more abundant further north where spinifex is less dominant (Ingelby 1991); Southgate pers. obs.). Bush stone curlew is also now largely restricted to more northern latitudes and no sign was seen in either study area (Southgate, pers. obs). Similarly, no sign of *Notoryctes* was seen on either the Coyote or the Puurta survey. The tracks of *Notoryctes* are quite distinctive and it is known they do come to the surface occasionally however, these occurrences appear to be extremely rare throughout central Australia.

4.3 Threats to conservation significant taxa

Three mammal species of conservation significance were recorded in the project area during the current survey. These were the mulgara *Dasycercus cristicauda,* the bilby *Macrotis lagotis* and spectacled hare-wallaby *Lagorchestes conspicillatus.*

The Bilby is listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003.* Sign of this species is encountered more commonly in certain habitats such as paelodrainage lines, areas with lateritic substrate and recently burnt habitat (Southgate *et al.* 2005; Southgate in prep). This means that much of arid Australia, which is dominated by sand plain, does not provide favourable habitat for the species. Few localities are used persistently by individuals. Only two of the 15 sites visited regularly over a three year period in the Tanami Desert showed sign of regular activity (Paltridge and Southgate 2001).

The Mulgara is also listed as vulnerable under the *EPBC Act 1999* (a referral has been lodged under this legislation), and as Schedule 1 under the *Wildlife Conservation Notice 2003*. In both the NT and WA the species conservation status could probably be revised downwards (Masters 2005). This species apparently prefers mature spinifex (*Triodia* spp.) with clear runways between hummocks (Baker 1996; Masters 1998). Populations are thought to contract to core habitat areas during harsh years and have also been documented as undergoing rapid expansions in response to good conditions (Baker 1996).

The spectacled hare-wallaby *Lagorchestes conspicillatus* is listed as Priority 4 under the *Wildlife Conservation Notice 2003.*

The threats to these species nationally relate primarily to predation pressure, degradation of key habitat refugia from introduced herbivores and altered fire regime (Burbidge and McKenzie 1989; Masters 1991; Morton 1990; Southgate 1990). Other threats such as habitat modification can become important at a regional or localised scale (McCarthy and Masters, in press).

4.3.1 Predation

Predation pressure is recognised widely as the primary threat to many medium size mammals in arid Australia both from correlative analysis of species distributions and reintroduction experiments (Christensen and Burrows 1995; Gibson *et al.* 1994). The combined affect of three sympatric predators species (feral cat, fox and dingo) is particularly devastating for a medium-sized mammal community. While dingoes, foxes and feral cats are widespread there is a significant difference in their distribution and prevalence. Dingoes and feral cats are both widespead in Australia but there is a greater prevalence of dingoes in the northern, higher rainfall parts of the Tanami Desert and the reverse trend for feral cats (Southgate, submitted). Fox prevalence diminishes toward the warmer and moister parts of the continent and, until recently, showed a similar distribution pattern to that of the rabbit. In the southern two thirds of the Tanami Desert all three predator species are sympatric. Of the three threatened taxa, the mulgara has shown greatest tolerance to predator pressure and reasonable populations occur in parts of the southern Tanami. The bilby shows a significant negative association with fox occurrence (Southgate *et al*., submitted) and this is probably the case for the spectacled hare-wallaby. The Coyote study area is important to the conservation of threatened taxa because it is positioned where fox prevalence is still naturally sparse.

4.3.2 Key habitat refugia and introduced herbivores

Paleodrainage systems in the arid environment of Australia are recognised as a key habitat for medium-sized mammals because they are areas where nutrients accumulate and the supply of water to plants is more reliable than sand plain and laterite substrates (Stafford Smith and Morton 1990). The three threatened taxa are not limited to paleodrainage habitat but these areas offer refugia to the species especially in times of severe drought. The bulb *Cyperus bulbosus* is limited to paleodrainage systems and forms an important food for the bilby (Latz, 1995; Southgate and Carthew, submittted).

Degradation of these systems can occur if invaded by herbivores such as camels and rabbits (Morton 1990). This is why paleodrainage systems in arid Australia that are least affected by rabbits have been identified as extremely important for conservation (Morton *et al.* 1995) and the increase in camel abundance is of great concern (Edwards *et al.* 2004).

Reasons for the importance of laterite substrate to threatened taxa are not as well documented. The substrates are typically elevated slightly and therefore, provide areas of localised runoff and run-on that may be sufficient to stimulate plant growth more readily than areas of sand plain with flat topography. The composition of plant species on laterite substrates is also distinctive. *Acacia hilliana* is a common feature on laterite areas and this plant is among a group of *Acacia* species that are occupied by root-dwelling larvae (Latz 1995). The plant is relatively small and prostrate and the roots can be ripped apart by bilbies intent on removing the larvae for food. *Triodia basedowii* also commonly occurs on laterite particularly in the more northern parts of this species' distribution. This spinifex species typically forms very neat hummocks with clear intervening runways making foraging and movement relatively easy for a medium-sized mammal compared to areas with *T. schinzii* and *T. pungens* which often has a stoloniferous growth form.

4.3.3 Fire regime

Fire is important for medium sized mammals because of its affect on the amount of refuge habitat and availability of food (Burbidge *et al.* 1988). Hare-wallabies require long-unburnt spinifex hummocks or similar cover for nesting (Lundie-Jenkins 1993) but often make use of nutritious forbs and herbs that may occur soon after fire (Lundie-Jenkins *et al.* 1993). Mulgaras do not require long-unburnt vegetation for nesting habitat however, populations are adversely affected when habitat is burnt or cleared (Masters 1993; McCarthey and Masters, in press.). It is thought that mature vegetation provides cover for the species while it is foraging and habitat for many prey items.

Bilbies can be found in long unburnt and recently burnt habitat. In the central part of the Tanami Desert there is a significant positive association between bilby prevalence and recent fire (<2 years old). The link between prevalence and fire is related to the diet of the bilby and the importance of some food items that are promoted by fire including *Solanum* spp. and short-lived grasses like *Yakirra australiense*. Seed from *Yakirra*, when available, can form a dominant component of the bilby diet and the abundance of this food resource is thought to support a higher density of bilbies than would otherwise occur when reliant primarily on invertebrates (Southgate and Carthew, submitted). Studies of arid rodent species also show a strong response to fire age and rainfall (Masters 1993; Southgate and Masters 1996). Although a sizeable portion of the Coyote study area had been recently burnt, there was little evidence of *Yakirra australiense.* This suggests that insufficient rain had occurred following fire to stimulate widespread and abundant germination of these plants.

4.4 Potential impacts from mining

There are a number of direct and indirect impacts that are typically associated with mining and infrastructure proposals of a similar scale to the proposed Western Tanami project. **For the three species of threatened fauna identified, some of the impacts associated with mining can have positive repercussions while others will be negative.** The most important direct impact relates to direct loss of habitat from mining operations and the possibility of increased death rate during construction and mine operations (eg. road deaths). The most important indirect impacts relate to the affect of roads and mining operations on fire regime and feral predator and herbivore activity and abundance. Other important indirect modifications may also occur to fauna habitat as a result of the construction and operation of the mines and haul road. These may include changes to surface hydrology, increased erosion and weed introduction or spread (Teale and Hamilton 2005).

4.4.1 Direct impact: loss of key habitat

Direct loss of habitat can occur with the establishment of:

- new mine pits;
- a processing plant;
- associated mine infrastructure (e.g. waste dumps, haul roads);
- a haul road between the Larranganni deposits and processing plant (approximately 40 km in length); and
- associated infrastructure (a new camp, mine offices, new airstrip, power transmission lines, bulk fuel storage, vehicle workshops, etc.).

It is proposed that the airstrip and the new campsite be located on an elevated laterite unit to provide for better all-weather access to the site. This will result in the removal of approximately 31 ha of lateritic habitat and remove about 3.5% of the 884 ha of laterite habitat from within a 50 km radius around the project area (Teale and Hamilton, 2005). All three species occur on laterite substrates but the bilby would be most susceptible to this loss of habitat. It is likely that key habitat for the bilby and mulgara would be lost with the construction of the proposed airstrip and new camp site and this would have a negative impact on the bilby and mulgara population.

4.4.2 Direct impacts: during construction and operations

The loss of mulgara and the bilby individuals residing in burrows could occur during the earthworks associated with the development of the campsite, airstrip and mine pits. Individuals from each species may also suffer mortality from road kill with greater vehicle and haulage movements and this would have a negative impact on their populations.

4.4.3 Indirect impacts: Introduced predators and herbivores

There are two main factors that can alter the dynamics of introduced predator and herbivore populations. Firstly, the development of a road network allows species such as the dingo, camel and fox to disperse easily and reduce energetic demand in moving between habitats. Access to road kill can also reduce foraging pressure confronting these predator species. Secondly, the development of a camp and some mining and pit operations can increase the availability of food and free-standing water for these species. Garbage dumps provide excellent scavenging and den localities for feral cats and foxes. The combined effect of a road network plus increased availability of food and water would result in a greater abundance and persistence of introduced predator species and a to lesser degree herbivore species around mining operations, stations and communities. With the availability of these resources, these species can remain abundant instead of declining during seasonally dry periods when food and water would normally be scarce. A build up of foxes and cats would have a negative impact on the threatened species taxa. The continued presence of dingoes is of less concern because the threatened taxa have demonstrated a resilience to this species and, of more significance, a resident dingo population may effectively reduce the abundance of foxes and feral cats (Southgate *et al*., submitted).

4.4.4 Indirect impacts: Fire

A more extensive road network tends to increase the chance of fire ignition from human activities however, roadways can act as fire breaks and limit the spread of fires. These two features result in greater heterogeneity of fire age and size surrounding mining camps and communities compared to uninhabited regions with similar landscape features. A more extensive fine-grained fire heterogeneity would improve habitat suitability and have a positive impact on the three threatened taxa for the reasons outlined in Section 4.3.3.

5.0 Recommendations

5.1 Fire management

It is considered that the loss of key habitat associated within the construction of the airstrip, camp and associated infrastructure and the impact of road kill from vehicle movements could be offset if a fire management program was implemented within the lease area to improve food availability and protect refuge habitat of the threatened taxa. Fire management would also reduce the threat to infrastructure from wildfire.

- Some areas would need to be burnt in late spring or early summer in an effort to prepare the substrate for a high yield of *Yakirra* seed should adequate rainfall occur.
- A burning program could be administered by an organisation such as the Kimberley Regional Fire Management Project with the coordinated involvement of Aboriginal people from the Balgo community (see Appendix 1 for more details).

5.2 Predator management

It is considered that a build up of introduced predators on the leased area could occur from inappropriate management of garbage refuse and free-standing water This would have a negative impact on threatened species populations. In response, a predator management program needs to be developed and implemented

- Refuse pits need to be caged or regularly covered with topsoil to exclude predators from gaining access to these resources.
- The provision of permanent or semi-permanent free-standing water accessible to introduced predators should be discouraged and eliminated where possible.
- A program to specifically trap feral cats and foxes in the vicinity of infrastructure may need to be implemented. Baiting programs should **not** be adopted unless proven to not target dingoes.
- An induction course for members of the workforce should include information outlining the importance of maintaining dingoes within the region as a deterrent to foxes and feral cats. Tolerance of dingoes needs to be encouraged but not for camels, foxes or feral cats.

5.3 Intermittent monitoring of threatened and pest fauna

A monitoring program to intermittently assess the prevalence of both threatened taxa and introduced species and assess the efficacy of the fire and predator management programs needs to be implemented.

- A program to regularly monitor threatened taxa and introduced predator and herbivore species could be achieved with the coordinated involvement of Aboriginal people from the Balgo community. This program could also be managed by an organisation like the Kimberley Regional Management Fire Project. A fauna monitoring and fire management program has been implemented on the Newmont mining leases in the Tanami Desert in a joint venture between Newmont, the Central Land Council, Aboriginal traditional owners and environmental consultants.
- A register for opportunistic records of introduced species may allow Coyote workforce employees to play a role monitoring the occurrence of threatened and introduced species.

Additionally, a number of the recommendations presented in the Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project Area (Coyote and Larrangani Desposits) (Teale and Hamilton 2005) are supported. These include:

- The key laterite and drainage line habitats for bilby and mulgara within the lease should be left undisturbed as far as practicable within the context of developing the mine and associated infrastructure. Overburden and tailing dumps should not be placed on laterite, surface drainage or paleodrainage lines.
- An exploration Management Plan should be developed to ameliorate potential impacts to either bilbies or mulgaras and their habitat arising from proposed future exploration activities.
- All members of the work force on site should be provided with an environmental induction to ensure they are familiarised with the presence of bilby and mulgara and other threatened species in the area.
- Prior to completion of the project, airstrip and camp lateritic areas will be subject to an investigation to determine specific fauna habitat reconstruction methodologies to maximise the potential for future use by bilbies and mulgaras.

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Table 2.1 The fauna able to be identified from track and gait characteristics using the plot sampling technique and the status of the species as listed in WA and nationally.

Fauna	**State WA**	**IUCN/SSC**
Native mammals		
marsupial mole *Notorycted* spp.	Schedule 1	endangered
echidna *Tachyglossus aculeatus*		low risk
bilby *Macrotis lagotis*	Schedule 1	vulnerable
mulgara or ampurta *Dasycercus* spp.	Schedule 1	vulnerable
spectacled hare-wallaby *Lagorchestes conspicillatus*	Priority 3	low risk
northern nail-tail wallaby *Onychogalea unguifera*		low risk
red kangaroos *Macropus rufus*		low risk
Introduced mammals		
red fox *Vulpes vulpes*		
feral cat *Felis catus*		
dingo *Canis familiaris*		
European rabbit *Oryctolagus cuniculus*		
camel *Camelus dromedarius*		
cattle *Bos taurus*		
donkey Equis		
Native reptiles		
gonnna *Varanus* spp.		
Giant desert skink *Egernia kintorei*	Schedule 1	vulnerable
Native birds		
emu *Dromaius novaehollandiae*		
Australian bustard *Ardeotis australis*	Priority 4	
bush stone curlew *Burhinus grallarius*	Priority 4	

Table 3.1 Coordinates, shrub and ground vegetation primary composition and estimated cover, surface trackability, substrate type and fire age for the plots sampled in June 2005 within the Coyote study area (Location format: UTM WGS84 Zone 52). Euc=*Eucalyptus*; Ac=*Acacia*; Mel=*Melaleuca*; Gr=*Grevillea*; Tr spp.=*Triodia* species; Trpun=*T. pungens*; Trsch=*T. schinzii*; Achil=*Acacia hilliana.* Lat=laterite (size range in mm); Rec=1-2 yrs, Int=3-6 yrs, Old>6 yrs.

Site	Date	Time	Easting	Northing	Shrub	Ground		Cover	Trackability	Substrate	Fire age
TN01	13-Jun-05	1105	481892	7799589	Euc, Ac	Tr spp.		20-30	good	Lat wash (1-3)	Int
TN02	13-Jun-05	915	485351	7800754	Euc	Trpun	Achil	30	good	Lat (10-30)	Rec,Int
TN03	13-Jun-05	1015	485961	7799693	Ac,Gr	Trsch		10-30	good	Lat wash (1-3)	Rec,Int
TN04A	14-Jun-05	1410	484324	7804134	Euc	Trsch		40	good	Sand	Rec,Old
TN05	13-Jun-05	1550	486924	7829246	Mel	Trpun			poor	Drainage	Int
TN06	13-Jun-05	1300	483953	7803162	Euc, Gr	Trpun		20	good	Sand	Rec,Int
TN07	13-Jun-05	1430	488053	7825607	Euc, Ha	Trpun		35-40	poor, crusty	Calc (>100)	Int
TN08A	13-Jun-05	1500	488028	7826021	Euc, Mel	Trpun			good on dune	Sand	Int
TN09	14-Jun-05	830	486414	7833953	Euc	Trpun	Achil	30	good	Lat wash (2-3)	Old
TN10	14-Jun-05	1230	485453	7833477	Euc, Ac	Trpun	Achil	40	poor, crusty	Lat wash (1-5)	Old
TN11	14-Jun-05	1000	485899	7834987	Euc	Tr spp.		30	ok	Lat wash (2-3)	Old
TN12	14-Jun-05	1130	485361	7833919	Euc, Ac	Tr spp.		30	ok	Qtz, Lat (5-12)	Old
A01	15-Jun-05	1300	476082	7801781	Ac	Trpun	Achil		ok, crusty	Sand, lat (2-3)	Int
A02	15-Jun-05	1520	490996	7800814	Euc, Gr	Trpun	Achil	20	ok	Lat (1-10)	Rec, Int
A03	15-Jun-05	1625	495341	7800469	Ac, Gr	Trpun		20-40	ok, crusty	Sand	Int, Old
A07	16-Jun-05	1150	485353	7806684	Euc, Gr	Tr spp.		20	ok, crusty	Sand, lat wash	Rec
A08	16-Jun-05	1050	487589	7812119	Euc, Gr	Trpun	Achil	5	good	Sand, lat wash	Rec<1yr
A09	17-Jun-05	815	483295	7801676	Euc	Tr spp.	Achil	10-15	poor, spatter	Lat (3-20)	Rec
A10	16-Jun-05	1440	473374	7801648	Euc	Trsch	Achil	35/10	ok/good	Lat (4-10)	Int,Rec
A11	16-Jun-05	1555	501205	7799904	Euc, Ac	Trpun	Achil	10	good	Sand, lat (3-4)	Rec,Int
B01	17-Jun-05	1020	487460	7792300	Ac, Euc	Tr spp.		20	poor, spatter	Sand, lat (3-4)	Rec
B02	17-Jun-05	1115	481267	7792318	Euc, Ac	Tr spp.	Achil	20	ok, crusty	Sand, lat (3-4)	Rec, Int
B03	17-Jun-05	1400	481890	7788794	Euc, Ac	Tr spp.	Achil	20-25	ok, crusty	Quartz, lat (3-15)	Rec
B04	17-Jun-05	1500	477997	7795082	Euc, Gr	Tr spp.	Achil	25	ok	Laterite (3-6)	Rec,Int
B05	17-Jun-05	1610	474973	7796271	Euc, Mel	Tr spp.		20	ok	Drain, lat (2-3)	Int

Table 3.2 Fauna identified using track and gait characteristics with the plot sampling technique in the Coyote survey compared with the Purrta survey area. The proportion of plots with fresh (1-2 night) sign in each region is identified.

	Coyote n=25	Puurta n=58
Native mammals		
bilby *Macrotis lagotis*	0.2	0.24
mulgara or ampurta *Dasycercus* spp.	0.12	0.02
spectacled hare-wallaby *Lagorchestes conspicillatus*	0.04	0.22
northern nail-tail wallaby *Onychogalea unguifera*	0	0.02
red kangaroos *Macropus rufus*	0.12	0.31
Introduced mammals		
red fox *Vulpes vulpes*	0	0.03
feral cat *Felis catus*	0.28	0.57
dingo *Canis familiaris*	0.36	0.57
camel *Camelus dromedarius*	0.2	0.02
cattle *Bos taurus*	0	0.05
donkey Equiis	0	0.12
Native reptiles		
Kintore’s desert skink *Egernia kintorei*	0	0.02
Native birds		
emu *Dromaius novaehollandiae*	0.08	0.07
Australian bustard *Ardeotis australis*	0.44	0.57

Table 3.3 Occurrence and estimated age of *Dasycercus* sign detected on tracking plots during the Coyote survey June 2005. * indicates sign observed off plot.

Site	Occurrence & age (nights) Tracks	Occurrence & age (months) Diggings	Burrows	Estimate no. of individuals	Notes
TN01	0	0	0	0	
TN02	1 (1-2)	0	0	1	
TN03	1 (1-2)	0	0	1	
TN04A	0	0	0	0	
TN05	0	1*	1*	0	Sign seen off plot
TN06	0	0	0	0	
TN07	0	0	0	0	
TN08A	1* (1-2)	0	1*	0	Tracks seen off plot (and mulgara dug from burrow)
TN09	0	0	0	0	
TN10	0	0	0	0	
TN11	0	0	0	0	
TN12	0	0	0	0	
A01	0	0	0	0	
A02	0	0	0	0	
A03	0	0	0	0	
A07	0	0	0	0	
A08	0	0	0	0	
A09	0	0	0	0	
A10	0	0	0	0	
A11	0	1*	0	0	Mulgara-like digs, no tracks
B01	0	0	0	0	
B02	1 (1-2, 3-5)	0	0	1	
B03	0	0	0	0	
B04	0	0	0	0	
B05	0	0	0	0	

Table 3.4 Occurrence and estimated age of bilby sign detected on tracking plots during the Coyote survey June 2005. * indicates sign observed off plot.

	Occurrence & age (nights)	Occurrence & age (months)		Estimate no.
Site	Tracks	Diggings	Burrows	of individuals
TN01	0	0	1	0
TN02	1 (1-2)	1 (<1)	1 (<1)	2
TN03	1 (1-2)	0	1 (<6)	2
TN04A	0	0	0	0
TN05	0	0	0	0
TN06	1 (1-2, 3-5)	0	1 (<5)	1
TN07	0	0	0	0
TN08A	0	0	0	0
TN09	1 (1-2)	0	0	1
TN10	0	0	0	0
TN11	0	0	1* (<1)	0
TN12	0	0	0	0
A01	0	0	0	0
A02	0	1 (<4)	0	0
A03	0	0	0	0
A07	0	0	0	0
A08	0	0	0	0
A09	1 (1-2, 3-5)	0	0	1
A10	0	0	0	0
A11	0	0	0	0
B01	0	0	0	0
B02	0	0	0	0
B03	0	0	0	0
B04	0	0	0	0
B05	0	0	0	0

Table 3.5 Occurrence and estimated age of the red kangaroo, spectacled hare-wallaby, emu and bustard sign detected on tracking plots during the Coyote survey June 2005

	Hare wallaby		Red kangaroo		Emu		Bustard	
Site	Plot	age (nights)	Road	age (nights)	Road	age (nights)	Road	Plot age (nights)
TN01	0		1	>5	0		0	
TN02	0		0		1	>2	1	1-2
TN03	0		0		0		1	>2
TN04A	0		1	1-2	0		1	>2
TN05	0		0		0		0	
TN06	0		1	1-2, 3-5	0		1	1-2
TN07	0		0		0		0	
TN08A	0		0		0		1	1-2
TN09	0		0		0		1	1-2
TN10	0		0		0		1	
TN11	0		1	>5	0		1	1-2, >2
TN12	0		0		0		1	1-2
A01	0		0		0		1	>2
A02	0		1	>5	0		1	>2
A03	0		1	>5	1	1-2	0	
A07	0		1	>5	0		1	>2
A08	0		1	1-2, 3-5	1	1-2	1	1-2
A09	0		0		1	>2	1	1-2
A10	0		0		0		0	
A11	0		0		0		1	1-2
B01	0		0		0		0	
B02	0		1	>5	1	>2	1	>2
B03	0		0		0		1	1-2
B04	1	1-2	0		0		1	>2
B05	0		1	>5	0		1	1-2

Table 3.6 The occurrence and estimated age of feral cat, dingo and camel sign detected on tracking plots during the Coyote survey June 2005

Site	Feral cats Road	Plot	age (nigths)	Dingo. Road	Plot	age (nights)	Camel Road	Plot	age (nights)
TN01	1	1	>5	1	1	1-2,>5	0	0	
TN02	0	0		0	0		0	0	
TN03	1	1	3-5	1	1	1-2	0	0	
TN04A	1	1	>5	0	0		1	0	>5
TN05	0	0		1	0	1-2	1	0	1-2
TN06	1	0	1-2	1	1	1-2	0	0	
TN07	0	0		1	0	1-2	1	0	1-2
TN08A	1	0	3-5	1	0	1-2	1	1	>5
TN09	0	1	3-5	0	1	3-5,>5	0	0	
TN10	1	1	1-2	1	1	1-2	1	0	1-2
TN11	1	1	1-2,>5	1	1	1-2	0	0	
TN12	1	1	1-2	1	1	1-2	0	0	
A01	0	1	1-2,>5	1	0	3-5	0	0	
A02	1	1	1-2,>5	1	1	>5	0	0	
A03	1	1	3-5	0	0		0	1	1-2
A07	0	1	3-5	0	0		0	1	3-5
A08	0	0		0	0		0	0	
A09	0	0		0	0		1	0	1-2
A10	1	1	3-5	0	0		0	0	
A11	1	1	1-2	0	0		0	0	
B01	1	0	3-5	0	0		1	0	>5
B02	1	1	3-5	1	0	3-5	0	0	
B03	0	1	3-5	0	0		0	1	>5
B04	0	0		1	1	3-5,>5	0	0	
B05	0	0		1	0	3-5	0	1	>5

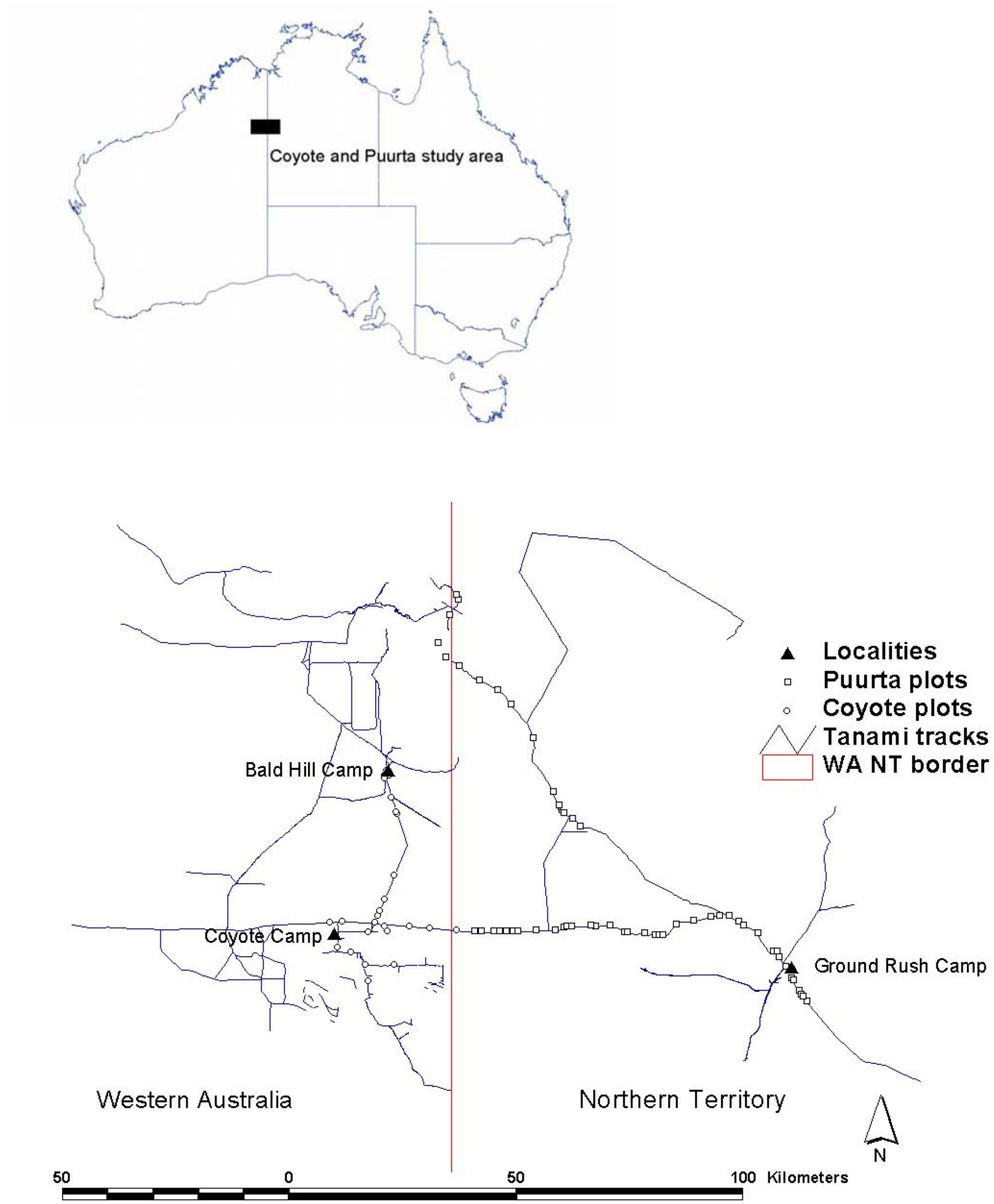

Fig. 2.1 Location of the Coyote and Puurta plots in the study area and locality of the project area

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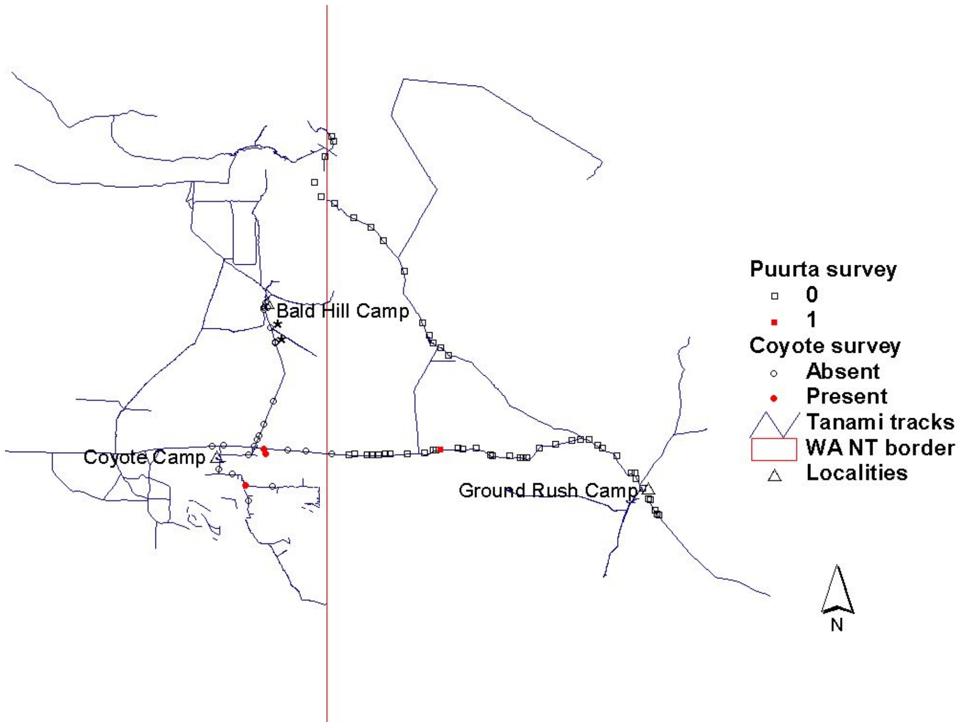

Fig. 3.1 *Dasycercus* sign (1-2 nights old) recorded on plots sampled in the Coyote survey area and the Puurta region. * indicates where mulgara sign was recorded off plot.

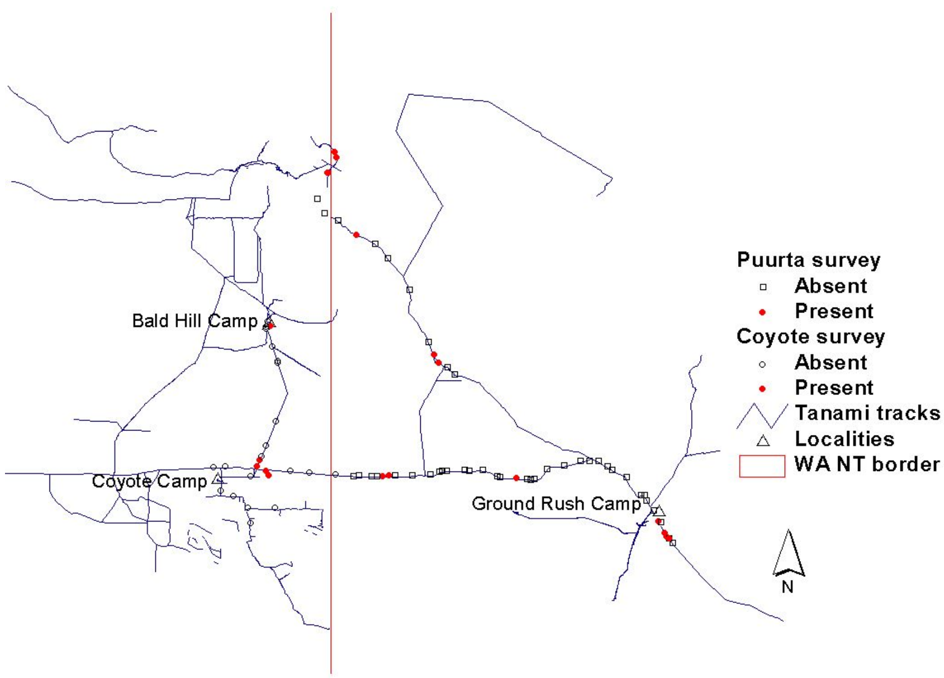

Fig. 3.2 Bilby sign (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

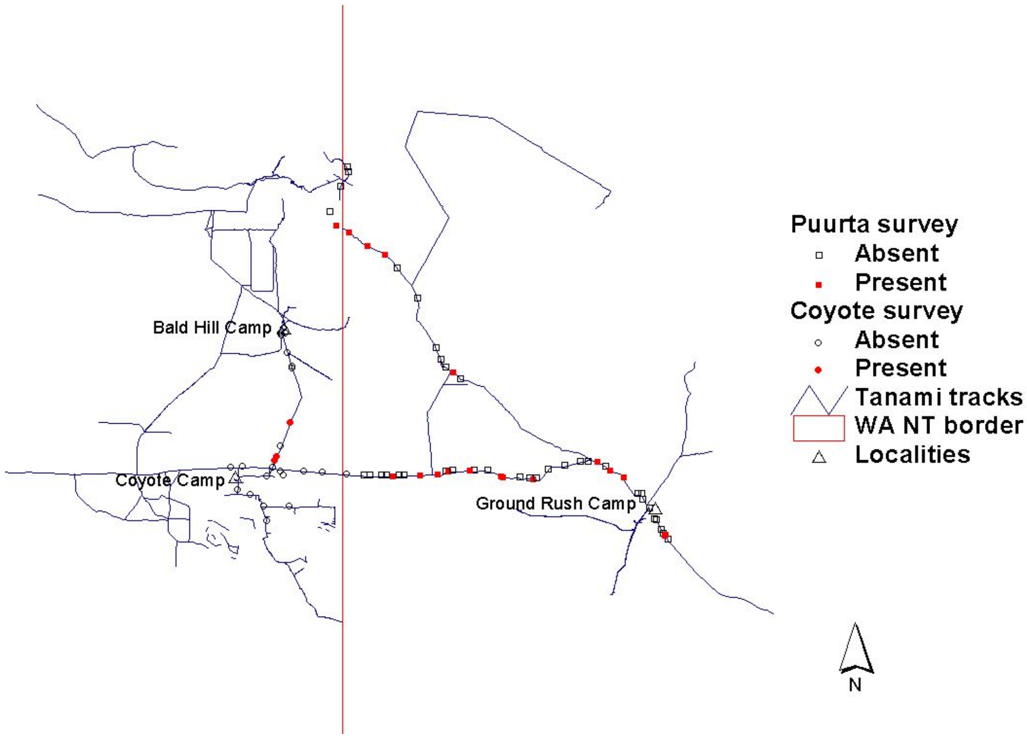

Fig. 3.3 Red kangaroo sign (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

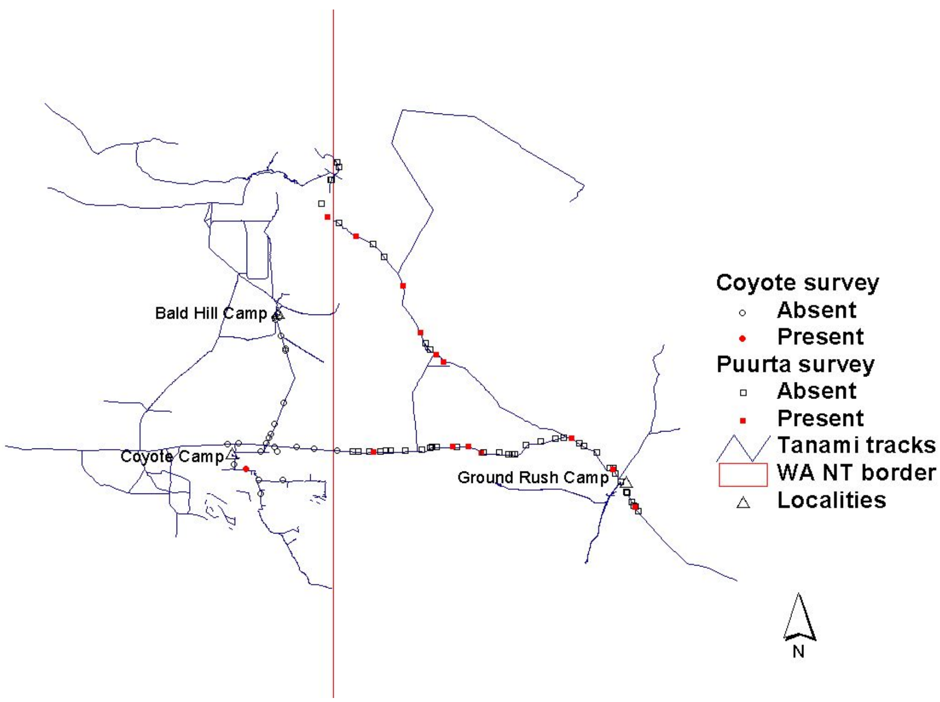

Fig. 3.4 Spectacle hare-wallaby sign (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

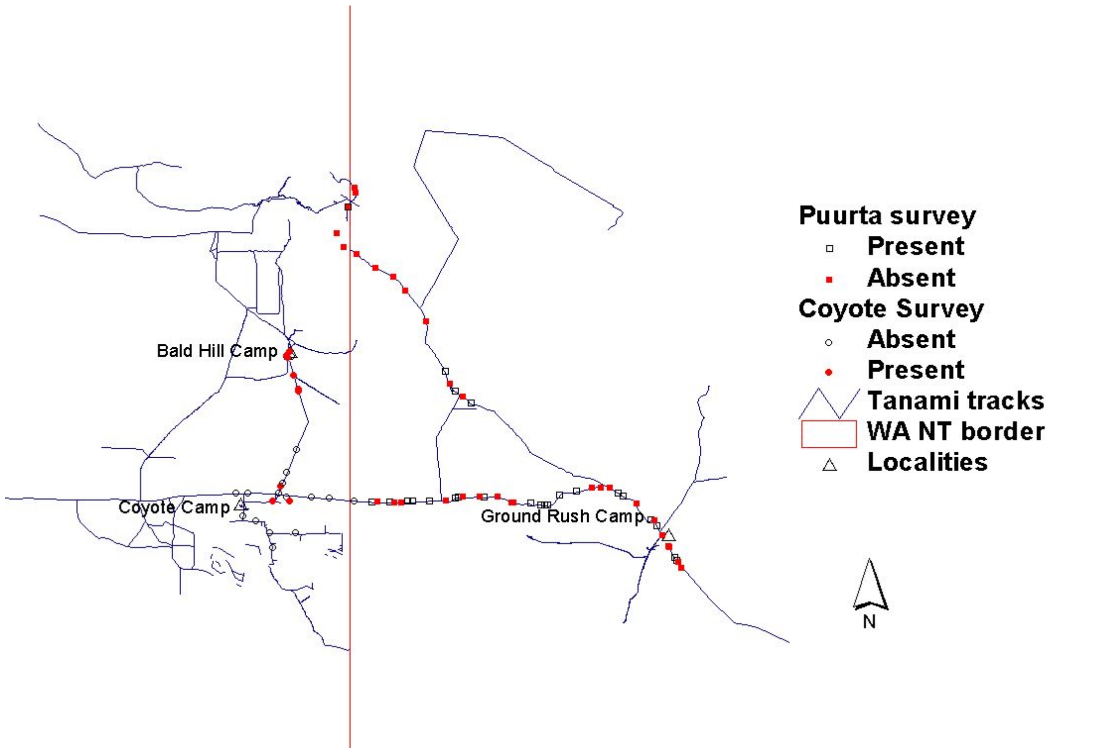

Fig. 3.5 Dingo sign (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

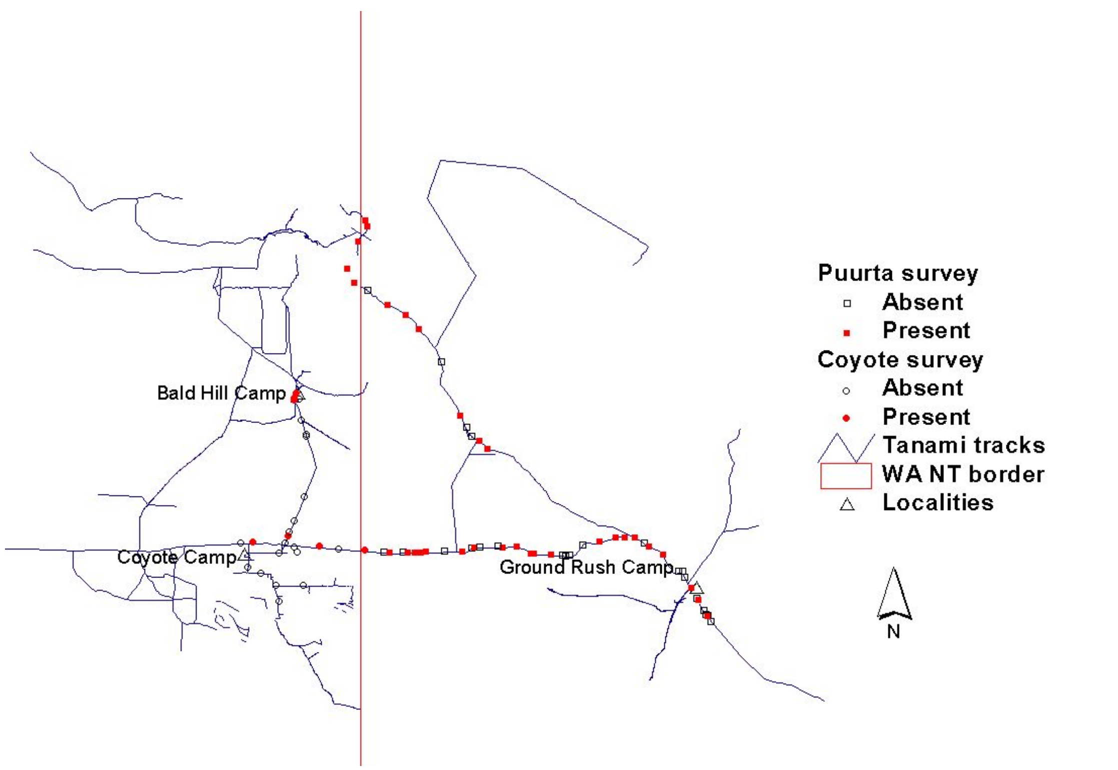

Fig. 3.6 Feral cat (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

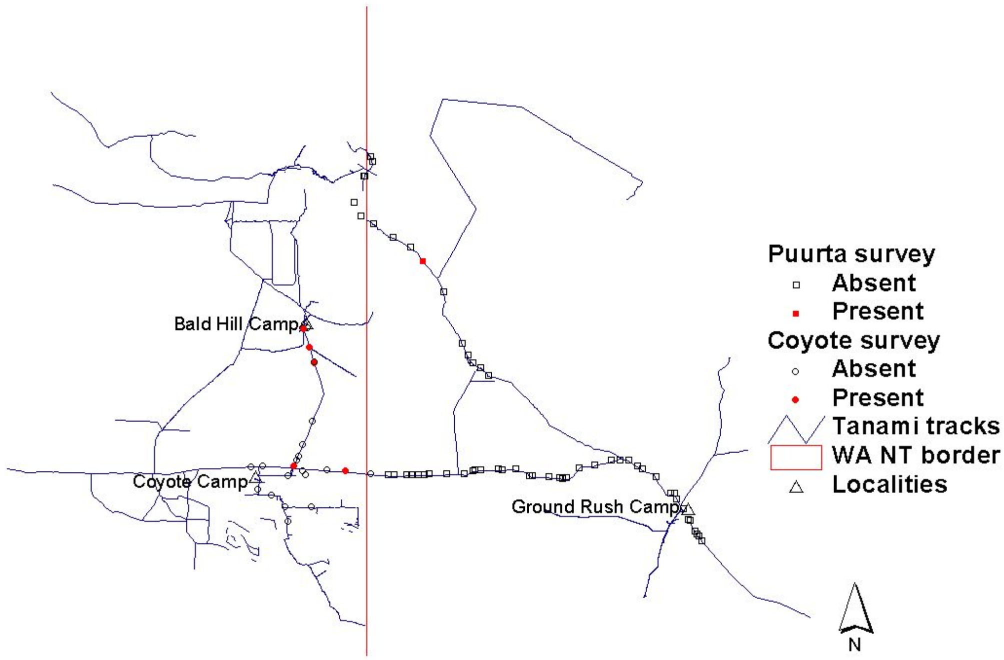

Fig. 3.7 Camel sign (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

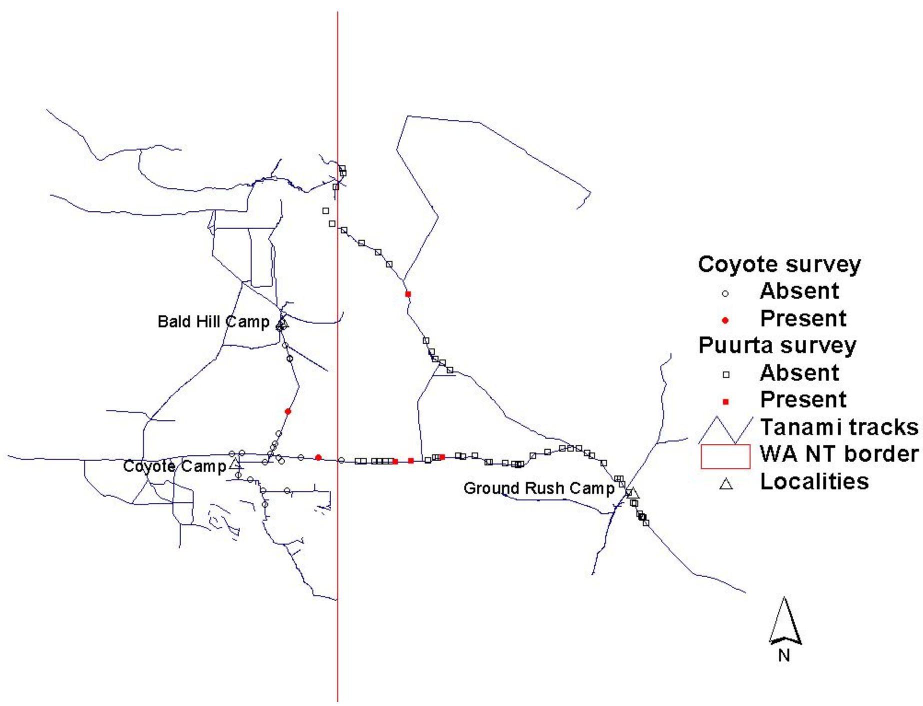

Fig. 3.8 Emu sign (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

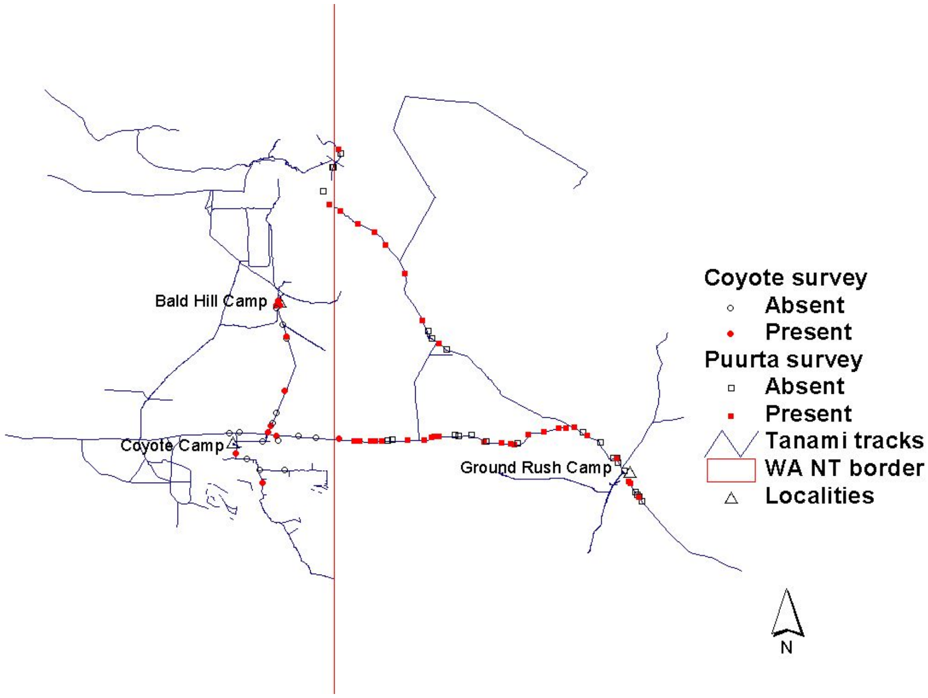

Fig. 3.9 Bustard sign (1-2 nights old) recorded from plots sampled in the Coyote project area and the Puurta region.

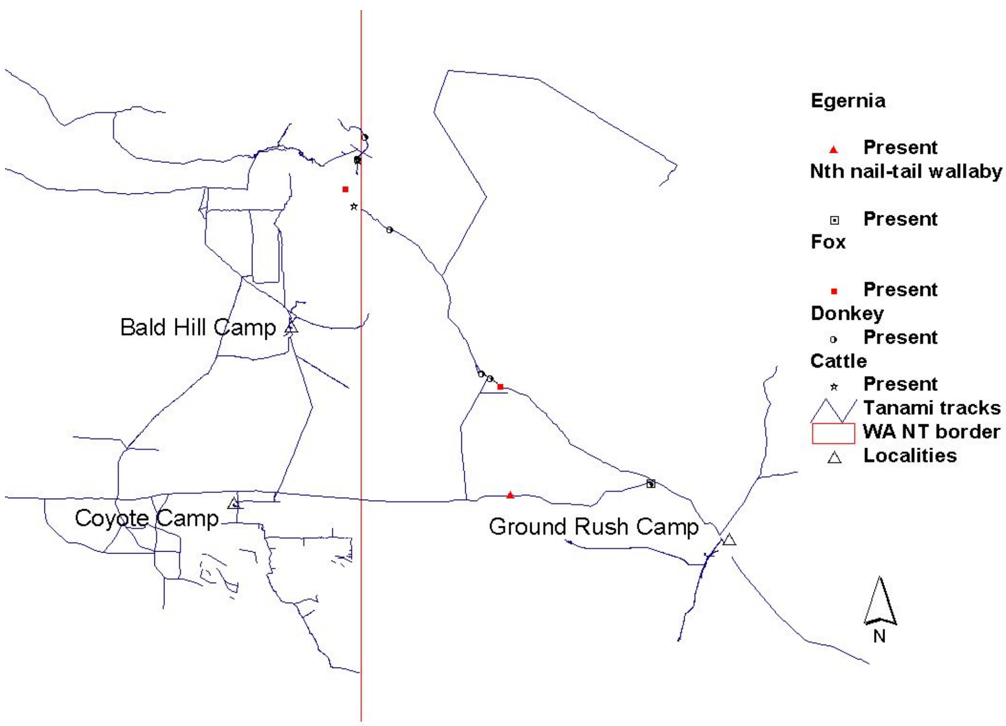

Fig. 3.10 Sign of *Egernia*, northern nail-tail wallaby, red fox, donkey and cattle recorded during the Puurta survey.

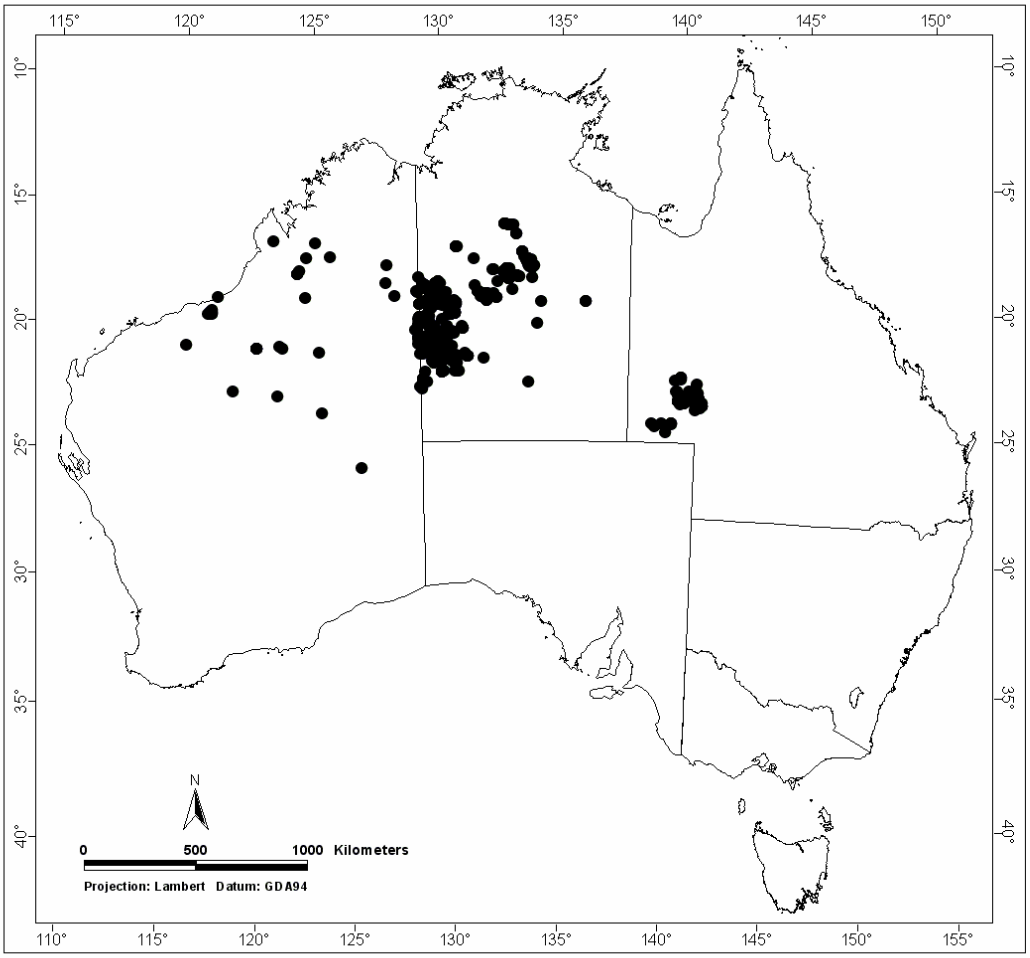

Fig. 4.1 The distribution of the bilby records in the period 1990-2003 from Pavey (in prep.)

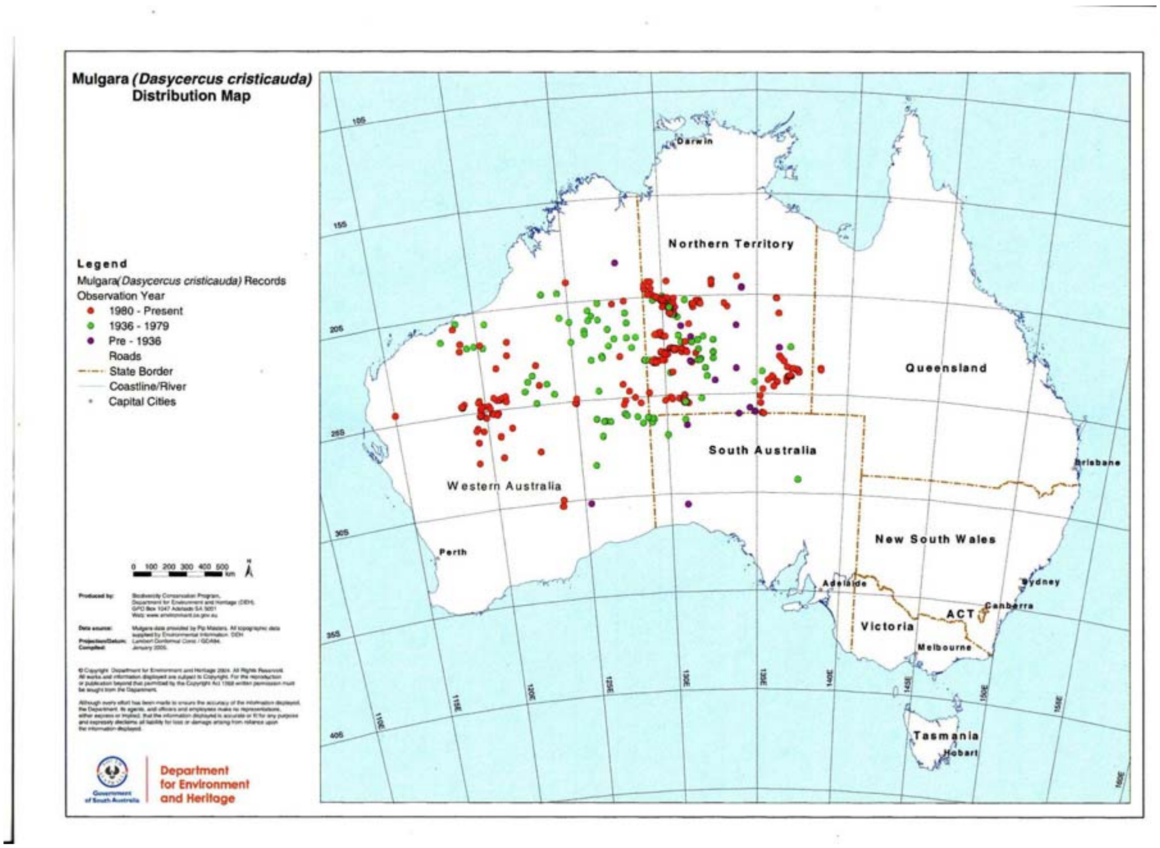

Fig. 4.2 The distribution of the mulgara records in the period 1990-2003 from Masters (2005)

Appendix 1 Contact details for Kimberley Regional Fire Management Project

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Kimberley Regional Fire Management Project
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Broome,
W.A. 6725

Appendix 14

Results of Vertebrate Trapping Program July - December 2006

Preliminary

Results of Trapping Conducted on the Stage 2 Haul Road Route

July - December 2006

ecotec
ENVIRONMENTAL MANAGEMENT

Trapping conducted by:	Andrew McMillan - Ecologist Sheridan Wakefield - Environmental Scientist Jeremy Shepherdson - Principal Consultant
Report by:	Megan Nicholas - Biologist Jeremy Shepherdson - Principal Consultant
Contact details:	Ecotec (WA) Pty Ltd 3 Glenunga Way, Craigie WA 6025 mob: 0407 554 314 ph: (08) 9401 4903 fax: (08) 9401 9107
Date:	July - December 2006
Location:	Coyote Project, Tanami Desert

1 Introduction

Tanami Gold NL (Tanami) operates the Coyote Project, a gold mine and processing plant located in the Tanami Desert approximately 280km south of Halls Creek. Tanami for Stage 2 of the mining project which will involve development of a haul road and two small open pits approximately 35kms north of the existing mine site.

Ecotec (WA) Pty Ltd (Ecotec) was engaged as the Environmental Consultant for the project in 2005. In July 2006 Ecotec started an ongoing trapping program involving a combination of pit fall and Elliot traps in an area of sand dune habitat intersected by the proposed haul road route. These sand dunes and the surrounding area are known to support populations of Mulgara.

The intention of the trapping program is to:

a) compile an inventory of the vertebrate species found in this habitat;

b) determine the extent of the Mulgara population(s) in this habitat; and

c) investigate patterns of vertebrate activity in relation to seasonal and other factors.

The information collected will assist in identifying any adverse impacts of the haul road on fauna in this area. The trapping program was outlined to the Department of Conservation and Land Management (now Department of Conservation and Environment) and a License to Take Fauna was issued to Jeremy Shepherdson, Biologist and Principal Consultant of Ecotec.

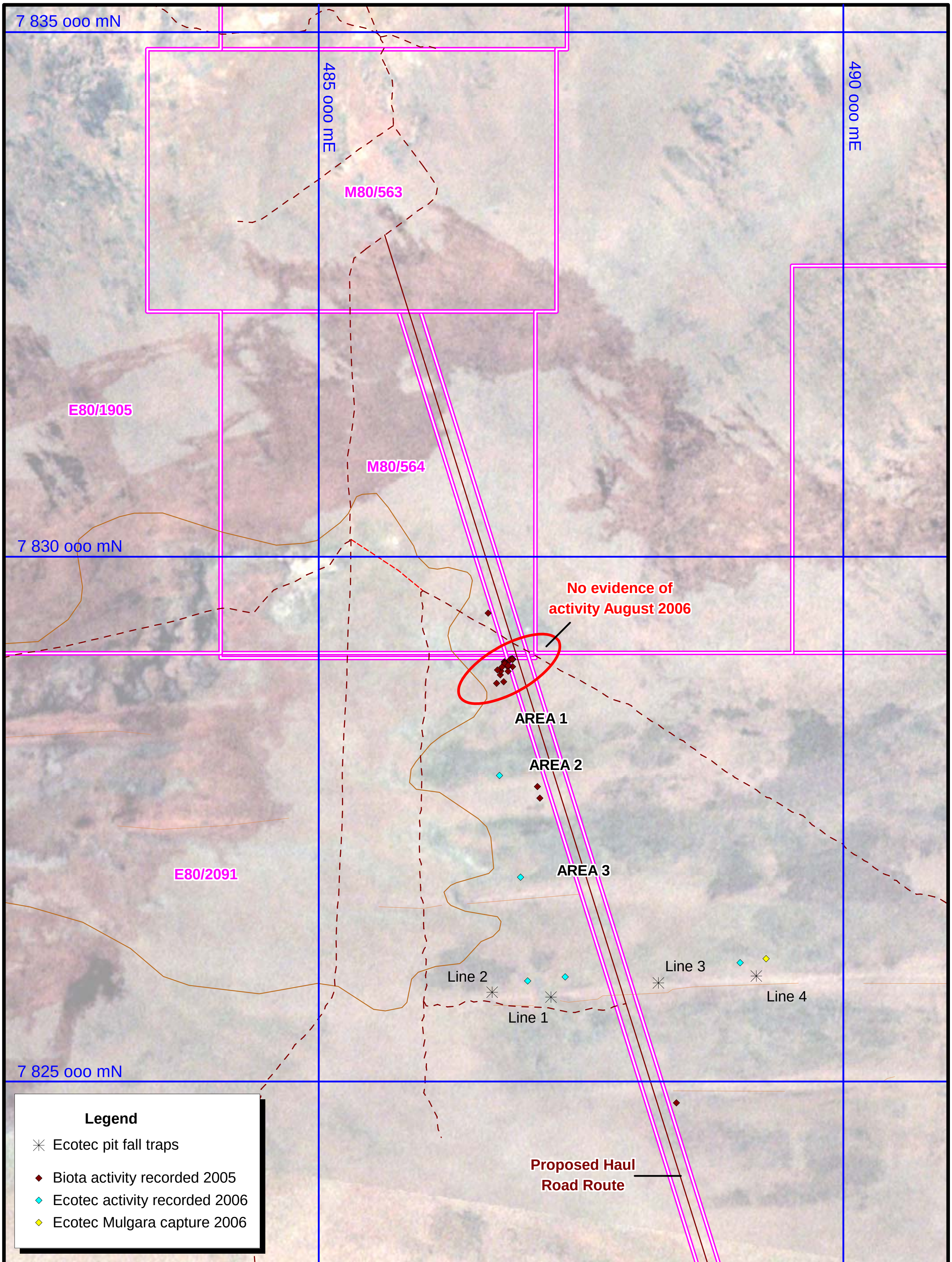
2 Method

Sixteen pit fall traps have been permanently installed with a cleared 5m line on either side for positioning of drift fences. The pitfalls have been placed in groups of four arranged in a zig-zag pattern to maximise coverage of the habitat. Traps are left open overnight and checked at sunrise the next morning. The traps remain open during the day when they are covered with a hessian shade (Photograph 1). When not in use each pit fall trap is capped with a plastic lid and buried.

The trapping locations are approximately 50m and 1000m either side of the haul road route (Figure 1). Grids are arranged in this manner to allow assessment of the impact of haul road activity on the abundance and diversity of species living adjacent and distant to the road.

Elliot trapping is conducted in conjunction with the pit fall trapping. The traps are baited with rolled oats and peanut butter and located in areas of potential Mulgara activity.

Photograph 1 Pit fall trap.



TANAMI GOLD NL			MULGARA ACTIVITY	
COYOTE PROJECT				
ORIGINATOR: J. Shepherdson	DATE: Feb 2007	DRAWN: A. Weston	1 : 50,000 0 1000 2000 3000 AMG Zone 52 (AGD84) metres	FIGURE 1
PLAN No: WTP_GD_BHG_1_5_001				

3 Results

The results included in this section are preliminary, pending identification of several skinks and compilation of data not included in the current spreadsheets.

Pitfall and Elliot trapping commenced in July 2006 and was carried out at monthly intervals until December 2006. Heavy rain resulted in the area being inaccessible in January and February 2007.

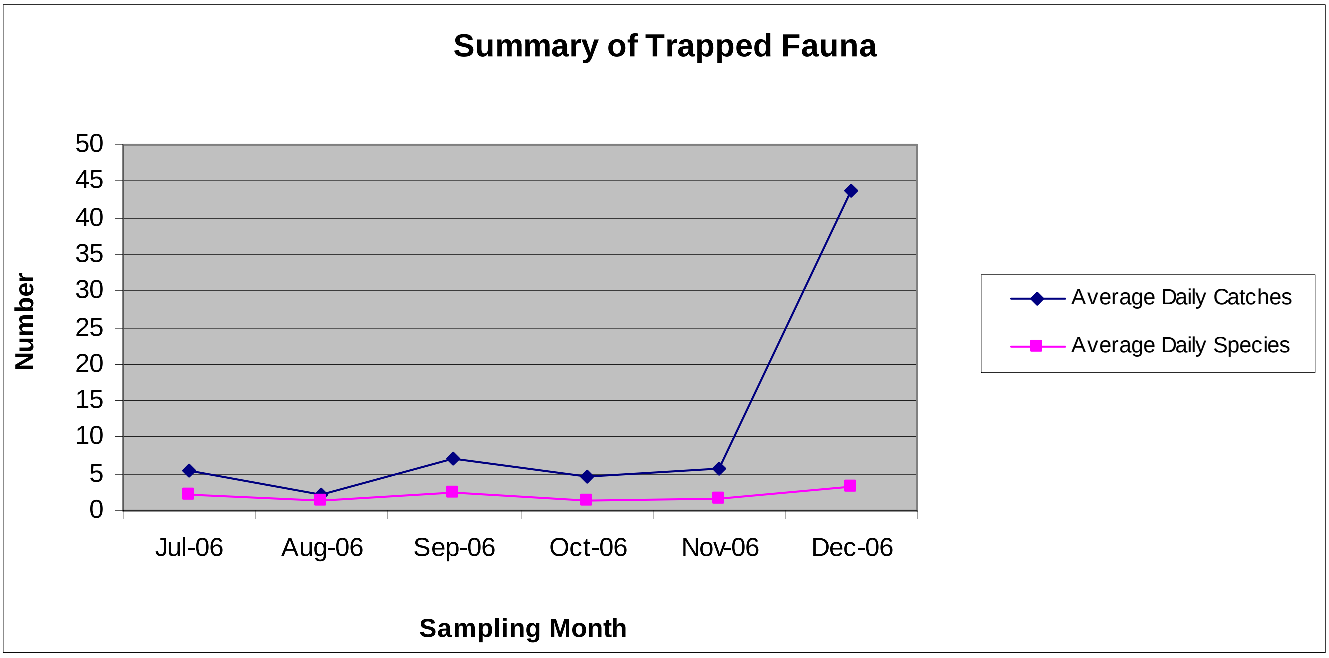
Trapping during the July to December period has resulted in capture of a range of reptile, amphibian and small mammal species. Combining the results of pit fall and Elliot trapping, approximately 82% of the fauna trapped were reptiles, 8% were amphibians and the remaining 10% were mammals.

While there were several species which were identified only once during the course of the sampling, there were also a number of species trapped often and in large quantities. A total of 324 individuals were trapped during the course of sampling, consisting of 21 formally identified species, including 6 different species of skink. The most frequently trapped species was *Lerista bipes*, commonly known as the Two-toed Skink, which made up approximately 30% of the total individuals trapped. Other species trapped in large quantities included (in descending order) *Uperoleia micromeles* (Tanami Toadlet), *Notaden nicholsii* (Desert Spadefoot), *Ctenotus pantherinus*, *Ctenophorus isolepis* and *Eremiascincus fasciolatus*.

Frog numbers were noted to increase significantly immediately following rainfall.

Small mammals including *Pseudomys desertor, Pseudomys hermannsbergensis, Mus musculus* and *Sminthopsis youngsoni* were caught in pitfalls during the cooler months of July and August, but not since.

The volume of fauna trapped during the December sampling was significantly greater than any of the five previous months, which all recorded comparatively similar results. Figure 1 shows the comparison of average number of species and average number of individuals caught for each month.



Following the fire in late November, Elliot trapping was conducted close to an area of unburnt vegetation close to Line 4 (Photograph 2). Tracks and burrowing activity suspected to belong to Mulgara were observed and 10 Elliot traps were placed to target this area. Two Mulgara were captured in two days using standard peanut butter and rolled oats bait. Prior to the fire Elliot trapping had succeeded in capturing mostly *Notomys alexis* (Hopping Mouse) using the same bait. Both were males and appeared in good health. Both animals were considerably stressed by the ordeal of having been trapped and, given the lack of success in prior trapping, it was decided not to permanently mark the animals.

4 Discussion

The local area experienced fires during late November and this is believed to be at least partly responsible for the increase in number of animals trapped in December. Increased fauna activity following the fire may be a result of animals having to cover a larger area to find food or shelter. There could be a degree of bias during this period as animals, particularly reptiles, may have been attracted to the pitfalls as a source of shelter.

Ants became increasingly more abundant in the warmer months from September to December. Several traps had to be closed during the September trapping period to prevent ants attacking trapped animals. Ant deterrent was sprayed around all traps during the November and December with some success. Small sticks or grass stems were placed in each pitfall to allow ants to exit, however there was a high degree of predation on other insects in the traps.

Reptiles were considerably more abundant during the warmer months of November and December with potentially 4 species caught that had not been recorded in previous surveys. All appear to belong to the Scincidae family however identification is yet to be completed.

Similar suspected Mulgara activity had been targeted throughout the trapping periods prior to the fire without success. The reason for capturing Mulgara in the December trapping period and not prior, is not fully understood, although may be related to the fire. Suitable food, including beetles, centipedes and small reptiles, were abundant at that time, so it is considered unlikely that the animals were attracted to the baits in the traps out of hunger. Lack of cover while foraging may have caused the animals to enter the traps seeking shelter.

The results presented in this report are not complete as not data collected has been collated at this stage. A complete report will be produced at the end of June following a full year of trapping.

Appendix 15
Vertebrate Fauna Observed and Expected in the Western Tanami Region

Vertebrate Fauna Observed and Expected in the Western Tanami Region

August 2004 to August 2006

1 Introduction

The following tables list the vertebrate fauna observed and expected to be present in the region surrounding the Coyote Project. The tables are a compilation of information obtained from surveys by Biota Environmental Sciences Pty Ltd (2004 and 2005) and Ecotec (WA) Pty Ltd (2006).

Observations include sightings of evidence such as tracks, scats and burrows.

2 Birds

Family	Species	Common name	Observed
CASUARIIDAE (emus)			
	Dromaius novaehollandiae	Emu	+
PHASIANIDAE (pheasants and quails)			
	Coturnix ypsilophora	Brown Quail	+
ACCIPITRIDAE (kites, hawks and eagles)			
	Elanus caeruleus axillaris	Black-shouldered Kite	+
	Lopoictinia isura	Square-tailed Kite	
	Hamirostra melanosternon	Black-breasted Buzzard	+
	Milvus migrans	Black Kite	+
	Haliastur sphenurus	Whistling Kite	
	Accipiter fasciatus	Brown Goshawk	
	Accipiter cirrhocephalus	Collared Sparrowhawk	
	Aquila audax	Wedge-tailed Eagle	+
	Hieraaetus morphnoides	Little Eagle	+
	Circus assimilis (button quails)	Spotted Harrier	+
FALCONIDAE (falcons)			
	Falco subniger	Black Falcon	
	Falco peregrinus^^	Peregrine Falcon	
	Falco hypoleucos	Grey Falcon	+
	Falco berigora berigora	Brown Falcon	+
	Falco cenchroides cenchroides	Australian Kestrel	+
	Falco longipennis	Australian Hobby	+
TURNICIDAE (button-quails)			
	Turnix velox	Little Button-quail	+

Family	Species	Common name	Observed
OTIDIDAE (bustards)			
	Ardeotis australis^	Australian Bustard	+
BURHINIDAE (stone-curlews)			
	Burhinus grallarius^	Bush Stone-curlew	+
GLAREOLIDAE (pratincoles)			
	Glareola maldivarum	Oriental Pratincole	
	Stiltia isabella	Australian Pratincole	
CHARADRIIDAE (plovers and dotterels)			
	Charadrius tricolor	Banded Lapwing	
	Vanellus miles	Masked Lapwing	
	Charadrius veredus	Oriental Plover	+
COLUMBIDAE (pigeons and doves)			
	Geopelia placida	Peaceful Dove	
	Phaps chalcoptera	Common Bronzewing	
	Phaps histrionica	Flock Bronzewing	+
	Ocyphaps lophotes	Crested Pigeon	+
	Geophaps plumifera	Spinifex Pigeon	+
	Geopelia cuneata	Diamond Dove	+
CACATUIDAE (cockatoos)			
	Cacatua sanguinea	Little Corella	+
	Cacatua leadbeateri^^	Major Mitchell's Cockatoo	+
	Cacatua roseicapilla	Galah	
PSITTACIDAE (lorikeets and parrots)			
	Nymphicus hollandicus	Cockatiel	+
	Platycercus zonarius zonarius	Australian Ringneck	+
	Melopsittacus undulatus	Budgerigar	+
	Polytelis alexandrae	Princess Parrot	
	Pezoporus occidentalis	Night Parrot	
CUCULIDAE (cuckoos)			
	Chrysococcyx basalis	Horsfield's Bronze Cuckoo	+
	Cuculus pallidus	Pallid Cuckoo	+
	Chrysococcyx osculans	Black-eared Cuckoo	
	Scythrops novaehollandiae	Channel-billed Cuckoo	

Family	Species	Common name	Observed
ACANTHIZIDAE			
	Acanthiza apicalis	Broad-tailed Thornbill	+
STRIGIDAE (hawk-owls)			
	Ninox novaeseelandiae	Boobook Owl	+
TYTONIDAE (barn owls)			
	Tyto alba	Barn Owl	
PODARGIDAE (frogmouths)			
	Podargus strigoides	Tawny Frogmouth	
AEGOTHELIDAE (owlet-nightjars)			
	Aegotheles cristatus	Australian Owlet-nightjar	
CAPRIMULGIDAE (nightjars)			
	Eurostopodus argus	Spotted Nightjar	+
APODIDAE (swifts)			
	Apus pacificus	Fork-tailed Swift	
HALCYONIDAE (forest kingfishers)			
	Todiramphus pyrrhopygia	Red-backed Kingfisher	+
	Todiramphus sanctus	Sacred Kingfisher	
MEROPIDAE (bee eaters)			
	Merops ornatus	Rainbow Bee-eater	+
MALURIDAE (fairy wrens)			
	Malurus lamberti assimilis	Variegated Fairy-wren	+
	Malurus leucopterus leuconotus	White-winged Fairy-wren	+
	Stipiturus ruficeps ruficeps	Rufous-crowned Emu-wren	+
	Amytornis striatus	Striated Grasswren	
PARDALOTIDAE (pardalotes)			
	Gerygone fusca	Western Greygone	
	Pardalotus rubricatus	Red-browed Pardalote	+
	Pardalotus striatus uropygialis	Striated Pardalote	+
	Smicrornis brevirostris	Weebill	

Family	Species	Common name	Observed
MELIPHAGIDAE (honeyeaters)			
	Lichmera indistincta indistincta	Brown Honeyeater	+
	Certhionyx niger	Black Honeyeater	+
	Certhioyx variegatus	Pied Honeyeater	+
	Lichenostomus virescens	Singing Honeyeater	+
	Lichenostomus keartlandi	Grey-headed Honeyeater	+
	Lichenostomus plumulus	Grey-fronted Honeyeater	
	Lichenostomus penicillatus	White-plumed Honeyeater	+
	Melithreptus gularis laetior	Black-chinned Honeyeater	+
	Phylidonyris albifrons	White-fronted Honeyeater	
	Manorina flavigula	Yellow-throated Miner	+
	Acanthagenys rufogularis	Spiny-cheeked Honeyeater	+
	Epthianura tricolor	Crimson Chat	
PETROICIDAE (Australian robins)			
	Petroica goodenovii	Red-capped Robin	
	Petroica cucullata	Hooded Robin	
POMATOSTOMIDAE (Australian babblers)			
	Pomatostomus temporalis	Grey-crowned Babbler	
PACHYCEPHALIDAE (whistlers)			
	Oreoica gutturalis	Crested Bellbird	+
	Pachycephala rufiventris rufiventris	Rufous Whistler	+
	Colluricincla harmonica brunnea	Grey Shrike-thrush	+
DICRURIDAE (flycatchers)			
	Rhipidura leucophrys leucophrys	Willie Wagtail	+
	Grallina cyanoleuca	Magpie-lark	+
	Myagra inquieta	Restless Flycatcher	
CAMPEPHAGIDAE (cuckoo-shrikes)			
	Coracina novaehollandiae subpallida	Black-faced Cuckoo-shrike	+
	Lalage tricolor	White-winged Triller	+
ARTAMIDAE (woodswallows)			
	Artamus leucorhynchus	White-breasted Woodswallow	
	Artamus personatus	Masked Woodswallow	+
	Artamus superciliosus	White-browed Woodswallow	

Family	Species	Common name	Observed
	Artamus cinereus melanops	Black-faced Woodswallow	+
	Artamus minor	Little Woodswallow	
	Gymnorhina tibicen	Australian Magpie	+
	Cracticus nigrogularis	Pied Butcherbird	+
CORVIDAE (ravens and crows)			
	Corvus bennetti	Little Crow	+
	Corvus orru	Torresian Crow	+
ALAUDIDAE (larks)			
	Mirafra javanica horsfieldii	Singing Bushlark	+
MOTACILLIDAE (pipits and true wagtails)			
	Anthus australis	Australian Pipit	
PASSERIDAE (finches and allies)			
	Emblema picta	Painted Firetail	
	Heteromunia pectoralis	Pictorella Mannikin	
	Taeniopygia guttata castanotis	Zebra Finch	+
DICAEIDAE (flower-peckers)			
	Dicaeum hirundinaceum hirundinaceum	Mistletoebird	+
HIRUNDINIDAE (swallows)			
	Cheramoeca leucosternus	White-backed Swallow	
	Hirundo nigricans	Tree Martin	
	Hirundo ariel	Fairy Martin	
SYLVIIDAE (Old World warblers)			
	Eremiornis carteri	Spinifex-bird	
	Cincloramphus mathewsi	Rufous Songlark	+
	Cincloramphus cruralis	Brown Songlark	+
107	*Cisticola exilis exilis*	Golden-headed Cisticola	+

3 Mammals

Family	Species	Common name	Observed
TACHYGLOSSIDAE (echidnas)			
	Tachyglossus aculeatus	Echidna	
NOTORYCTIDAE (marsupial moles)			
	Notoryctes typhlops^^	Southern Marsupial Mole	
	Notoryctes caurinus^^	Northern Marsupial Mole	
DASYURIDAE			
	Dasycercus cristicauda^^	Mulgara	+
	Ningaui ridei	Ningaui	+
	Pseudantechinus macdonnellensis	Fat-tailed False Antechinus	+
	Sminthopsis macroura	Striped-faced Dunnart	+
	Sminthopsis youngsoni	Lesser Hairy Footed Dunnart	+
THYLACOMYIDAE (bilbies or rabbit-eared bandicoots)			
	Macrotis lagotis^^	Bilby	+
MACROPODIDAE (kangaroos and wallabies)			
	Lagorchestes conspicillatus leichardti^	Spectacled Hare-wallaby	+
	Macropus robustus	Euro	
	Macropus rufus	Red Kangaroo	+
	Onychogalea unguifera	Northern Nail-tail Wallaby	+
MEGADERMATIDAE (leaf-nose bats)			
	Rhinonicteris aurantius	Orange Leaf-nose Bat	
EMBALLONURIDAE (sheathtail bats)			
	Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	
	Taphozous georgianus	Common Sheathtail Bat	
VESPERTILIONIDAE (vesper bats)			
	Chalinolobus gouldii	Gould's Wattled Bat	
	Nyctophilus geoffroyi	Lesser Long-eared Bat	
	Scotorepens balstoni	Inland Broad-nosed Bat	
	Scotorepens greyii	Little Broad-nosed Bat	
	Tadarida australis	White-striped Mastiff-Bat	+
	Vespadelus finlaysoni	Inland Cave Bat	

Family	Species	Common name	Observed
MURIDAE (rats and mice)			
	*Mus musculus**	House Mouse	+
	Notomys alexis	Spinifex Hopping Mouse	+
	Pseudomys delicatulus	Delicate Mouse	+
	Pseudomys desertor	Desert Mouse	+
	Pseudomys hermannsburgensis	Sandy Inland Mouse	+
	Pseudomys nanus	Western Chestnut Mouse	+
	Pseudomys johnsoni	Pebble-mound Mouse	+
CANIDAE (foxes and dogs)			
	Canis lupus dingo	Dingo	+
	*Vulpes vulpes**	Red Fox	
FELIDAE (cats)			
	*Felis catus**	Cat	+
CAMELIDAE (horned ruminants)			
	*Camelus dromedarius**	Camel	+
EQUIDAE (horses and donkeys)			
	*Equus asinus**	Feral Donkey	
35	*Equus caballus**	Feral Horse	

4 Reptiles and Amphibians

Family	Species	Common name	Observed
Myobatrachidae (ground frogs)			
	Crinia bilingua	Bilingual Froglet	
	Lymnodynastes ornatus	Ornate Frog	
	Neobatrachus aquilonius		
	Notaden nichollsi	Desert Spadefoot	+
	Uperoleia borealis	Northern Toadlet	
	Uperoleia micromeles	Tanami Toadlet	+
Hylidae (tree frogs)			
	Cyclorana australis	Giant Frog	+
	Cyclorana longipes	Long-footed Frog	
9	*Litoria rubella*	Desert Tree Frog	

Family	Species	Common name	Observed
Gekkonidae (geckoes)			
	Diplodactylus ciliaris	Spiny-tailed Gecko	+
	Diplodactylus conspicillatus	Fat-tailed Gecko	+
	Diplodactylus stenodactylus	Sandplain Gecko	+
	Gehyra australis		
	Gehyra pilbara	Pilbara Delta	
	Gehyra purpurascens		+
	Gehyra variegata		+
	Heteronotia binoei	Bynoe's Gecko	+
	Nephrurus levis levis		+
	Rhynchoedura ornata		+
	Strophurus elderi		
	Strophurus jeanae		+
Pygopodidae (legless lizards)			
	Delma borea		+
	Delma nasuta		+
	Lialis burtonis	Burtons's Legless Lizard	+
	Pygopus nigriceps	Hooded Scaleyfoot	+
Agamidae (dragon lizards)			
	Amphibolurus gilberti		
	Cryptagama aurita^	Gravel Dragon	
	Ctenophorus caudicinctus		
	Ctenophorus isolepis isolepis		+
	Ctenophorus nuchalis		+
	Diporiphora arnhemica		
	Diporiphora bennettii		
	Diporiphora bilineata		
	Diporiphora lalliae		+
	Diporiphora winneckei		
	Lophognathus longirostris		+
	Moloch horridus	Thorny Devil	+
	Pogona minor minor		+
Scincidae (skink lizards)			
	Carlia munda		+
	Carlia triacantha		+
	Cryptoblepharus plagiocephalus		

Family	Species	Common name	Observed
	Ctenotus grandis titan		+
	Ctenotus helenae		+
	Ctenotus inornatus		
	Ctenotus leonhardii		
	Ctenotus melanops		
	Ctenotus pantherinus ocellifer		+
	Ctenotus piankai		+
	Ctenotus quattuordecimlineatus		
	Ctenotus saxatilis		
	Ctenotus schomburgkii		+
	Ctenotus tanamiensis		+
	Ctenotus uber johnstonei^		
	Egernia kintorei^^	Giant Desert Skink	
	Egernia striata		
	Eremiascincus fasciolatus		+
	Lerista bipes		+
	Lerista greeri		+
	Lerista taeniata		
	Menetia greyii	Dwarf Skink	
	Morethia ruficauda ruficauda		+
	Notoscincus ornatus		
	Tiliqua multifasciata	Central Australian Bluetongue	+
Varanidae (monitors and goannas)			
	Varanus acanthurus	Ridge-tailed Monitor	+
	Varanus brevicauda		+
	Varanus eremius		+
	Varanus gilleni		
	Varanus gouldii	Gould's/Sand Monitor	+
	Varanus kingorum		
	Varanus mertensi		
	Varanus storri		
	Varanus tritis	Black-tailed Monitor	
Boidae (pythons)			
	Antaresia childreni	Children's Python	
	Aspidites melanocephalus	Black-headed Python	+
	Aspidites ramsayi^^	Woma	+

Family	Species	Common name	Observed
Typhlopidae (blind snakes)			
	Ramphotyphlops diversus		+
	Ramphotyphlops grypus		+
	Ramphotyphlops guentheri		
Elapidae (front-fanged snakes)			
	Acanthophis pyrrhus	Desert Death Adder	
	Brachyurophis roperi		+
	Demansia olivacea	Olive Whip Snake	
	Furina ornata	Moon Snake	
	Pseudechis australis	Mulga Snake	
	Pseudechis modesta	Ringed Brown Snake	+
	Pseudochis nuchalis	Gwardar	
	Simoselaps anomalus		+
78	*Suta punctata*	Spotted snake	+

+ = observed

+ = additional observations made during 2006 surveys

^ = Priority Listed Species (WA)

^^ = IUCN Listed Species

* = introduced species

Note: observations include sightings and evidence of the species (i.e. tracks, scats, burrows)

Appendix 16

Vegetation and Fauna Assessment - Ranges of the Western Desert Proposed Nature Reserve (Ecotec)

Vegetation and Fauna Assessment

Ranges of the Western Desert Proposed Nature Reserve

Tanami Exploration

TANAMI GOLD NL

June 2006

ecotec
ENVIRONMENTAL MANAGEMENT

Survey and report by: Andrew McMillan - Ecologist
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Date: 12th - 18th June 2006

Location: Ranges of the Western Desert, Tanami Desert, Western Australia.

1 Introduction

Tanami Exploration (Tanami) proposes to conduct mineral exploration in a number of locations within the Proposed Nature Reserve (PNR) known as the Ranges of the Western Desert. The area coincides with the Balwina Aboriginal Reserve, located approximately 20km south of the Tanami Road and 30km west of the Western Australia/Northern Territory border in the Tanami Desert.

Tanami operates the Coyote Gold Project, approximately 20km north of the survey area. Biological surveys have been carried out in the area surrounding the mining operation and to the north of the mine site. Very little work has been carried out to the south.

Ecotec (WA) Pty Ltd (Ecotec) was engaged to conduct a flora and fauna survey of the areas. The purpose of the survey was to:

- Document the flora species present within the specified areas of interest;
- Identify and document the location of any Declared Rare Flora (DRF), priority flora or other flora and vegetation of significance;
- Document the location of fauna activity and identify the species present;
- Identify and document the location of any land forms or vegetation that may be significant to fauna; and
- Recommend methods of minimising the environmental impact of the proposed exploration activity.

The survey was conducted over seven days from the 12th -18th June 2006.

2 Flora Assessment

2.1 Methodology

The flora survey involved vehicle and foot traverses of each of the proposed exploration areas. Existing tracks and gridlines were used to access each of the locations where a series of short traverses was conducted to record all flora species present.

Incidental sightings of plants were also recorded during travel between each of the sites. Prominent land forms such as hills and rocky outcrops and areas of vegetation different to the surroundings were investigated for the presence of significant flora.

Appendix 1 provides the location of each of the proposed exploration areas within the surveyed area.

2.2 Vegetation

The study area is located within the Tanami Region of the Interim Biogeographic Regionalisation of Australia (IBRA) (Figure 2.1).

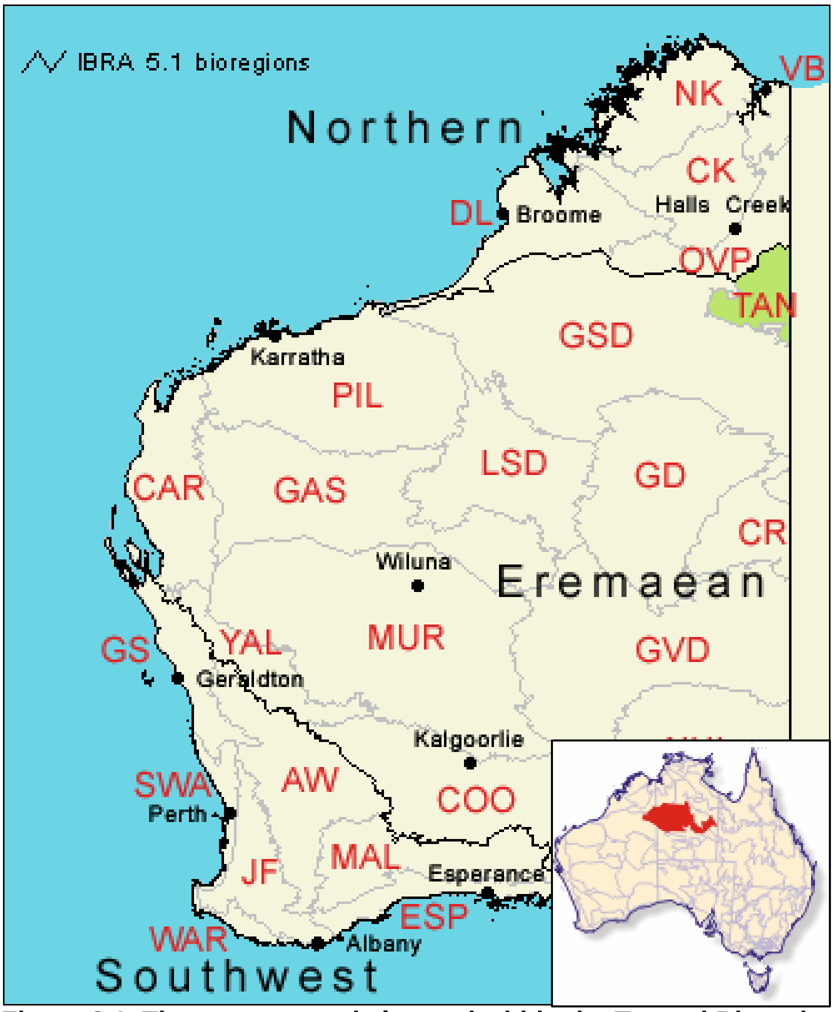


Figure 2.1 The survey area is located within the Tanami Bioregion. (Source: http://florabase.calm.wa.gov.au/help/ibra/#map)

The Tanami Bioregion supports a range of vegetation types, defined by the Australian Natural Resources Atlas (National Land & Water Resources Audit, 2001). This region has minimal prior disturbance.

The study area is indicated in Figure 2.2, which shows the major vegetation types present within the Tanami Bioregion (indicated by the red borders).

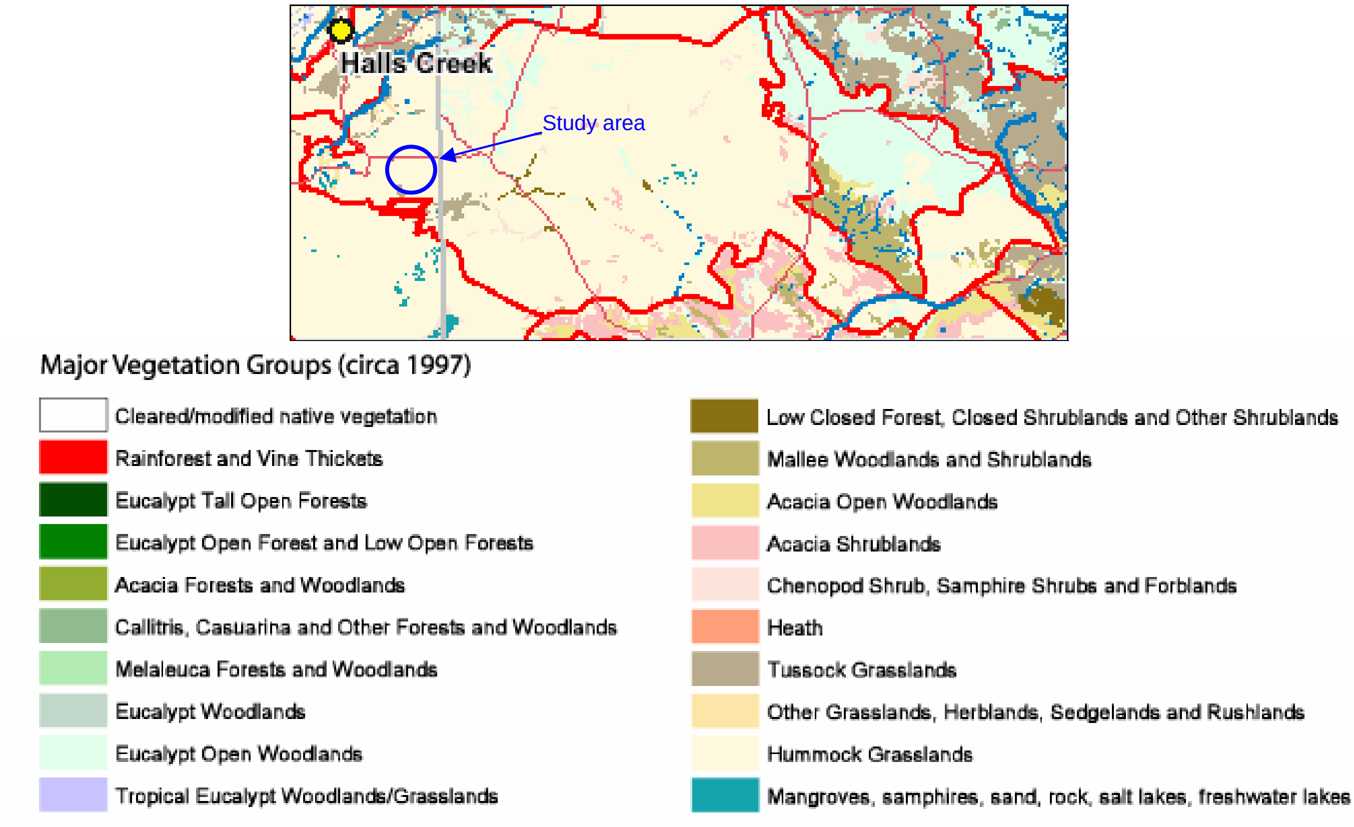


Figure 2.2 Major vegetation groups of the Tanami Bioregion (Source: http://audit.ea.gov.au/anra/atlas_home.cfm).

Two main vegetation types were identified in the survey area, being:

- Hummock Grassland; and
- Acacia Shrubland.

The predominant vegetation type in the Tanami region is Hummock Grassland, which is common and widespread throughout central and mid-western Australia. This vegetation type in the survey area is dominated by *Triodia pungens*, with *T. basedowii* found on rocky hills and outcrops. Scattered Eucalypts and other small to medium sized trees are found throughout this vegetation type with denser stands of Eucalypts common along drainage lines. Figure 2.3 shows the extent of Hummock Grassland vegetation in Australia.

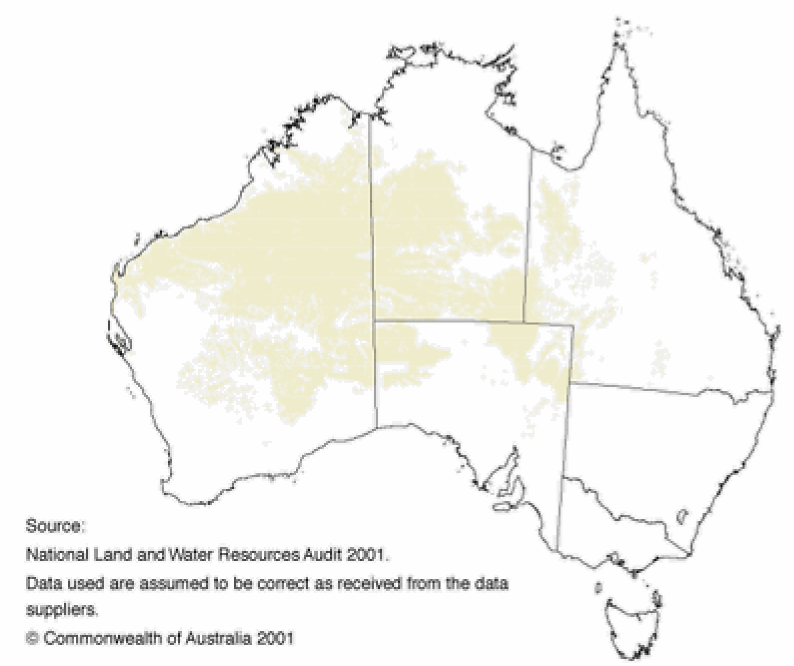


Figure 2.2 Extent of Hummock Grassland in Australia.

Acacia Shrubland was also found extensively throughout the study area. *Acacia adoxa* was generally the dominant species in this vegetation type, however a number of other Acacias were observed as the dominant species in some locations. Areas dominated by *Grevillea wickhamii* were interspersed within the Acacia Shrubland vegetation. A variety of Eucalypts were also found throughout this vegetation type.

These vegetation types were found throughout the surveyed area with similar flora species present in each.

Three main vegetation associations were identified during the survey, related primarily to soil type. The associations are:

- Sandplain - supporting grassland and shrubland vegetation;
- Laterite rise - supporting low shrubland and grassland; and
- Rocky hill - supporting grassland.

Areas supporting denser stands of Eucalypt species were also apparent and may be the result of drainage lines or accumulation of runoff in low-lying areas following rainfall. It is difficult to define these areas without current aerial photographs as they are generally not clearly evident at ground level.

2.2.1 Area One - Roadrunner Prospect

The vegetation of Area One, known as the Roadrunner prospect, is predominately sandplain with Acacia and Grevillea dominated Shrubland and scattered emergent *Eucalyptus brevifolia*. The understorey consists primarily of a *Triodia pungens* and *Aristida* grasses (Photograph 2.1). This area is also characterised by the occasional laterite gravel rise supporting dense populations of *Acacia hilliana*, *Eucalyptus gamophylla* and *E. odontocarpa*.

Photograph 2.2 Acacia / Grevillea Shrubland with emergent *Eucalyptus aspera* (background), typical of Area One.

2.2.2 Area Two - Rabies Prospect

Area Two, known as the Rabies prospect, is a laterite rise with occasional rocky outcrops. Vegetation is Grassland and low Shrubland consisting of *Acacia hilliana* with scattered *Acacia adoxa, Grevillea wickhamii* and Eucalypts over *Triodia basedowii*. The rocky outcrops have little or no topsoil and sparse understorey. *Calytrix carinata* was observed only on a rocky outcrop in this location. The southern region of this area is characterised by dense *Acacia* and *Grevillea* Shrubland over *Triodia pungens*, as in Area One.

Photograph 2.3: A rocky outcrop within the Rabies area. Vegetation consists mainly of several *Acacia* species and *Grevillea wickhamii* over *Triodia basedowii*.

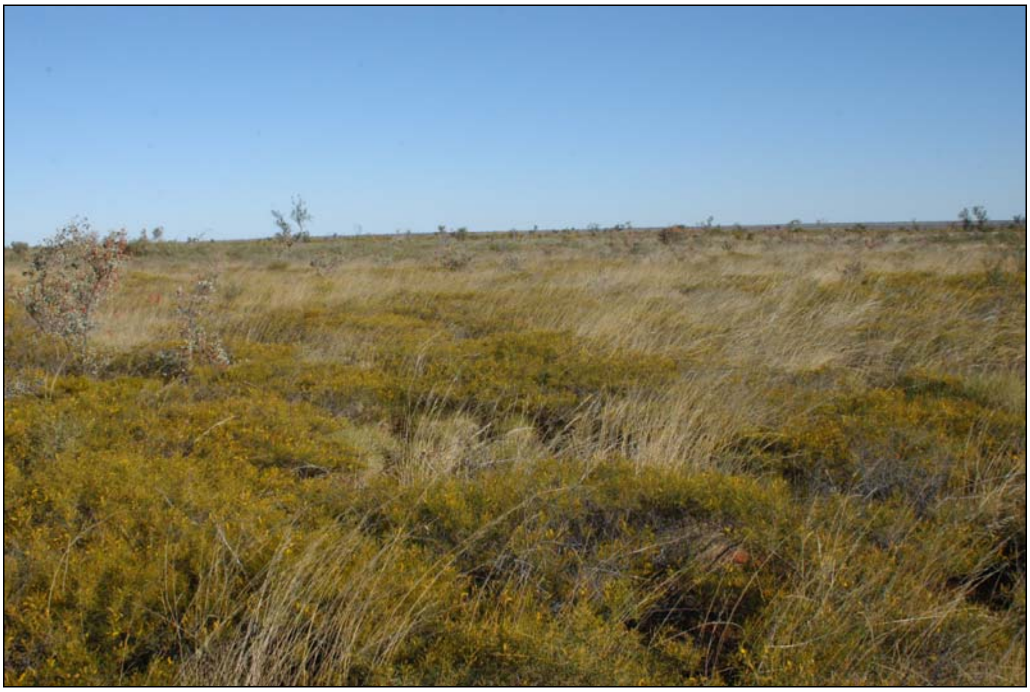
2.2.3 Area Three - Dino Prospect

Area Three, known as Dino, is sandplain supporting Acacia Shrubland with frequent *Grevillea wickhamii* over mixed *Triodia* and *Aristida* grasses. The upper storey was dominated by *Corymbia opaca (*formerly *E. terminalis)*, *Eucalyptus odontocarpa*, *E. gamophylla* and *E. pachyphylla*. The understorey species included *Dicrastylis exsuccosa*, *Jacksonia aculeta* and *Senna* species. Within this proposed area, rocky outcrops and regions of laterite gravel rise were evident, supporting the same species found in Areas One and Two.

Photograph 2.4 Acacia Shrubland in the Dino area with *Triodia/Aristida* understorey and scattered Eucalypts.

2.2.4 Area Four - Fremlin Prospect

Area Four, known as the Dino prospect, is a mixture of sandplain and low laterite rise landforms. Vegetation is predominately Acacia Shrubland over *Triodia* and *Aristida* grasses. The laterite rises support low Acacia Shrubland, dominated by *A. hilliana*. A laterite rise dominated by *Triodia basedowii* Grassland was evident in the north-west region of the area. To the south was an east-west trending range of laterite hills. The range was not accessible due to the poor condition of the track.



Photograph 2.5 Low Acacia Shrubland in Area Four (Fremlin).

Photograph 2.6 The range of hills to the south of Area Four (Fremlin).

2.2.5 Area Five - Seismic Line south of Harkonan Prospect

The landscape of area five was Sandplain supporting *Triodia* Grassland. The upper storey was characterised by sparse Eucalyptus, Hakea and Acacia species. In the western region of this area numerous laterite and quartz hills were evident, each with similar vegetation structure.

Photograph 2.6 Sandplain in Area Five predominately supporting Grassland vegetation.

2.3 Flora

The survey resulted in identification of a total of 66 native and introduced flora species from 23 families. The most common plant families recorded were Poaceae (10 taxa), Mimosaceae (9 taxa), Myrtaceae (9 taxa) and Proteaceae (5 taxa). The genus with the most representatives was *Acacia* with 9 species and *Eucalyptus* with 7 species.

Several introduced species, mainly grasses, were recorded. These were typically, although not exclusively, associated with previous exploration disturbance.

The range of flora species recorded within each of the areas surveyed did not vary greatly due to the consistent nature of the soils.

Appendix Two provides a list of the flora species recorded during the survey.

2.4 Significant Flora

There was no Declared Rare, Priority listed or otherwise significant flora species recorded within the areas surveyed.

2.5 Discussion

The vegetation of the surveyed area is typical of the Tanami Region, being predominately Hummock Grassland on sandy soils.

Vegetation in the region has been observed to recover relatively quickly from disturbance created by clearing. Most of the tracks used to access the surveyed area were between 2 and 5 years old and were generally overgrown with vegetation (Photograph 2.7). The sandy soil is however prone to erosion by surface water runoff when cleared. Recent tracks on sloping terrain where generally badly eroded as a result of an extreme rainfall event in January 2006 (Photograph 2.8).

Weeds were encountered in each of the surveyed areas, but were not prevalent. Seeds of weed species such as Buffel Grass (*Cenchrus biflorus*) are dispersed by wind, while others such as Gallon's Curse (*C. ciliaris*) cling to clothing and vehicles.

Photograph 2.7 Tracks in the area generally revegetate rapidly.

Photograph 2.8 The access track to Pebbles.

3 Fauna Assessment

A fauna assessment of each location was conducted in conjunction with the flora survey. The Tanami Region is known to support numerous Schedule, Priority listed or otherwise significant fauna species, many of which are potential inhabitants of the survey area.

The main objectives of the fauna assessment were to:

- Identify areas of vegetation or particular landforms that could support significant fauna species;
- Record sightings or evidence of significant fauna species within the survey area; and
- Recommend methods of minimising the potential for impact on fauna within the proposed exploration areas.

3.1 Methodology

At each location a 30 to 60 minute search for tracks, scats, burrows, diggings and other evidence of vertebrate fauna was carried out. Incidental observations of fauna were recorded while driving between and within each of the sites. Prominent landforms such as hills and rocky outcrops were also investigated for evidence of animal activity.

3.2 Fauna

Over 100 vertebrate species have been recorded in the area surrounding, and to the north of the Coyote Project (Biota, 2005). Twelve vertebrate species with conservation significance are known or possible inhabitants of the Tanami Region, and are therefore have potential to be found within the area of interest to Tanami. Table 3.1 lists these species.

These species are classified under the Western Australian Wildlife Conservation (Specially Protected Fauna) Notice 2005, managed by the Department of Environment and Conservation (DEC), formerly Department of Conservation and Land Management (CALM). Four of these animals are recognised under the international IUCN conservation ranking system, administered by the World Conservation Union. Table 3.2 provides definitions of the conservation codes used for fauna in Western Australia, while Table 3.3 provides definitions of the international conservation ranking system.

Species	DEC Conservation Level	IUCN Conservation Ranking	Recorded during recent surveys
Mulgara *Dasycercus cristicauda*	Schedule 1	VU	Yes
Bilby *Macrotis lagotis*	Schedule 1	VU	Yes
Southern and Northern Marsupial Mole *Notoryctes typhlops* and *N. caurinus*	Schedule 1	EN	No
Great Desert Skink *Egernia kintorei*	Schedule 1	VU	No
Peregrine Falcon *Falco peregrinus*	Schedule 4	-	No
Major Mitchell's Cockatoo *Cacatua leadbeateri*	Schedule 4	-	Yes
Gravel Dragon *Cryptagama aurita*	Priority 1	-	No
Ctenotus uber johnstonei	Priority 2	-	No
Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*	Priority 3	LR	No
Bush Stone-curlew *Burhinus grallarius*	Priority 4	NT	Yes
Australian Bustard *Ardeotis australis*	Priority 4	NT	Yes

Table 3.1 Vertebrate species with conservation significance known or potentially inhabiting the Tanami Region.

Classification of rare and endangered fauna under the Wildlife Conservation (Specially Protected Fauna) Notice 2005 recognises four distinct schedules of taxa:	
Schedule 1	Fauna which are rare or likely to become extinct and are declared to be fauna in need of special protection.
Schedule 2	Fauna which are presumed to be extinct and are declared to be fauna in need of special protection.
Schedule 3	Birds which are subject to an agreement between the governments of Australia, Japan and China relating to the protection of migratory birds and birds in danger of extinction, which are declared to be fauna in need of special protection.
Schedule 4	Fauna that are in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 and 3.
In addition to the above classification, fauna are also classified under five different Priority codes defined by the Department of Conservation and Land Management:	
Priority One (P1)	Taxa with few, poorly known populations on threatened lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Two (P2)	Taxa with few, poorly known populations on conservation lands. Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Three (P3)	Taxa with several, poorly known populations, some on conservation lands. Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
Priority Four (P4)	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
Priority Five (P5)	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Table 3.2 Definitions of the Western Australian fauna conservation codes.

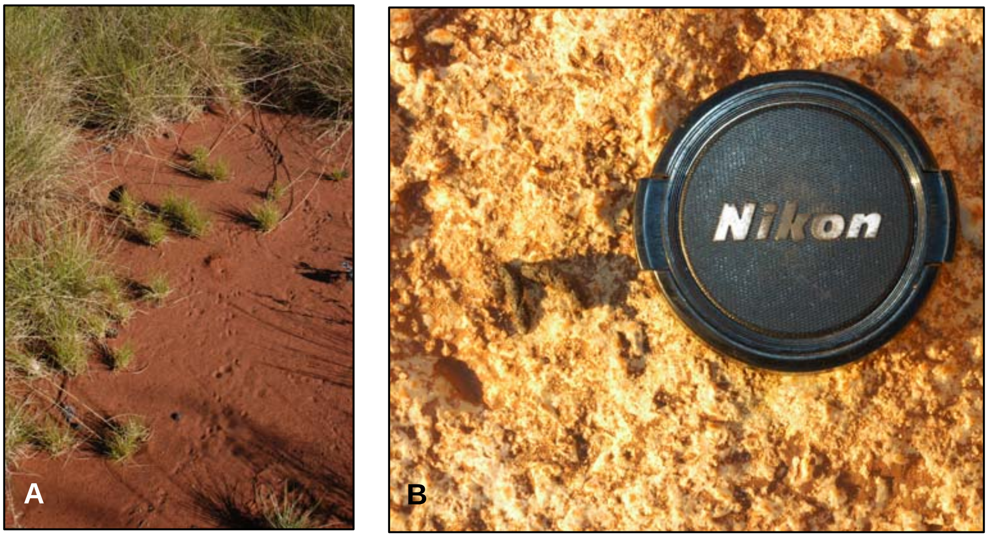
IUCN Red List Categories and Criteria	
EXTINCT (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
EXTINCT IN THE WILD (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
CRITICALLY ENDANGERED (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered (see Section V), and it is therefore considered to be facing an extremely high risk of extinction in the wild.
ENDANGERED (EN)	A taxon is Endangered when the best available evidence indicates that it meets any of the criteria A to E for Endangered (see Section V), and it is therefore considered to be facing a very high risk of extinction in the wild.
VULNERABLE (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria A to E for Vulnerable (see Section V), and it is therefore considered to be facing a high risk of extinction in the wild.
NEAR THREATENED (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
LEAST CONCERN (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
DATA DEFICIENT (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking. Data Deficient is therefore not a category of threat. Listing of taxa in this category indicates that more information is required and acknowledges the possibility that future research will show that threatened classification is appropriate. It is important to make positive use of whatever data are available. In many cases great care should be exercised in choosing between DD and a threatened status. If the range of a taxon is suspected to be relatively circumscribed, and a considerable period of time has elapsed since the last record of the taxon, threatened status may well be justified.

Table 3.3 Definitions of the IUCN threatened species categories.

3.3 Mammals

Numerous mammal species are expected to inhabit the surveyed areas, including several with conservation significance.

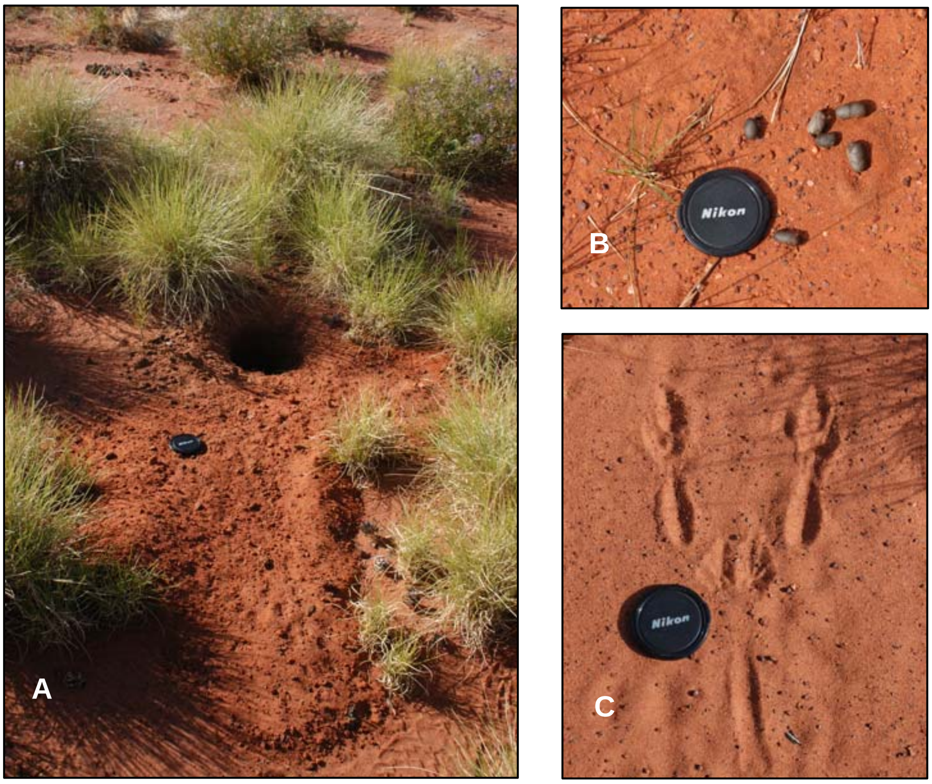
Tracks, diggings, burrows and scats of animals were observed at each of the areas surveyed, particularly in sandy areas. It is likely much of this is the result of native rodents such as the Desert Mouse (*Pseudomys desertor*), the Sandy Inland Mouse (*Pseudomys hermannsburgensis*) and the Spinifex Hopping Mouse (*Notomys alexis*). Photograph series 3.1 illustrates the tracks and scats of small mammals representative of the activity observed throughout the survey area.



Photograph series 3.1. **A)** Small mammal tracks were observed in most sandy areas. **B)** Scats collected from a rocky outcrop at Area Two (52mm lens cap).

Previous studies have documented the presence of Mulgara (*Dasycercus cristicauda*, Vulnerable - IUCN, Schedule 1 - DEC) within the Tanami Region, including a series of sand dunes to the north of the mine site. This Dasyurid occupies a range of habitats, primarily associated with sandy soils. Suitable habitat includes hummock grass plains, sand ridges and mulga shrubland on sandy loam (Menkhorst, 2001). As such, there is potential for this species to be located within the surveyed area, although no definitive evidence was located during this survey.

A species of Pebble-mound Mouse (likely to be *Pseudomys johnsoni*, pers. comm. Tony Start, DEC, July 2006) has been recorded at Bald Hill, approximately 60km north of the survey area (Biota, 2005). This mammal is typically found on laterite hills, where complex burrow systems are excavated with piles of pebbles forming a mound around the entrance. Inspections of potential habitat were carried out throughout the survey area, however no evidence was found. The population located to the north is believed to be at the southern extent of the range of the animal. It is considered unlikely that the species inhabits the surveyed area. None of the Pseudomys species have conservation significance, however considerable research is underway to clarify the identity of several members of the genus.

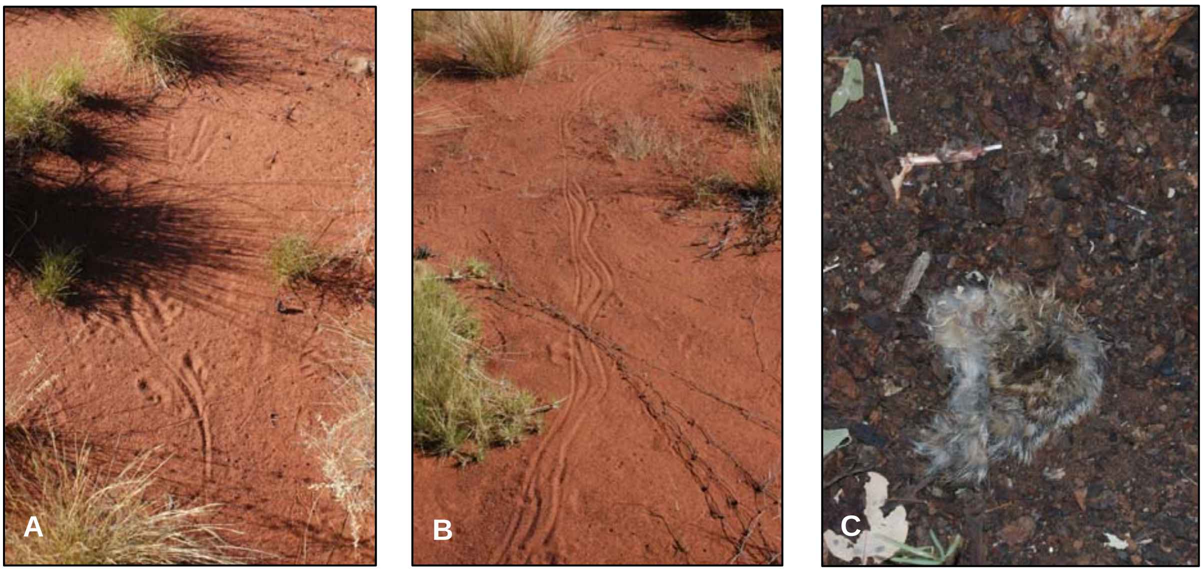


Photograph series 3.2 A) An active Bilby burrow in sandy soil B) Fresh Bilby scats adjacent to a burrow. C) Bilby tracks (72mm lens cap).

Medium sized mammal activity was observed in several areas. Mammal species of conservation significance previously observed in the Tanami region include the Bilby (*Macrotis lagotis*, Vulnerable - IUCN; Schedule 1 - DEC) and the Spectacled Hare-Wallaby (*Lagorchestes conspicillatus* subsp. *leichardti*, Priority 3 - DEC). Photograph 3.2A illustrates a potentially active Bilby burrow, one of many found in Area Five. Fresh scats (3.2B) and tracks (3.2C) were also common in this area. Map 2 (Appendix 2) indicates the locations of active Bilby burrows located during the survey.

Medium sized mammal tracks, either wallaby or Bilby, and evidence of a recent kill by a cat were observed adjacent to the track between Areas Two and Three (Photograph series 3.3).

The survey also recorded the activity of three introduced fauna species. These were the Dingo (*Canis lupis dingo*), the cat (*Felis catus*) and the camel (*Camelus dromedarius*). Evidence of each (tracks, scats, remnants of prey) was found in numerous locations throughout the surveyed area.



Photograph series 3.3 A) Medium sized mammal tracks B) Cat tracks and drag marks. C) Remains of the kill found nearby.

3.4 Birds

Numerous bird species were recorded from incidental sightings during the survey. Of note was the Australian Bustard or Bush Turkey (*Ardeotis australis*, Priority 4 - DEC) and the Major Mitchell's Cockatoo (*Cacatua leadbeateri*, Schedule 4 - DEC), both sighted in several locations in the surveyed area. Tracks potentially belonging to the Bush Stone-curlew (*Burhinus grallarius*, Priority 4 - DEC) were observed in sandy areas throughout the surveyed area.

3.5 Reptiles

Numerous reptiles were sighted incidentally during the survey and included common geckos, dragons and skinks. A Ridge-tailed Monitor (*Varanus acanthurus*) was found on the rocky outcrop at the Rabies prospect.

The survey area includes habitat suitable for the Giant Desert Skink (*Egernia kintorei*, Vulnerable - IUCN; Schedule 1 - DEC) and the Gravel Dragon (*Cryptogama aurita*, Priority 1 - DEC). *E. kintorei* inhabits sandy soils with spinifex cover, while *C. aurita* is believed to prefer gravely slopes with spinifex cover. Neither has been recorded within the survey area.

3.6 Discussion

The most significant finding of this survey was the prevalence of Bilby activity in Area Five. The increased activity appears to be at least partly in response to fires in the area in 2004. This is possibly due to increased food availability. The decreased density of vegetation may also allow the animals to move more freely and thus cover a larger area while foraging. The Seismic Line, used for mineral exploration, was also cleared in 2004 by the Western Australian Geological Survey. This disturbance, and the high volume of vehicles and machinery associated with it, has obviously not impacted on Bilby activity in the area. Indeed, Bilbies have utilised the disturbance to construct burrows (Photograph 3.4). A number of Bilby "warrens" were observed within Area Five, comprising four or more burrows, many of which appeared to be active (Photograph 3.5). All the burrows observed had been constructed in sandy soil although most were adjacent to laterite rises. It is anticipated that further Bilby activity will be found within the burnt area surround Area Five, indicated on Map 2 (Appendix 2).

Photograph 3.4 A recent Bilby burrow beneath a pile of vegetation cleared from the Seismic Line in Area Five.

Photograph 3.5 A Bilby "warren" comprising six large burrows, four of which appeared to be active.

The Bush Turkey, Major Mitchell's Cockatoo and the Bush Stone-curlew are common throughout the Tanami Region. They occupy a variety of habitats and, although dependant on the existing vegetation, do not appear to be affected by small-scale disturbance (pers. observations: 31 Major Mitchell's

Cockatoos sighted at the mine airstrip, 14th May 2006; 4 Bush Stone-curlews sighted on the camp access road 15th March 2006; almost daily sightings of Bush Turkey along the Tanami Road).

4 Recommendations

Each of the areas surveyed has been previously disturbed by exploration activity over the last ten years, in some cases several times. Revegetation of local flora species and the high occurrence of fauna activity within each area indicate good recovery of the local environment after disturbance.

As a result of observations made during the flora and fauna survey of the proposed exploration areas within the Ranges of the Western Desert Proposed Nature Reserve, the following recommendations have been made to assist in minimising adverse environmental impact as a result of exploration activity.

- Further survey work should be conducted in Area Five to determine the extent of Bilby activity and to estimate the population size;
- Suitable habitat throughout the surveyed area should be regularly surveyed for Bilby activity, with particular focus on recently burnt areas and on transition zones between laterite rises and sand plain;
- Personnel working in the area should be familiarised with the presence of Bilby and other burrowing mammals in the area and required to record the location of any such activity encountered;
- The range of hills to the south-east of Area Four was not accessible and therefore not surveyed. Further investigation for the presence of fauna species including the Mulgara, Pebble-mound Mouse, Bilby and species of macropod is recommended prior to activity in this area;
- Weeds are common but not prevalent throughout the surveyed area. Care should be taken to avoid further spread of the various weeds present. Methods of control include avoidance of weed infested areas, removal and burning of weeds before seed is set and thorough cleaning of vehicles and clothing before moving to new areas;
- Access tracks should be cleared using the raised blade method wherever possible. This will assist in minimising soil erosion. Where grading is required tracks should be constructed along the contour of hills and sloping terrain where possible to minimise water erosion. Tracks required for medium to long-term use should be constructed with a central crest to enable shedding of water.

5 References

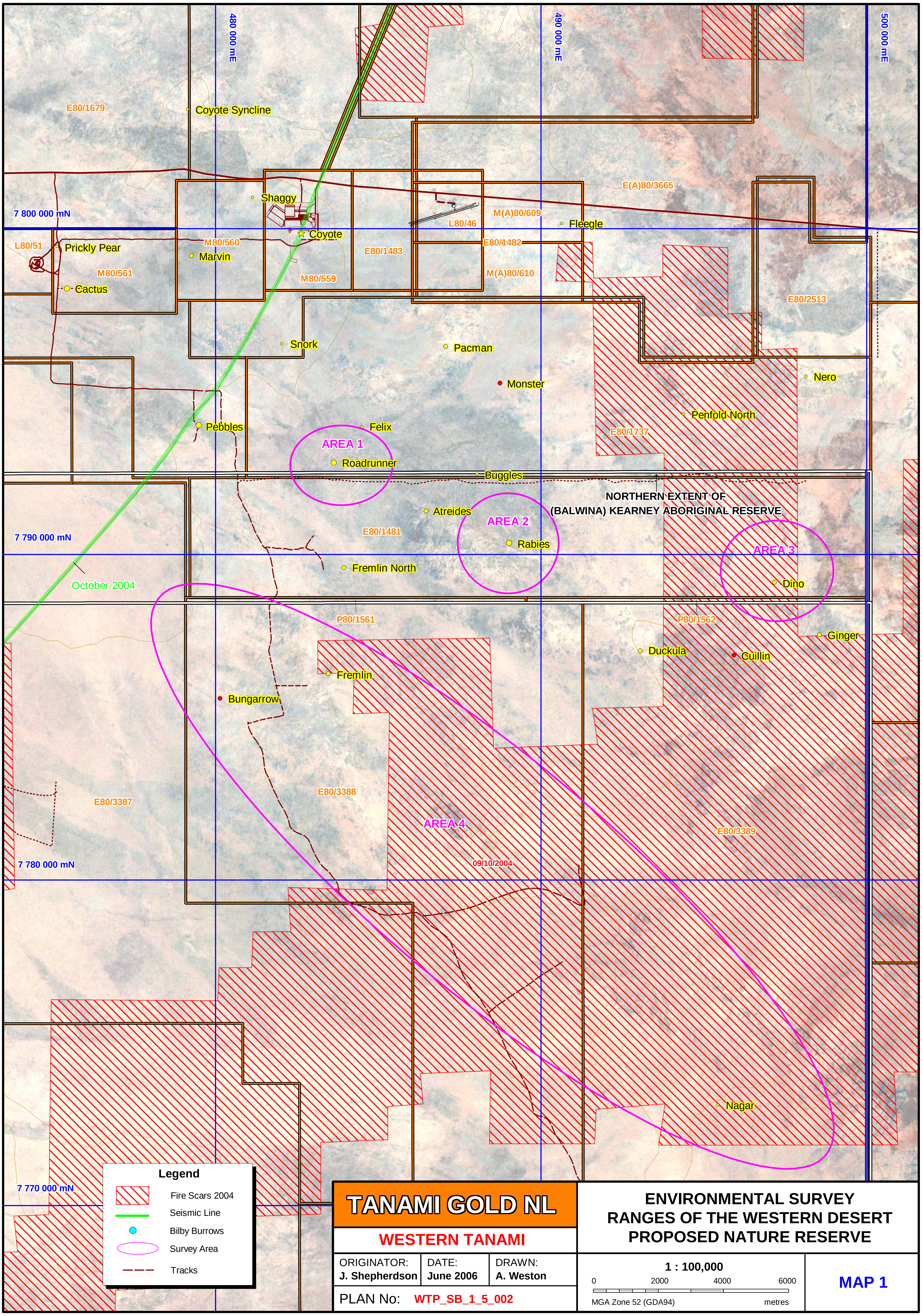
Biota Environmental Services Pty Ltd (2005). *Fauna Habitats and Fauna Assemblage Survey of the Western Tanami Project Area*. Report for Tanami Gold NL.

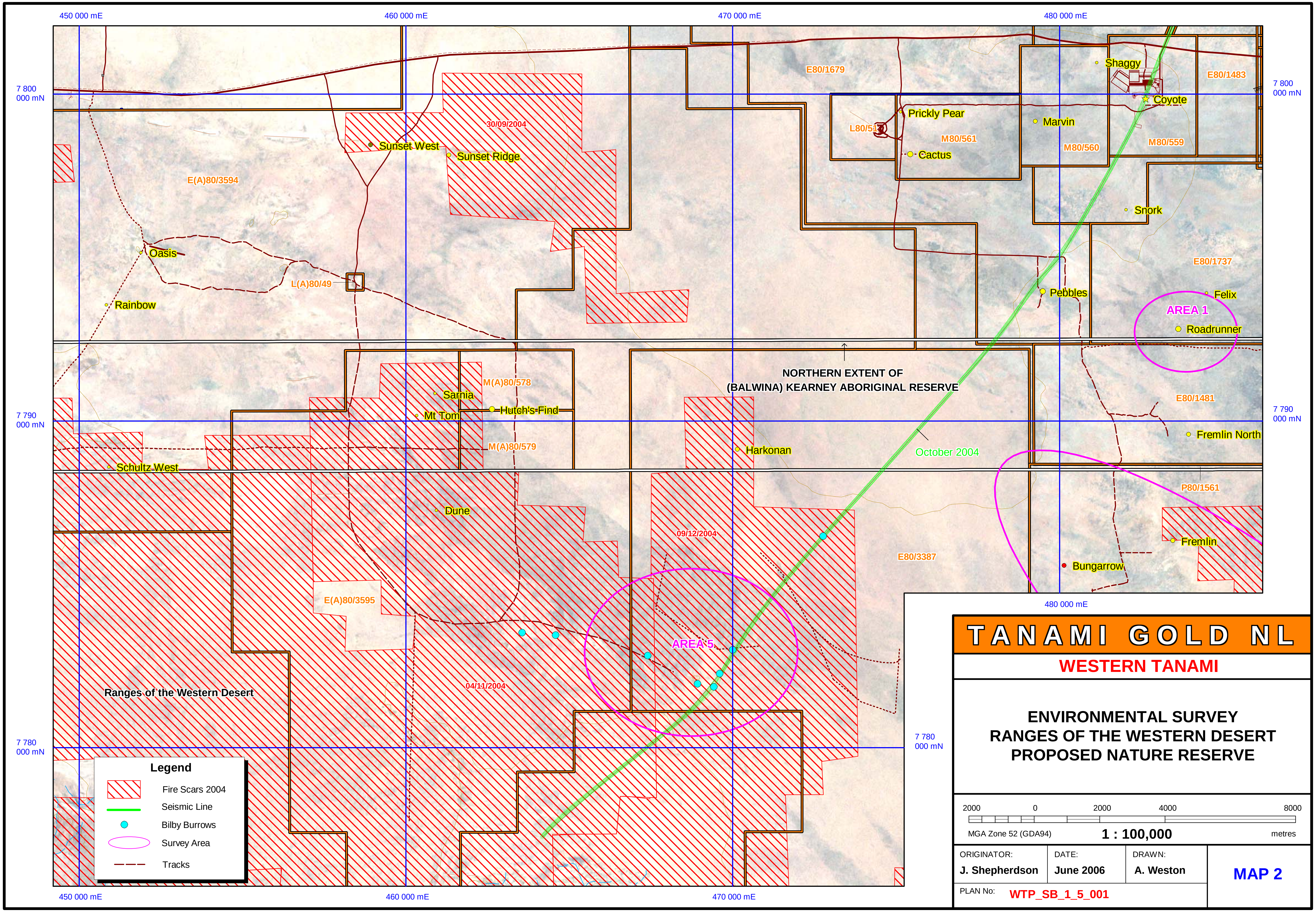
National Land & Water Resources Audit (2001). *Australian Natural Resources Atlas V2.0*. Web site:http://audit.ea.gov.au/anra/atlas_home.cfm. Commonwealth of Australia.

Menkhorst, P. and Knight, F. (2001). A Field Guide to the Mammals of Australia. Oxford University Press. South Melbourne, Australia.

Appendix 1

Maps


480 000 mE
490 000 mE
500 000 mE
7 800 000 mN
7 790 000 mN
7 780 000 mN
7 770 000 mN
E80/1679
Coyote Syncline
Shaggy
Coyote
E(A)80/3665
M(A)80/609
L80/46
Fleegle
L80/51
Prickly Pear
M80/560
Marvin
E80/1483
E80/1482
M80/561
Cactus
M80/559
M(A)80/610
E80/2513
Snork
Pacman
Monster
Nero
Penfold North
Pebbles
Felix
E80/1737
AREA 1
Roadrunner
Buggles
NORTHERN EXTENT OF
(BALWINA) KEARNEY ABORIGINAL RESERVE
Atreides
AREA 2
E80/1481
Rabies
AREA 3
Fremlin North
Dino
October 2004
P80/1561
P80/1562
Ginger
Duckula
Cuillin
Fremlin
Bungarrow
E80/3387
E80/3388
AREA 4
E80/3389
09/10/2004
Nagar
Legend
Fire Scars 2004
Seismic Line
Bilby Burrows
Survey Area
Tracks
TANAMI GOLD NL
WESTERN TANAMI
ENVIRONMENTAL SURVEY
RANGES OF THE WESTERN DESERT
PROPOSED NATURE RESERVE
ORIGINATOR:
J. Shepherdson
DATE:
June 2006
DRAWN:
A. Weston
1 : 100,000
0
2000
4000
6000
MGA Zone 52 (GDA94)
metres
MAP 1
PLAN No: WTP_SB_1_5_002



TANAMI GOLD NL
WESTERN TANAMI
ENVIRONMENTAL SURVEY
RANGES OF THE WESTERN DESERT
PROPOSED NATURE RESERVE
MAP 2
ORIGINATOR: J. Shepherdson
DATE: June 2006
DRAWN: A. Weston
PLAN No: WTP_SB_1_5_001
MGA Zone 52 (GDA94)
1 : 100,000
2000 0 2000 4000 8000
metres
Legend
Fire Scars 2004
Seismic Line
Bilby Burrows
Survey Area
Tracks
450 000 mE
460 000 mE
470 000 mE
480 000 mE
7 800 000 mN
7 790 000 mN
7 780 000 mN
NORTHERN EXTENT OF
(BALWINA) KEARNEY ABORIGINAL RESERVE
Ranges of the Western Desert
AREA 1
AREA 5
October 2004
30/09/2004
09/12/2004
04/11/2004
E80/1679
E80/1483
E80/1737
E80/1481
E80/3387
E(A)80/3594
E(A)80/3595
L(A)80/49
L80/51
M80/561
M80/560
M80/559
M(A)80/578
M(A)80/579
P80/1561
Shaggy
Coyote
Prickly Pear
Marvin
Cactus
Snork
Sunset West
Sunset Ridge
Oasis
Rainbow
Pebbles
Felix
Roadrunner
Sarnia
Mt Tom
Hutch's Find
Harkonan
Schultz West
Fremlin North
Dune
Fremlin
Bungarrow

Appendix 2

Flora Species List

Survey of Proposed Areas of Exploration

within the Ranges of the Western Desert Proposed Nature Reserve

Flora Species Recorded 12th - 18th June 2006

Family	Genus	Species
Aizoaceae		
	Trianthema	*oxycalyptra*
	Trianthema	*pilosa*
	Trianthema	*portulacastrum*^
Amaranthaceae		
	Ptilotus	*calostachyus*
	Ptilotus	*exaltatus*
	Ptilotus	*fusiformis*
	Ptilotus	*polystachyus*
Asteraceae		
	Pterocaulon	*serrulatum*
Boraginaceae		
	Halgania	*solanacea*
Caesalpiniaceae		
	Chamaecrista	*symonii*
	Petalostylis	*cassioides*
	Senna	*artemisioides* subsp. *oligophylla*
Capparaceae		
	Cleome	*viscosa*
Caryophyllaceae		
	Polycarpaea	*corymbosa*
Convolvulaceae		
	Ipomoea	*costata*
Lamiaceae		
	Dicrastylis	*exsuccosa*
Loranthaceae		
	Lysiana	*spathulata*
Malvaceae		
	Abutilon	*macrum*
	Abutilon	*octocarpum*
	Gossypium	*australe*
	Hibiscus	*leptocladus*

Family	Genus	Species
Mimosaceae		
	Acacia	*adoxa*
	Acacia	*adsurgens*
	Acacia	*ancistrocarpa*
	Acacia	*coriacea* subsp. *sericophylla*
	Acacia	*hilliana*
	Acacia	*lysiphloia*
	Acacia	*orthocarpa*
	Acacia	*stellaticeps*
	Acacia	*stipulegra*
Myoporaceae		
	Eremophila	*latrobei*
Myrtaceae		
	Calytrix	*carinata***
	Corymbia	*opaca* (formerly *E. terminalis*)
	Eucalyptus	*aspera*
	Eucalyptus	*brevifolia*
	Eucalyptus	*gamophylla*
	Eucalyptus	*odontocarpa*
	Eucalyptus	*pachyphylla*
	Eucalyptus	*pruinosa*
	Eucalyptus	sp. (hybrids)
Papilionaceae		
	Indigofera	*monophylla*
	Jacksonia	*aculeata*
	Leptosema	*anomalum*
Poaceae		
	Aristida	*contorta*
	Aristida	*holathera*
	Aristida	*sp.*
	Cenchrus	*biflorus^*
	Cenchrus	*ciliaris^*
	Cymbopogon	*bombycinus*
	Enneapogon	*caerulescens*
	Enneapogon	*purpurascens*

Family	Genus	Species
	Eragrostis	*eriopoda*
	Triodia	*pungens*
	Triodia	*basedowii*
Proteaceae		
	Hakea	*macrocarpa*
	Hakea	*suberea*
	Grevillea	*eriostachya*
	Grevillea	*stenobotrya*
	Grevillea	*wickhamii*
Sapindaceae		
	Dodonaea	*coriacea*
Solanaceae		
	Solanum	*chippendalei*
	Solanum	*diversiflorum*
Stackhousiaceae		
	Macgregoria	*racemigera*
Sterculiaceae		
	Keraudrenia	*nephrosperma*
Thymelaeaceae		
	Pimelea	*ammocharis*
Violaceae		
	Hybanthus	*aurantiacus*

*Only found in Area Two (Rabies)

^Introduced species

Appendix 17

Geochemical Characterisation of Process Tailings Samples (Graeme Campbell & Associates)

TANAMI GOLD NL

WESTERN TANAMI PROJECT

GEOCHEMICAL CHARACTERISATION

OF PROCESS-TAILINGS SAMPLES

('STATIC-TESTWORK')

Implications for Process-Tailings Management

GRAEME CAMPBELL AND ASSOCIATES PTY LTD

(ACN 061 827674)

NOVEMBER 2004

Job No. 0433

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TABLES AND APPENDICES

(At Back of Report Text)

SUMMARY OF TECHNICAL TERMS EMPLOYED IN THIS REPORT

ACRONYM	PARAMETER	DEFINITION/DETERMINATION	UNIT
AFP	Acid-Formation Potential		
ARD	Acid-Rock Drainage		
Total-S	Total Sulphur	Analysis Result	% (w/w)
Sulphide-S	Sulphide Sulphur	Testwork Result [i.e. Sulphide-S = Total-S - Sulphate-S]	% (w/w)
ANC	Acid-Neutralisation Capacity	Testwork Result	kg H_2SO_4/tonne
MPA	Maximum-Potential Acidity	Calculation	kg H_2SO_4/tonne
NAPP	Net-Acid-Producing Potential	Calculation	kg H_2SO_4/tonne
NAG	Net-Acid Generation	Testwork Result	kg H_2SO_4/tonne
NAF	Non-Acid Forming	Calculation: • Sulphide-S < 0.3 % • Sulphide-S ≥ 0.3 %, and negative-NAPP value with ANC/MPA ≥ 2.0	kg H_2SO_4/tonne
PAF	Potentially-Acid Forming	Calculation: • Sulphide-S ≥ 0.3 %, and any positive-NAPP value • Sulphide-S ≥ 0.3 %, and a negative-NAPP value with ANC/MPA < 2.0	kg H_2SO_4/tonne
PAF-[SL]	PAF-[Short-Lag]	Estimation [e.g. inferred from 'kinetic' testing]	
PAF-[LL]	PAF-[Long-Lag]	Estimation [e.g. inferred from 'kinetic' testing]	
SOR	Sulphide-Oxidation Rate	Testwork Result [e.g. obtained from 'kinetic' testing]	mg SO_4/kg/week, or kg SO_4/tonne/annum

Notes: The **PAF-[SL]** classification applies to (initially circum-neutral) PAF-materials that may acidify (viz. pH less than 5) within a matter of weeks-to-months when subjected to "aggressive-ambient-weathering", corresponding to periods of at least a few days during which unsaturated-conditions prevail (via drainage/evaporation processes) between successive inundations that, in turn, occur semi-regularly (e.g. weekly-to-fortnightly "on-average" during most of the annual hydrological-cycle).

The **PAF-[LL]** classification applies to PAF-materials where exposure to the atmosphere for years (even decades, or longer) may be needed before acidification develops. Circum-neutral-pH during the "lag-phase" for such lithotypes is chiefly due to buffering reactions involving carbonate-minerals.

Climate directly influences the duration of the "lag-phase", and a sulphide-gangue assemblage classified as PAF-[SL] in a "humid" environment where the SOR is controlled by **O_2-supply**, may instead be classified as PAF-[LL] in semi-arid/arid environments where the SOR is contolled by **water-supply** (viz. frequency of "flushing-episodes") [Campbell 2004]. The formation of "secondary-oxidation-products" (e.g. Fe-oxyhydroxides) as protective-coatings is generally enhanced during the "lag-phase-stage" of mine-waste weathering in semi-arid/arid environments, and so further curtails sulphide-oxidation rates.

1.0 INTRODUCTION

Tanami Gold NL produces gold at the Western Tanami Project located *c.* 300 kms to the east of Halls Creek, Western Australia.

The Coyote Deposit is proposed to be mined initially as an open-pit operation, followed by underground-mining of largely Transition-Ore, and minor Primary-Ore. The Larranganni Deposits are to be mined as open-pit operations, comprising Kookaburra Oxide-Ore, and Sandpiper Oxide-Ore. The current mining/milling schedule involves open-pit mining of the Coyote Deposit first, then open-pit mining of the Larranganni Deposits, and finally underground-mining of the Coyote Deposit. The stream of process-tailings (in the form of a slurry) will be discharged to an engineered, Tailings-Storage Facility (TSF).

Graeme Campbell & Associates Pty Ltd (GCA) was commissioned to carry out geochemical testwork on tailings-slurry samples (viz. **Coyote-Ore-Tailings** and **Larranganni-Ore-Tailings**) derived from a bench-scale-metallurgical study.

The 'Static-Testwork' Programme focused on the Acid-Formation Potential (AFP), Multi-Element Composition, and Mineralogy of the tailings-solids samples.[1] In addition, the quality (viz. major/minor-ion chemistry, and cyanide forms) of the tailings-slurry-waters, was determined.

The testwork results are presented and discussed in this report, and implications for process-tailings management highlighted.

[1] A 'Static-Testwork' Programme comprises "whole-rock" analyses and tests.

2.0 STUDY APPROACH

Details of the sampling and testwork programmes, and the calculations and criteria employed for classifying the tailings-solid samples into AFP categories, are presented and discussed in the following sections.

2.1 Testwork Programme

2.1.1 Samples

The tailings-slurry samples submitted to GCA for testing are derived from a programme of bench-scale-metallurgical testwork performed by Ammtec Limited (Balcatta). Details of the metallurgical study are presented in Appendix A.

The tailings-slurry samples were provided in 10-L, white-plastic-pails which were almost filled to the brim with slurry. The heights of the tailings-solids were approximately one-third (Coyote-Ore-Tailings), and one-half (Larranganni-Ore-Tailings), of the total-slurry heights. The clear supernatants (viz. tailings-slurry-waters) overlying the settled tailings-solids were decanted via siphoning, and preserved for specific analyses.[2]

The 'sludge' of tailings-solids was removed from each plastic-pail, and homogenised by hand-mixing. Although the top *c.* 10-20 mm of the tailings-solids-packs in the plastic-pails had a "sloppy" consistency, the remainder was coherent, and the tailings-solids

[2] Sub-samples of the 'raw' tailings-slurry-waters were employed for the analysis of major-parameters and metals, whereas NaOH-dosed sub-samples were used for the analysis of cyanide forms. The NaOH-dosed sub-samples were stored in 500-mL, black-plastic-bottles. The determination of NO_3-N and NH_3-N was performed on H_2SO_4-dosed sub-samples.

The multi-element composition of the tailings-slurry-waters was determined by analysing the *unacidified* waters, since acidification using HNO_3 often results in the formation of complex, insoluble compounds of cyanide and metals (especially when thiocyanate is present). Such precipitation reactions complicate both chemical analysis, and interpretation of the analysis results.

overall were worked-up by hand-mixing. The tailings-solids samples were not washed prior to testing.

2.1.2 Testwork

The testwork methods employed in this study are based on recognised procedures for the geochemical characterisation of mine-waste materials, process-liquors and natural-waters (e.g. AMIRA 2002; Morin and Hutt 1997; Smith 1992; Coastech Research 1991; BC AMD Task Force 1989; APHA 1992).

Details of the testwork methods are presented in Appendix B.

Part of the testwork was carried out by SGS Environmental Services [SGS] (Welshpool), and Genalysis Laboratory Services [GLS] (Maddington). The analyses performed by SGS and GLS have NATA endorsement.[3]

Specialised testing (viz. Net-Acid-Generation [NAG] Tests) was undertaken by Dr. Graeme Campbell in the GCA Testing-Laboratory (Bridgetown).

The mineralogical work was performed by Dr. Roger Townend of Roger Townend & Associates (Malaga).

Copies of the laboratory and mineralogical reports are presented in Appendix C.

2.2 Calculated Parameters

The Maximum-Potential-Acidity (MPA) values (in kg H_2SO_4/tonne) of tailings-solids samples are typically calculated by multiplying the Sulphide-S values (in %) by 30.6.

[3] NATA = National Association of Testing Authorities.

The multiplication-factor of 30.6 reflects both the reaction stoichiometry for the complete oxidation of pyrite/pyrrhotite, by O_2 to "$Fe(OH)_3$" and H_2SO_4, and the different weight-based units of % and kg H_2SO_4/tonne. The Net-Acid-Producing-Potential (NAPP) values (in kg H_2SO_4/tonne) of tailings-solids samples are calculated from the corresponding MPA and Acid-Neutralisation-Capacity(ANC) values (i.e. NAPP = MPA - ANC). However, since the tailings-solids samples tested herein had Sulphide-S contents less than 0.05 % (Table 3.1), NAPP calculations were not performed.

2.3 Classification Criteria

In terms of AFP, mine-waste materials may be classified into one of the following categories, viz.

- Non-Acid Forming (NAF).

- Potentially-Acid Forming (PAF).

There are **no** unifying, "standard" criteria for classifying the AFP of mine-waste materials (Campbell 2002a,b; Smith 1992), and reflects the diversity of sulphide and gangue-mineral assemblages within (un)mineralised-lithotypes of varying weathering- and alteration-status. Rather, criteria for classifying AFP may need to be tailored to deposit-specific geochemistry, and mineralogy.

The AFP-classification criteria often employed at mining-operations worldwide are:

- **NAF**: Sulphide-S < 0.3 %. For Sulphide-S ≥ 0.3 %, both a negative NAPP value, and an ANC/MPA ratio ≥ 2.0.

- **PAF**: For Sulphide-S ≥ 0.3 %, any positive-NAPP value; negative-NAPP value with an ANC/MPA ratio < 2.0.

In assessing the AFP of mine-waste materials, there is consensus (e.g. mining/environmental regulators in British Columbia, Canada) that lithotypes with Sulphide-S contents less than 0.3 % are unlikely to oxidise at rates fast enough to result in acidification (e.g. pH less than 4-5) [Soregaroli and Lawrence 1997]. This position assumes that the groundmass hosting such "trace-sulphides" is not simply quartz, and/or clays (Price *et al.* 1997), and that for a carbonate-deficient gangue, the sulphides are not unusually reactive (e.g. sulphide-oxidation rates [SORs] less than *c.* 20-40 mg SO_4/kg/week) [= *c.* 1-2 kg SO_4/tonne/year].[4] A "cut-off" of 0.3 % for Sulphide-S also accords with the findings of 'kinetic' testing conducted, since the late-1980s, by Dr. Graeme Campbell for mine-waste samples of diverse mineralogy in terms of AFP.

The ANC/MPA criteria for the NAF category reflects the need to compensate for "less-than-perfect" availability of alkalinity-forms (e.g. carbonates) for neutralisation of acid produced through pyrite-oxidation. A "less-than-perfect" availability of alkalinity-forms may arise from:

(a) Restricted accessibility of acid to carbonate-grains.

(b) Rate-limiting dissolution of carbonates-grains near pH=7.

(c) Depletion of carbonate-minerals through rainfall-fed leaching within waste-dumps.[5]

[4] Although 'steady-state' SORs (at circum-neutral-pH) for Sulphide-S contents less than 0.3 % may indeed exceed 1-2 kg SO_4/tonne/year, such rates are generally restricted to either sedimentary forms (e.g. framboidal-pyrite), or hydrothermal-sulphides that are atypically reactive.

[5] Depletion of carbonate-minerals through dissolution in meteoric-waters is minimal in semi-arid settings, especially within the "hydrologically-active-zone" (e.g. top 2-3 m) of a waste-dump, since re-precipitation occurs during evapo-concentration when desiccating conditions return after "wet-spells".

Restricted accessibility of acid to the surfaces of carbonate-grains may occur at different spatial-scales (viz. at the "whole-rock-scale" in which Acid-Rock Drainage [ARD] "by-passes" carbonate-bearing materials via preferential-flow pathways within a waste-dump, and at the "pore/grain-scale" in which the surfaces of individual carbonate-grains are "blinded/rimmed" by precipitates of Fe(III)-oxyhydroxides [e.g. ferrihydrite-type phases]). As shown by Li (1997), ferroan-carbonates (especially "Fe-rich" varieties) are prone to "surface-armouring/rimming" during dissolution: weathering of tailings-solids containing pyrite, ankerites and Mg-siderites produced acidic leachates when less than one-third of the carbonate-grains had dissolved.

To compensate for the effects of (a) to (c) above, some authors advocate that, for a mine-waste sample to be classified as NAF, it must have an ANC/MPA ratio of at least 3.0 (see review of earlier literature by Smith [1992]). In recent years, fundamental-research (especially estimation of reaction-rates for diverse sulphide/gangue-mineral assemblages), and field-experience at mining operations world-wide, have shown that the potential for ARD production is very low for mine-waste materials with ANC/MPA ratios greater than 2.0 (AMIRA 2002; Price *et al.* 1997, Currey *et al.* 1997, and Murray *et al.* 1995).[6] This ANC/MPA ratio is employed in the present work.[7]

The risk posed by handling PAF-lithotypes during the working of a deposit is governed primarily by the duration of the "lag-phase" (i.e. the period during which sulphide-oxidation occurs, but acidification does not develop, due to buffering near pH=7 by gangue-phases).[8] Although the "lag-phase" applicable to exposed mine-wastes at

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6 Such ANC/MPA ratios are consistent with those indicated from SORs, and carbonate-depletion rates, as reported in the International-Kinetic Database for mine-waste materials from around the world (Morin and Hutt 1997).

7 It should be noted that mining-regulators in Nevada (USA) classify a mine-waste sample as NAF, if it is characterised by an ANC/MPA ratio greater than 1.2 (US EPA 1994). This lower ANC/MPA ratio reflects the semi-arid conditions typically encountered at mine-sites in Nevada. Although utilised in the early-1990s, it is understood that an ANC/MPA ratio of 1.2 is still entertained by regulators in Nevada for "screening" PAF and NAF varieties of mine-wastes in semi-arid settings.

8 SO_4 is still produced by sulphide-oxidation during the "lag-phase", and soluble-forms of minor-elements (e.g. As) may be released at circum-neutral-pH during the "lag-phase-stage" of mine-waste weathering.

"field-scale" cannot be accurately predicted *a priori*, estimates (albeit approximate) are still needed to identify the exposure-times for the safe handling of PAF-lithotypes, and so reduce the risk for ARD production. Estimates of the "lag-phase" are invariably obtained through programmes of 'kinetic' testing (viz. Weathering-Columns). However, based on experience, "first-pass" estimates of the "lag-phase" may be made, and thereby used to further classify PAF-lithotypes into **PAF-[Short-Lag]** and **PAF-[Long-Lag]** sub-categories. Such "first-pass" estimates are necessarily provisional, and subject to revision, in the light of the outcomes of 'kinetic' testing, and field observations.

3.0 ACID-BASE CHEMISTRY OF TAILINGS-SOLIDS SAMPLES

The testwork results on the acid-base chemistry of the tailings-solids samples are presented in Table 3.1, and discussed in the following sections.

3.1 Sulphur Forms

The tailings-solids samples had Total-S and SO_4-S values of 0.04-0.10 %, and 0.02-0.03 %, respectively (Table 3.1).

The testwork results indicate that the tailings-solids samples contained negligible amounts of sulphide-minerals, corresponding to Sulphide-S contents less than 0.05 %.

3.2 Acid-Consuming Properties

The tailings-solids samples had ANC values of 5.1-8.6 kg H_2SO_4/tonne, and CO_3-C values of 0.04-0.07 % (Table 3.1).[9]

The testwork results indicate that the tailings-solids samples had a very-low capacity to consume acid, and reflects a paucity of carbonate-minerals in the various orebodies.

3.3 Acid-Formation Potential

The tailings-solids samples had NAG-pH values of 9.1-9.4, and NAG values less than 0.5 kg H_2SO_4/tonne (Table 3.1).[10] Therefore, under the strongly-oxidising conditions of the NAG-testwork, the samples did not acidify.

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[9] ANC values of 5.1-8.6 kg H_2SO_4/tonne are equivalent to *c.* 0.51-0.86 % (as "$CaCO_3$").
[10] The NAG-testwork corresponds to the "Single-Addition" variant of the NAG Test (AMIRA 2002).

The NAG-testwork results indicate that the tailings-solids samples are classified as Non-Acid Forming (NAF).

4.0 MULTI-ELEMENT COMPOSITION AND MINERALOGY OF TAILINGS-SOLIDS SAMPLES

The multi-element composition and mineralogy of the tailings-solids samples are indicated by the data presented in Tables 4.1 and 4.2, respectively.[11] The corresponding element-enrichments in the samples, as indicated by the values of the Geochemical-Abundance Index (GAI), are also presented in Table 4.1.[12] It should be noted that these element-enrichments are relative enrichments, based on the element contents typically recorded for unmineralised soils, regoliths and bedrocks (Bowen 1979).

The tailings-solids samples were variously enriched in As, Bi, Sb, Se, Mo, B, Cd and Pb (Table 4.1). However, the contents of these chalcophyles were not marked.

The As content of 0.33 % for the Larranganni-Ore-Tailings-Solids sample stood out, though it falls within the range typically recorded for process-tailings-solids produced at local gold-mines.[13]

The tailings-solids samples has essentially identical mineralogies, and were dominated by quartz with major amounts of muscovite. Kaolin, goethite and biotite were accessory, with traces of Ti-oxides. The Larranganni-Ore-Tailings-Solids sample also contained traces of arseniosiderite [viz. a Fe/Ca-hydroxyarsenate of ideal composition $Ca_2Fe_3O_2(AsO_4)_3.3H_2O$].

[11] The suite of elements listed in Table 4.1 is grouped into (a) the major-elements (viz. Na, K, Mg, Ca, Al and Fe) making-up the lattices of primary-silicates, sulphides, clays, sesquioxides and carbonates, and (b) minor-elements. A distinction is made between minor-elements which, under neutral-to-alkaline conditions, occur (i) as cationic-hydrolysis forms (e.g. Cu), and (ii) as anions/oxyanions (e.g. As). Anionic forms may exhibit moderate solubility under neutral-to-alkaline conditions.

[12] The GAI is defined in Appendix B.

[13] This statement is based on Dr. Graeme Campbell's experience (since the late-1980s) in related tailings-geochemistry studies for a wide range of gold-mines throughout Western Australia.

The analysis results indicate that, geochemically, the tailings-solids samples were relatively "clean". However, the Larranganni-Ore-Tailings-Solids sample had an As content of 0.3-0.4 %.

5.0 QUALITY OF TAILINGS-SLURRY-WATER SAMPLES

The analysis results for the tailings-slurry-water samples are presented in Table 5.1, and discussed in the following sections.

5.1 pH and Salinity

The samples had pH values of 9.6-9.8, and salinities (as Total-Dissolved Solids, TDS) of 3,100-6,500 mg/L (Table 5.1).

The groundwaters to be sourced for make-up-water in the mill, were employed in the bench-scale-metallurgical-testwork programme. The shallow groundwaters typically have a salinity of *c.* 3,000 mg/L, whereas the deeper groundwaters tend to have a salinity of *c.* 6,000-7,000 mg/L (Mr William Darcy, *pers. commun.*). Although difficult to predict accurately, the salinity of the tailings-slurry-waters should be near 3,000 mg/L during the early stages of the Project, and thereafter increase as the dewatering activities draw more on the deeper groundwaters.

The testwork results indicate that the tailings-water samples were neutral-to-alkaline (viz. pH 9-10), and brackish-to-saline.

5.2 Major/Minor-Ion Chemistry

The salts in the samples comprised NaCl (viz. "halite"), together with sulphates and Ca (Table 5.1).

The concentrations of most minor-elements were below, or close to, the respective detection-limits (Table 5.1). The low concentrations of soluble metals attest to the efficiency of metal-sorption reactions under neutral-to-alkaline conditions (Sposito 1984).[14]

The exceptions were Cu and Zn which forms soluble complexes with cyanide (see Section 5.3).

The As concentration in the slurry-water of the Larranganni-Ore-Tailings sample was *c.* 0.2-0.3 mg/L, and shows that the Total-As content of *c.* 0.3-0.4 % in the tailings-solids corresponds to As forms that exhibit minimal leaching under alkaline conditions. The mineralogical study identified arseniosiderite in the tailings-solids (Table 4.2), and the dissolution of arseniosiderite may result in As concentrations within the mg/L range (Campbell 2004). The reduced As solubility observed herein is believed to reflect the net outcome of arseniosiderite dissolution, and "scavenging" of As(V) forms (i.e. arsenates) by kaolin and goethite which are each accessory components of the tailings-solids sample.

The analysis results indicate that the tailings-slurry-water samples had concentrations of most minor-elements less than, or close to, the respective detection-limits. Exceptions included cyanide-complexing metals (see Section 5.3).

5.3 Cyanide Forms

The tailings-slurry-water samples had CN_{tot} and CN_{wad} concentrations of 170-230 mg/L and 170-220 mg/L, respectively (Table 5.1).[15]

> Note: In the bench-scale-metallurgical-testwork programme, the NaCN-dosage rates were much higher than those to be employed during the full-scale milling of ores. Accordingly, the CN_{tot} concentrations recorded for the tailings-slurry-water samples analysed herein exceed those

[14] Sorption reactions include both adsorption and precipitation reactions (Sposito 1984).
[15] CN_{tot} = Total Cyanide; CN_{wad} = Weak-Acid-Dissociable Cyanide.

anticipated for the 'ex-mill' stream of process-tailings. Provisionally, the CN_{tot} concentrations within the latter should range up to *c.* 100-150 mg/L.

The Fe, Cu, Ni and Co concentrations in the tailings-slurry-water samples were consistent with the CN_{tot} and CN_{wad} concentrations (Table 5.1). Since the concentrations of cyanide-complexing metals are low for the "overdosed" samples analysed herein, low concentrations of these metals should also occur in the slurry-waters derived from the full-scale milling of ores.

Based on the analysis results for the "overdosed" the tailings-slurry-water samples, it is anticipated that the slurry-water of the 'ex-mill' stream of process-tailings should have a CN_{tot} concentration of approximately 100 mg/L. Allowing for the degree of cyanide degradation (chiefly via volatilisation processes) following discharge to the TSF, the decant-water should have a CN_{wad} concentrations less than approximately 50 mg/L. The latter should therefore be below the 50 mg/L guideline suggested for the protective of wildlife (e.g. birds) that come into contact with cyanide-bearing liquors at mine-sites (Smith and Mudder 1991).

Monitoring of the decant-water will need to be undertaken to confirm (or refine) the above projections of CN_{tot} and CN_{wad} concentrations.

6.0 CONCLUSIONS

Based on the testwork results obtained in this study, it is concluded that:

- The tailings-solids samples are classified as *Non-Acid Forming (NAF)*.

- The tailings-solids samples were only slightly enriched in chalcophyles, although the Larranganni-Ore-Tailings-Solids sample had an As content of *c.* 0.3-0.4 %.

- The tailings-water samples were alkaline, brackish-to-saline hypersaline, and had low concentrations of minor-elements (including As). The occurrence of kaolin and goethite as gangue-phases means that As solubility is constrained through sorption reactions.

  It is anticipated that, in the full-scale Project, the CN_{wad} concentration in the decant-pond-water/return-water should be less than the 50 mg/L guideline suggested for the protective of wildlife (e.g. birds) that come into contact with cyanide-bearing liquors (Smith and Mudder 1991). Monitoring is needed to confirm (or refine) this prediction.

In brief, the formation of Acid-Rock Drainage (ARD) should be a "non-issue" for the process-tailings-solids to be produced from the Coyote and Larranganni Deposits, assuming that the tailings-solids samples tested herein are representative.

A moderate enrichment in As within the surface-zone of the filled-TSF will likely be the main issue to contend with when developing a TSF-closure strategy, as governed by the As status of Transition/Primary-Ores from the Coyote Deposit.[16] However, these ores

[16] TSF = Tailings-Storage Facility.

appear to have As contents appreciably lower than those for the Oxide-Ores from the Larranganni Deposits.

Given the climate of the mine-site, some form of (vegetated) 'store/release-cover' system should be suitable for TSF-closure/rehabilitation, as routinely employed at other gold-mines located within the Mulga Zone, and arid areas of inland Australia (Campbell 2004).

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TABLES

Table 3.1: Acid-Base-Analysis and Net-Acid-Generation Results for Tailings-Solids Samples

GCA-SAMPLE NO.	TAILINGS TYPE	MC (%, w/w)	TOTAL-S (%)	SO_4-S (%)	Sulphide-S (%)	CO_3-C (%)	ANC	NAPP	NAG	NAG-pH	AFP CATEGORY
							kg H_2SO_4/tonne				
GCA5445	Coyote-Ore-Tailings-Solids	27.5	0.04	0.02	0.02	0.04	5.1	nc	<0.5	9.1	NAF
GCA5446	Larranganni-Ore-Tailings-Solids	30.8	0.10	0.07	0.03	0.07	8.6	nc	<0.5 (<0.5)	9.4 (9.4)	NAF

Notes:
MC = Moisture-Content; ANC = Acid-Neutralisation Capacity; NAPP = Net-Acid-Producing Potential; NAG = Net-Acid Generation; nc = not calculated;
AFP = Acid-Formation Potential; NAF = Non-Acid Forming.
All results expressed on a dry-weight basis, except for NAG-pH.
MC value corresponds to water-weight divided by dry-solids-weight (after oven-drying at 105 ^{o}C for 24 hrs), and expressed as a percentage.
Values in (parentheses) represent duplicates.

Table 4.1: Multi-Element-Analysis Results for Tailings-Solids Samples

Note: Refer Appendix B for the definition of the Geochemical-Abundance-Index (GAI) indicated in this table.

ELEMENT	TOTAL-ELEMENT CONTENT (mg/kg or %)		AVERAGE-CRUSTAL ABUNDANCE (mg/kg or %)	GEOCHEMICAL-ABUNDANCE INDEX (GAI)	
	Coyote-Ore-Tailings-Solids (GCA5445)	Larranganni-Ore-Tailings-Solids (GCA5446)		Coyote-Ore-Tailings-Solids (GCA5445)	Larranganni-Ore-Tailings-Solids (GCA5446)
Al	8.0%	6.0%	8.2%	0	0
Fe	3.2%	6.0%	4.1%	0	0
Na	0.19%	0.12%	2.3%	0	0
K	3.2%	1.8%	2.1%	0	0
Mg	0.44%	0.57%	2.3%	0	0
Ca	0.12%	0.36%	4.1%	0	0
Ag	0.1	0.3	0.07	0	2
Cu	50	120	50	0	1
Zn	67	220	75	0	1
Cd	0.3	1.7	0.11	1	**3**
Pb	130	58	14	**3**	1
Cr	620	630	100	2	2
Ni	350	400	80	2	2
Co	11	30	20	0	0
Mn	160	430	950	0	0
Hg	<0.01	0.03	0.05	0	0
Sn	6.3	1.9	2.2	1	0
Sr	49	67	370	0	0
Ba	690	210	500	0	0
Th	17	2.6	12	0	0
U	5.3	4.1	2.4	0	0
Tl	0.60	0.74	0.6	0	0
V	61	310	160	0	0
As	400	3,300	1.5	**6**	**6**
Bi	3.1	0.26	0.048	**5**	2
Sb	1.3	39	0.2	2	**6**
Se	0.19	1.1	0.05	1	**4**
Mo	43	60	1.5	**4**	**5**
B	140	58	10	**3**	2
P	380	170	1,000	0	0
F	580	360	950	0	0

Note: Average-crustal abundance of elements based on Bowen (1979).

Table 4.2: Mineralogical Results for Tailings-Solids Samples

Coyote-Ore-Tailings-Solids (GCA5445)		Larranganni-Ore-Tailings-Solids (GCA5446)	
Component	**Abundance**	**Component**	**Abundance**
quartz	dominant	quartz	dominant
muscovite	major	muscovite	major
kaolin goethite biotite	accessory	kaolin goethite biotite	accessory
Ti-oxides	trace	arseniosiderite Ti-oxides	trace

Notes:

dominant = greater than 50 %; major = 20-50 %; accessory = 2-10 %; and, trace = less than 2 %.

See mineralogical report in Appendix C for further information.

Table 5.1: Analysis Results for Tailings-Slurry-Water Samples

Note: All results in mg/L, except for pH and EC (µS/cm).

ELEMENT/ PARAMETER	Coyote-Ore-Tailings-Slurry-Water (GCA5445)	Larranganni-Ore-Tailings-Slurry-Water (GCA5446)	ELEMENT/ PARAMETER	Coyote-Ore-Tailings-Slurry-Water (GCA5445)	Larranganni-Ore-Tailings-Slurry-Water (GCA5446)
Major-Parameters			***Minor-Ions***		
pH	9.6	9.8	Fe	<0.1 (0.18)	<0.1 (0.16)
EC [µS/cm]	12,000	6,100	Cu	1.6 (2.6)	0.6 (1.0)
TDS(gravimetric)	6,500	3,100	Ni	0.2 (0.43)	<0.1 (0.24)
			Zn	0.50 (0.70)	1.9 (3.2)
Major-Ions			Co	0.064	0.057
			Al	0.2	0.9
Na	1,800	960	Cd	0.0048	0.17
K	82	19	Pb	<0.005	<0.005
Mg	31	3.9	Cr	<0.1	<0.1
Ca	150	70	Hg	0.002	0.002
Cl	2,400	1,100	As	0.051 (<0.02)	0.23 (<0.02)
SO_4	1,600	730	Sb	0.0016	0.0050
HCO_3	<5	<5	Bi	<0.00005	<0.00005
CO_3	140	110	Se	0.091	0.030
OH	56	43	B	<0.1	0.1
			Mo	0.18	0.070
Nitrogen-Forms			P	2	3
			F	0.4	1.0
NH_3-N	<0.1	<0.1	Ag	0.084	0.012
NO_3-N	1.2	2.6	Ba	0.094	0.12
			Sr	2.2	0.8
Cyanide-Forms			Tl	0.0002	0.0002
			V	<0.1	<0.1
CN_{tot}	230	170	Sn	0.002	0.002
CN_{wad}	220	170	U	0.00005	<0.00005
SCN	<0.1	0.3	Th	<0.00005	<0.00005
			Mn	<0.1	<0.1

Notes: EC = Electrical Conductivity; TDS = Total-Dissolved Solids; CN_{tot} = Total Cyanide; CN_{wad} = Weak-Acid-Dissociable Cyanide; SCN = Thiocyanate; nm = not measured.
Values for Fe, Cu, Ni, Zn and As in parentheses represent analyses by different laboratories (see Appendix C).

APPENDIX A

DETAILS OF BENCH-SCALE-METALLURGICAL STUDY

Roger Townend and Associates
Consulting Mineralogists

G CAMPBELL AND ASSOC

PO BOX 247,

BRIDGETOWN

WA

10-11-2004

OUR REF. 21151

YOUR REF. 0433

XRD/PLM/SEM ANALYSIS OF TWO TAILINGS.

(GCA 5445-6, COYOTE)

R TOWNEND

RESULTS **XRD/PLM/SEM ANALYSIS**

Correspondence to Box 3129, Malaga D.C. WA 6945
ACN 069 920 476 ABN 92 076 109 663

GCA	5445	5446
QUARTZ	DOMINANT	DOMINANT
KAOLIN	ACCESSORY	ACCESSORY
MUSCOVITE	MAJOR	MAJOR
BIOTITE	ACCESSORY	ACCESSORY
GOETHITE	ACCESSORY	ACCESSORY
TI OXIDES	TRACE	TRACE
ARSENIOSIDERITE		TRACE

AMMTEC LIMITED
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AMMTEC
6 MacAdam Place, Balcatta
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Telephone: (08) 9344 2416
Facsimile: (08) 9345 4688
Email: manager@ammtec.com.au

To: Mr Graeme Campbell
Graeme Campbell & Associates Pty Ltd
Testing Laboratory
Unit B, 15 Rose Street,
Bridgetown,
WA 6255

Dear Graeme,

RE: TAILING TESTWORK – COYOTE GOLD PROJECT [TANAMI GOLD NL]

As per discussions between yourself and Mr Bill Darcy of Tanami Gold Nl, I am sending the following pulp sample for tailing testwork :

- Overall Leach residue/tailing pulp

The pulp sample is 10 litres, which is a blend of oxide [65% w/w], Transition [27% w/w] and Fresh [8% w/w] residue. The sample is at a pulp density of 40% solids (w/w). Pulp pH is 10 [hydrate lime] and solution cyanide strength is ~ 300ppm. We have used site bore water for generating the pulp sample.

Please liase with Mr Bill Darcy regarding the work and forward all your findings and invoices directly to Tanami Gold.

Sincerely Yours

Hamid Sheriff
Laboratory Manager

9th September 2004

AMMTEC LIMITED
A.C.N. 063 332 516

AMMTEC
6 MacAdam Place, Balcatta
Western Australia 6021
Telephone: (08) 9344 2416
Facsimile: (08) 9345 4688
Email: manager@ammtec.com.au

To: Mr Graeme Campbell
Graeme Campbell & Associates Pty Ltd
Testing Laboratory
Unit B, 15 Rose Street,
Bridgetown,
WA 6255

Dear Graeme,

RE: TAILING TESTWORK – LARRANGANNI GOLD PROJECT [TANAMI GOLD NL]

As per discussions between yourself and Mr Bill Darcy of Tanami Gold Nl, I am sending the following pulp sample for tailing testwork :

- Larranganni Oxide Overall Leach residue/tailing pulp

The pulp sample is 10 litres, which is a blend of Kookaburra oxide [78% w/w] and Sandpiper Oxide [22% w/w] residue. The sample is at a pulp density of 40% solids (w/w). Pulp pH is 10 [hydrate lime] and solution cyanide strength is ~ 300ppm. We have used site bore water for generating the pulp sample.

Please liase with Mr Bill Darcy regarding the work and forward all your findings and invoices directly to Tanami Gold.

Sincerely Yours

Hamid Sheriff
Laboratory Manager

15th September 2004

APPENDIX B

TESTWORK METHODS

APPENDIX B

TESTWORK METHODS

B1.0 ACID-BASE-CHEMISTRY TESTWORK ON TAILINGS-SOLIDS SAMPLES

The acid-base chemistry of the tailings-solids samples was assessed by determining:

- Total Sulphur (Total-S) and Sulphate Sulphur (SO_4-S).
- Acid-Neutralisation Capacity (ANC) and Carbonate Carbon (CO_3-C).
- Net-Acid Generation (NAG).

Relevant details of the testwork methods employed are discussed briefly below. Further details are presented in the laboratory reports (see Appendix C).

B1.1 Total-S and SO_4-S Tests

The Total-S values were measured by Leco combustion (@ 1300 ^{o}C) with detection of evolved $SO_{2(g)}$ by infra-red spectroscopy. The SO_4-S values were determined by the Na_2CO_3-Extraction Method (Lenahan and Murray-Smith 1986).[1]

The difference between the Total-S and SO_4-S values indicates the Sulphide-S (strictly Non-Sulphate-S) content.

[1] The Na_2CO_3-reagent extracts SO_4-S which occurs as soluble sulphates, and calcium sulphates (e.g. gypsum and anhydrite). It also extracts SO_4 sorbed to the surfaces of sesquioxides, clays and silicates. However, SO_4 present as barytes ($BaSO_4$) is not extracted, and SO_4 associated with jarositic-type and alunitic-type compounds is incompletely extracted.

B1.2 ANC and CO_3-C Tests

B1.2.1 ANC Tests

The ANC values were determined by a procedure based on that of Sobek *et al.* (1978). This procedure is essentially the "standard" method employed for estimating the ANC values of mine-waste materials (Morin and Hutt 1997; BC AMD Task Force 1989).

The samples were reacted with dilute HCl for *c.* 2 hours at 80-90 ^oC, followed by back-titration with NaOH to a pH=7 end-point to determine the amount of acid consumed.[2] The simmering step for *c.* 2 hours differs slightly from the heating treatment of the Sobek *et al.* procedure wherein the test mixtures are heated to near boiling until reaction is deemed to be complete (viz. gas evolution not visually apparent), followed by boiling for one minute. In terms of dissolution of carbonate, primary-silicate and oxyhydroxide minerals, this variation to the Sobek *et al.* method is inconsequential.

The Sobek *et al.* (1978) procedure exposes mine-waste samples to both strongly-acidic conditions (e.g. pH of 1-2), and a near-boiling temperature. Provided excess acid is added, this method ensures that carbonate-minerals (including ferroan and manganoan varieties) are dissolved quantitatively, and that at least traces of ferro-magnesian silicates (e.g. amphiboles, pyroxenes, chlorites, micas, etc.), and feldspars, are dissolved. However, under circum-neutral (viz. pH 6-8) conditions required for mine-waste and environmental management, the dissolution of ferro-magnesian silicates is kinetically extremely slow (e.g. see review-monograph by White and Brantley [1995]). Near pH=7, the dissolution rates (under 'steady-state' conditions, and in the absence of inhibiting alteration-rims) of mafic-silicates and feldspars generally correspond to H_2SO_4-consumption rates 'of-the-order' $10^{-11}/10^{-12}$ moles/m^2/s (White and Brantley 1995). As a guide, for minerals of sub-mm grading, such silicate-dissolution rates correspond to Sulphide-Oxidation Rates (SORs) ranging up to 'of-the-order' 1-10 mg

[2] Two drops of 30 % (w/w) H_2O_2 were added to the test mixtures as the pH=7 end-point was approached, so that any Fe(II) forms released by the acid-attack of ferroan- carbonates and -silicates are oxidised to Fe(III) forms (which then hydrolyse to "Fe(OH)$_3$"). This step ensures that the resulting ANC values are not unduly biased "on-the-high-side", due to the release of Fe(II) during the acidification/digestion step. Such potential bias in ANC values may be marked for mine-waste samples in which "Fe-rich" ferroan-carbonates (e.g. siderite) dominate acid consumption. The addition of the H_2O_2 reagent is <u>not</u> part of the methodology described by Sobek *et al.* (1978).

SO_4/kg/week (= *c.* 0.1-1.0 kg H_2SO_4/tonne/year).[3] Maintenance of circum-neutral-pH through dissolution/hydrolysis of primary-silicates is therefore restricted to both "mineral-fines", and slow rates of pyrite weathering.

Despite the aggressive-digestion conditions employed, the ANC values determined by the Sobek *et al.* (1978) method allow an informed, initial "screening" of mine-waste materials in terms of acid-consuming and pH-buffering properties, especially when due account is taken of gangue mineralogy (Morin and Hutt 1997). Jambor *et al.* (2000, 2002) have presented a compendium of 'Sobek-ANC' values for specific classes of primary-silicates, and assists interpretation of the ANC values recorded for mine-waste materials of varying mineralogy.

B1.2.2 CO_3-C Values

The CO_3-C value is the difference between the Total-C and Total-Organic-C (TOC) values.

The Total-C was measured by Leco combustion (@ 1300 ^oC) with detection of evolved $CO_{2(g)}$ by infra-red spectroscopy. The TOC was determined by Leco combustion on a sub-sample which had been treated with strong HCl to decompose carbonate-minerals.

B1.3 NAG Tests

The NAG Test is a direct measure of a sample's potential to produce acid through sulphide oxidation, and also provides an indication of the reactivity of the sulphides, and the availability of the alkalinity-forms contributing to the ANC (AMIRA 2002; Miller *et al.* 1997, 1994).

In this test, the sample is reacted with H_2O_2 to rapidly oxidise contained sulphides, and allow the produced acid to react with the acid-neutralising materials (e.g. carbonates). The NAG Test supplements the NAPP-based assessment of the acid-formation potential of mine-waste materials (Morin and Hutt 1997).

[3] SORs of this magnitude (at circum-neutral-pH) would typically only be recorded for the oxidation of "trace-sulphides" (e.g. Sulphide-S contents less than 0.5 %).

The procedure employed in this study is based on that for the 'Static-NAG Test', as described by Miller *et al.* (1994, 1997). The Start-pH of the 15 % (w/w) H_2O_2 solution (prepared from A.R.-grade H_2O_2) was adjusted to pH=4.5 using dilute NaOH. In addition, the boiling treatment to decompose residual, unreacted H_2O_2 following overnight reaction was carried out in two stages (viz. boiling for *c.* 2 hours initially, cooling and addition of 1 mL of 0.02 M-$CuSO_4$ to the test mixtures, followed by boiling again for *c.* 2 hours). The addition of Cu(II) salts catalyses the decomposition of residual H_2O_2, and thereby prevents "positive-blank" values being obtained (O'Shay *et al.* 1990). Pulped K-feldspar was employed for the blanks run for the NAG-testwork.

Prior to the boiling steps, the pH values of the test-mixture suspensions are measured, and invariably correspond to an "overnight-period" of reaction. Such pH values reflect buffering under ambient conditions without accelerated dissolution of gangue-phases through boiling to decompose any unreacted-H_2O_2. In the interpretation of NAG-testwork data, it is important to take note of the pH values recorded prior to the boiling steps, especially for mine-waste samples that have both Sulphide-S contents less than 1 %, and ANC values less than *c.* 10 kg H_2SO_4/tonne (as typically recorded for a 'carbonate-deficient' gangue). Furthermore, oxidation by H_2O_2 is generally at least 10^4-10^5 faster than the SORs recorded during 'kinetic' testing (e.g. Wetting/Drying Columns) of mine-waste samples. If circum-neutral conditions are to prevail during NAG testwork, then the rate of acid consumption by gangue-phases must be proportionately faster (c.f. rates for 'ambient-weathering'). This aspect must also be borne in mind when interpreting NAG-testwork data, especially for mine-waste materials that are devoid of carbonates, since the dissolution/hydrolysis kinetics of primary-silicates are strongly pH-dependent.

B2.0 MULTI-ELEMENT ANALYSES ON TAILINGS-SOLIDS SAMPLES

The total content of a wide range of major- and minor-elements in the tailings-solids samples was determined through the use of various digestion and analytical techniques. The detection-limits employed are appropriate for environmental investigations.

Element enrichments were identified using the *Geochemical Abundance Index (GAI)*.[4]

The GAI quantifies an assay result for a particular element in terms of the average-crustal-abundance of that element.[5] The GAI (based on a log-2 scale) is expressed in 7 integer increments (viz. 0 to 6). A GAI of 0 indicates that the content of the element is less than, or similar to, the average-crustal-abundance; a GAI of 3 corresponds to a 12-fold enrichment above the average-crustal-abundance; and so forth, up to a GAI of 6 which corresponds to a 96-fold, or greater, enrichment above average-crustal-abundances.

B3.0 ANALYSIS OF TAILINGS-SLURRY-WATER SAMPLES

The tailings-slurry-water samples were analysed for pH, Electrical Conductivity (EC), salinity (as Total-Dissolved Solids, TDS), alkalinity-forms, Cl and SO_4, and a wide range of major- and minor-elements employing detection-limits appropriate for environmental investigations.

The concentrations of cyanide forms (viz. Total Cyanide, CN_{tot}; Weak-Acid-Dissociable Cyanide, CN_{wad}; and, Thiocyanate, SCN) in the sample were determined by standard methods (APHA 1992). Compared with CN_{wad}, SCN exhibits a reduced toxicity towards biota (Smith and Mudder 1991).

All analyses were performed on appropriately-preserved 'splits' for the determination of specific analytes (see Appendix C).

[4] The GAI was developed by Förstner *et al.* (1993), and is defined as:

$$GAI = \log_2 [C_n/(1.5 \times B_n)]$$

where:

C_n = measured content of n-th element in the sample.

B_n = "background" content of the n-th element in the sample.

[5] The average-crustal-abundances of the elements for the GAI calculations are based on the values listed in Bowen (1979).

APPENDIX C

LABORATORY REPORTS

11 November, 2004

Graeme Campbell & Associates Pty Ltd
Attn: Dr G Campbell
PO Box 247
BRIDGETOWN WA 6255

Our Reference: 84203
Your Reference: GCA0433
NATA Accreditation: 2562(1705)

Dear Sir

On the 30th of September 2004 you forwarded testwork instructions for two (2) raw water samples and two (2) solids which were received on 27th of September 2004 at our laboratory. The samples were identified as follows:

GCA5445 and GCA 5446: Raw waters in 2 x 1000mL translucent-plastic-bottle.

GCA5445 and GCA 5446: NaOH-dosed water in 2 x 500mL black-plastic-bottle.

GCA5445 and GCA 5446 H_2SO_4 dosed water in 2 x 250mL translucent plastic bottle.

GCA5445 and GCA 5446: Moist filter cakes of tailings solids in 4 x 250mL plastic jar.

One of the moist residue solids jars and 100mL of the raw water (vacuum filtered 0.45-µm membrane) were forwarded to Genalysis Laboratory Services as requested. 50g of moist tailings solids was sent to Roger Townend and Associates with the remaining moist tailings solids are being sub sampled for moisture and the dried sample pulped to a nominal 75µm particle size for sulphur and carbon forms analysis.

Results of all testwork performed follow:

Sample Number	Moisture Content @ 105°C (% w/w)	Total Carbon (% w/w)	Total Organic Carbon (% w/w)	Total Sulphur S (% w/w)	Sulphate Sulphur SO_4-S (Na_2CO_3) (% w/w)	Carbonate Carbon CO_3-C (% w/w)
GCA 5445	27.5	0.090	0.05	0.040	0.02	0.04
GCA 5446	30.8	0.11	<0.05	0.10	0.07	0.07

NOTES:

1. *Moisture content was determined on an as received sample as loss in weight after 24 hours drying at 105°C and is reported on the dried sample weight basis.*
2. *Sulphate sulphur was determined on an as received sample by Na_2CO_3 extraction, $BaSO_4$ precipitation with results reported back to the 105°C dried sample basis.*
3. *Total sulphur, total carbon and total organic carbon (noncarbonate or acid insoluble carbon) were determined on dried pulped sample by LECO induction furnace, IR detection,*

CLIENT: **Graeme Campbell & Associates Pty Ltd** **OUR REFERENCE: 84203**
PROJECT NO: **GCA0433**

and is reported on that basis. This test work was performed by SGS Minerals Services, Welshpool, report number WM081063 (NATA1936).

Acid Neutralisation Capacity (ANC):

Sample Number	Fizz Rating	Sample Weight (g)	Titre NaOH (mL)	Normality HCl/NaOH (N)	Initial Effervescence	Effervescence on Warming	ANC Solution pH	ANC (kg H_2SO_4/tonne)
GCA5445	0-1	4.9142	21.30	0.1N	Nil	Nil	1.58	5.1
GCA5446	0-1	4.8879	18.70	0.1N	Nil	Nil	1.70	8.6
ANC Std20		1.9226	17.50	0.1N			1.56	19.80

NOTES:

1. *Acid neutralisation capacity was determined on as received moist sample with results corrected back to the 105°C sample weight basis. Unless otherwise stated, 25mL of HCl is used. Reagent blank titre of 0.1N NaOH was 25.40mL.*
2. *ANC Std20 is an internally produced standard of $CaCO_3$ and quartz pulped to a nominal 75µm particle size which has a nominal ANC of 20kg of H_2SO_4/tonne.*
3. *This procedure is based on Sobek et al, 1978.*

Results of the tailings waters analysis follow on a separate table.

Yours faithfully,

STEVEN EDMETT
Client Liaison Manager

JANICE VENNING
Manager, Perth

This report supersedes our preliminary results sent by facsimile on the 25th of June 2004.

CLIENT: **Graeme Campbell & Associates Pty Ltd** **OUR REFERENCE: 84203**
PROJECT NO: **GCA0433**

LABORATORY REPORT

Your reference	**GCA 5445**	**GCA 5446**	
Our reference	**84203-1**	**84203-2**	
Sample type	**Water**	**Water**	
Units	**mg/L**	**mg/L**	**Method**
pH (pH Units)	9.6	9.8	PEI 001
Total Dissolved Solids (grav)	6,500	3,100	PEI 002
Electrical Conductivity @ 25°C (µS/cm)-Direct	12,000	6,100	PEI 032
Chloride, Cl	2,400	1,100	PEI 008
Sulphate, SO_4	1,600	730	PEI 034
Carbonate, CO_3	140	110	PEI 006
Bicarbonate, HCO_3	<5	<5	PEI 006
Hydroxide, OH	56	43	PEI 006
Fluoride, F	0.4	1.0	PEI 027
Ammoniacal Nitrogen, NH_3-N	<0.1	<0.1	PEI 010
Iron, Fe (soluble)	0.18	0.16	PEM 001
Copper, Cu	2.6	1.0	PEM 001
Nickel, Ni	0.43	0.24	PEM 001
Zinc, Zn	0.70	3.2	PEM 001
Thiocyanate, SCN	<0.1	0.3	PEI 025
Arsenic, As	<0.02	<0.02	PEM 004
Nitrate-Nitrogen, NO_3-N	1.2	2.6	PEI 011
Total Cyanide, CN	230	170	PEI 021/023
Weak Acid Dissociable Cyanide, WADCN	220	170	PEI 026/023

NOTES:

1. *Total and weak acid dissociable cyanide were analysed from the NaOH preserved bottle.*
2. *Ammoniacal nitrogen and nitrate nitrogen were analysed from the H2SO4 dosed bottle with balance of analysis on raw bottle.*

NET-ACID-GENERATION (NAG) TESTWORK

Sample Number	Sample Weight (g) [moist]	Sample Weight (g) [dry]	Comments	pH of Test Mixture Before Boiling Step	Test Mixture After Boiling Step		Titre [0.1 M-NaOH] (mL)	NAG (kg H_2SO_4/ tonne)
					pH	EC (µS/cm)		
GCA5445	4.6	3.6		6.5	9.1	120	-	<0.5
GCA5446	8.9	6.8	Reaction peaked overnight (?)	7.2	9.4	190	-	<0.5
GCA5446 (Repeat)	7.4	5.6	Reaction peaked overnight (?)	7.2	9.4	160	-	<0.5
Blank	-	6.6		5.2	7.5	71	-	<0.5

Notes: Test conditions based on those described by Miller *et al.* (1997). The pH of the 15 % (v/v) H_2O_2 solution was adjusted to 4.5 using 0.1 M-NaOH prior to commencing the NAG Tests. Test mixtures boiled for *c.* 2 hours to accelerate reaction with H_2O_2. Then, after allowing the test mixtures to cool, 1.0 mL of 0.016 M-$CuSO_4$ solution was added, and the test mixtures again boiled for *c.* 2 hours. The addition of Cu(II) catalyses the decomposition of any residual, unreacted-H_2O_2 in the test mixtures (O'Shay *et al.* 1990). K-Feldspar was employed for the Blank. NAG values expressed on a dry-weight basis.

Dr GD Campbell
9th November 2004

ANALYTICAL REPORT

Dr G. CAMPBELL
CAMPBELL, GRAEME and ASSOCIATES
PO Box 247
BRIDGETOWN, W.A. 6255
AUSTRALIA

JOB INFORMATION

JOB CODE	:	143.0/0407659
No. of SAMPLES	:	2
No. of ELEMENTS	:	31
CLIENT O/N	:	GCA0433
SAMPLE SUBMISSION No.	:	
PROJECT	:	COYOTE GOLD PROJECT
STATE	:	Water
DATE RECEIVED	:	01/10/2004
DATE COMPLETED	:	10/11/2004
DATE PRINTED	:	10/11/2004

LEGEND

X	= Less than Detection Limit
N/R	= Sample Not Received
*	= Result Checked
( )	= Result still to come
I/S	= Insufficient Sample for Analysis
E6	= Result X 1,000,000
UA	= Unable to Assay
>	= Value beyond Limit of Method

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Unit 14a 253 Dormehl Road, Middlepark,

JOHANNESBURG SAMPLE PREPARATION DIVISION

Anderbolt, Gauteng, South Africa 1459.
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SAMPLE DETAILS

DISCLAIMER

Genalysis Laboratory Services Pty Ltd wishes to make the following disclaimer pertaining to the accompanying analytical results.

Genalysis Laboratory Services Pty Ltd disclaims any liability, legal or otherwise, for any inferences implied from this report relating to either the origin of, or the sampling technique employed in the collection of, the submitted samples.

SIGNIFICANT FIGURES

It is common practice to report data derived from analytical instrumentation to a maximum of two or three significant figures. Some data reported herein may show more figures than this. The reporting of more than two or three figures in no way implies that the third, fourth and subsequent figures may be real or significant.

Genalysis Laboratory Services Pty Ltd accepts no responsibility whatsoever for any interpretation by any party of any data where more than two or three significant figures have been reported.

SAMPLE STORAGE DETAILS

GENERAL CONDITIONS

SAMPLE STORAGE OF SOLIDS

Bulk Residues and Pulps will be stored for 60 DAYS without charge. After this time all Bulk Residues and Pulps will be stored at a rate of $1.50 per cubic metre per day until your written advice regarding collection or disposal is received. Expenses related to the return or disposal of samples will be charged to you at cost. Current disposal cost is charged at $50.00 per cubic metre.

SAMPLE STORAGE OF SOLUTIONS

Samples received as liquids, waters or solutions will be held for 60 DAYS free of charge then disposed of, unless written advice for return or collection is received.

NOTES

*** NATA ENDORSED DOCUMENT ***

Company Accreditation Number 3244

The contents of this report have been prepared in accordance with the terms of NATA accreditation and as such should only be reproduced in full.

The analysis results reported herein have been obtained using the following methods and conditions:

The 2 samples, GCA5445 and GCA5446, were received as being tailings waters which had been filtered.

The results have been determined according to Genalysis methods numbers IC_W004 and ICP_W005.

The analysis included the assay of blanks and Genalysis in-house reference standards. The results are expressed as milligrams per litre or micrograms per litre in the solution as received.

NATA Signatory: Zongshou Yu

Date: 10th November 2004

ANALYSIS

ELEMENTS	Ag	Al	As	B	Ba	Bi	Ca	Cd	Co	Cr
UNITS	ppb	mg/l	mg/l	mg/l	ug/l	ug/l	mg/l	ug/l	mg/l	mg/l
DETECTION	0.1	0.1	0.001	0.1	0.5	0.05	0.1	0.2	0.001	0.1
DIGEST		X/	X/	X/	X/	X/	X/	X/	X/	X/
ANALYTICAL FINISH	/MS	OES	MS	OES	MS	MS	OES	MS	MS	OES
SAMPLE NUMBERS										
0001 GCA5445	84.0	0.2	0.051	X	93.1	X	144.9	4.8	0.064	X
0002 GCA5446	11.9	0.9	0.226	0.1	114.4	X	69.6	169.9	0.057	X
CHECKS										
0001 GCA5445	85.0	0.3	0.049	X	90.5	X	144.2	5.1	0.062	X
STANDARDS										
0001 Alcoa4-OES		1.8		1.1			50.9			0.5
0002 Alcoa6MS			0.026		7.9	4.81		5.2	0.571	
0003 BLEG4b	42.9									
0004 Alcoa4-OES		1.9		0.9			51.1			0.5
BLANKS										
0001 Control Blank	X	X	X	X	X	X	X	X	X	X

ANALYSIS

ELEMENTS	Cu	Fe-Sol	Hg	K	Mg	Mn	Mo	Na	Ni	P
UNITS	mg/l	mg/l	ug/l	mg/l	mg/l	mg/l	ug/l	mg/l	mg/l	mg/l
DETECTION	0.1	0.1	1	1	0.1	0.1	0.5	0.1	0.1	1
DIGEST	X/	X/	X/	X/	X/	X/	X/	X/	X/	X/
ANALYTICAL FINISH	OES	OES	MS	OES	OES	OES	MS	OES	OES	OES
SAMPLE NUMBERS										
0001 GCA5445	1.6	X	2	82	31.0	X	175.9	1764.0	0.2	2
0002 GCA5446	0.6	X	2	19	3.9	X	69.3	950.2	X	3
CHECKS										
0001 GCA5445	1.6	0.1	2	82	30.7	X	174.3	1838.3	0.2	2
STANDARDS										
0001 Alcoa4-OES	0.4	2.0		4	59.1	0.5		237.6	0.5	1
0002 Alcoa6MS			5				5.7			
0003 BLEG4b										
0004 Alcoa4-OES	0.4	2.1		4	57.9	0.5		50.5	0.5	1
BLANKS										
0001 Control Blank	X	X	X	X	X	X	X	X	X	X

ANALYSIS

ELEMENTS	Pb	Sb	Se	Si	Sn	Sr	Th	Tl	U	V
UNITS	mg/l	ug/l	mg/l	mg/l	ug/l	mg/l	ug/l	ug/l	ug/l	mg/l
DETECTION	0.005	0.1	0.005	0.5	1	0.1	0.05	0.1	0.05	0.1
DIGEST	X/	X/	X/	X/	X/	X/	X/	X/	X/	X/
ANALYTICAL FINISH	MS	MS	MS	OES	MS	OES	MS	MS	MS	OES
SAMPLE NUMBERS										
0001 GCA5445	X	1.6	0.091	X	2	2.2	X	0.2	0.05	X
0002 GCA5446	X	5.0	0.030	X	2	0.8	X	0.2	X	X
CHECKS										
0001 GCA5445	X	1.5	0.092	X	2	2.2	X	0.2	0.06	X
STANDARDS										
0001 Alcoa4-OES				1.6		0.5				0.5
0002 Alcoa6MS	0.006	5.5	0.024		6		5.34	4.7	5.02	
0003 BLEG4b										
0004 Alcoa4-OES				9.7		0.5				0.5
BLANKS										
0001 Control Blank	X	X	X	X	X	X	X	X	X	X

ANALYSIS

ELEMENTS	Zn
UNITS	mg/l
DETECTION	0.1
DIGEST	X/
ANALYTICAL FINISH	OES
SAMPLE NUMBERS	
0001 GCA5445	0.5
0002 GCA5446	1.9

CHECKS	
0001 GCA5445	0.5

STANDARDS	
0001 Alcoa4-OES	0.5
0002 Alcoa6MS	
0003 BLEG4b	
0004 Alcoa4-OES	0.5

BLANKS	
0001 Control Blank	X

METHOD CODE DESCRIPTION

/MS

No digestion or other pre-treatment undertaken. Analysed by Inductively Coupled Plasma Mass Spectrometry.

X/MS

Client Specified Digestion or Extraction. Analysed by Inductively Coupled Plasma Mass Spectrometry.

X/OES

Client Specified Digestion or Extraction. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.

ANALYTICAL REPORT

Dr G. CAMPBELL
CAMPBELL, GRAEME and ASSOCIATES
PO Box 247
BRIDGETOWN, W.A. 6255
AUSTRALIA

JOB INFORMATION

JOB CODE	:	143.0/0407660
No. of SAMPLES	:	2
No. of ELEMENTS	:	32
CLIENT O/N	:	GCA0433
SAMPLE SUBMISSION No.	:	
PROJECT	:	COYOTE GOLD PROJECT
STATE	:	Taillings
DATE RECEIVED	:	01/10/2004
DATE COMPLETED	:	26/10/2004
DATE PRINTED	:	26/10/2004

LEGEND

X	= Less than Detection Limit
N/R	= Sample Not Received
*	= Result Checked
( )	= Result still to come
I/S	= Insufficient Sample for Analysis
E6	= Result X 1,000,000
UA	= Unable to Assay
>	= Value beyond Limit of Method

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SAMPLE STORAGE OF SOLUTIONS

Samples received as liquids, waters or solutions will be held for 60 DAYS free of charge then disposed of, unless written advice for return or collection is received.

ANALYSIS

ELEMENTS	Ag	Al	As	B	Ba	Bi	Ca	Cd	Co	Cr
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
DETECTION	0.1	20	1	50	0.1	0.01	10	0.1	0.1	2
DIGEST	A/	A/	A/	D/	A/	A/	A/	A/	A/	A/
ANALYTICAL FINISH	MS	OES	MS	OES	MS	MS	OES	MS	MS	OES
SAMPLE NUMBERS										
0001 GCA5445	0.1	8.00%	393	135	686.7	3.07	1168	0.3	11.0	618
0002 GCA5446	0.3	5.95%	3299	58	206.0	0.26	3552	1.7	29.6	629
CHECKS										
0001 GCA5445	0.1	7.60%	408	132	725.0	2.96	1128	0.2	11.3	598
STANDARDS										
0001 AE12										
0002 HgSTD										
0003 STSD-2										
0004 TKC4				829						
0005 TKCLOW-1	5.2	4.11%	166		532.6	4.29	1.20%	1.1	37.6	386
BLANKS										
0001 Control Blank	X	X	X	X	X	0.01	X	X	X	X

ANALYSIS

ELEMENTS	Cu	F	Fe	Hg	K	Mg	Mn	Mo	Na	Ni
UNITS	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm
DETECTION	1	50	0.01	0.01	20	20	1	0.1	20	1
DIGEST	A/	DH/	D/	CM/	A/	A/	A/	A/	A/	A/
ANALYTICAL FINISH	OES	SIE	OES	CVAP	OES	OES	OES	MS	OES	OES
SAMPLE NUMBERS										
0001 GCA5445	50	580	3.20	X	3.18%	4310	152	42.5	1807	343
0002 GCA5446	118	358	5.97	0.03	1.73%	5696	422	59.6	1177	399
CHECKS										
0001 GCA5445	48	533	3.25	X	3.03%	4161	148	44.9	1785	329
STANDARDS										
0001 AE12										
0002 HgSTD				0.23						
0003 STSD-2		986								
0004 TKC4			9.33							
0005 TKCLOW-1	528				1.58%	9439	788	92.0	1.36%	570
BLANKS										
0001 Control Blank	X	X	X	X	X	X	X	X	X	X

ANALYSIS

ELEMENTS	P	Pb	S	Sb	Se	Sn	Sr	Th	Tl	U
UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
DETECTION	20	2	10	0.05	0.01	0.1	0.05	0.01	0.02	0.01
DIGEST	A/	A/	A/	A/	BP/	A/	A/	A/	A/	A/
ANALYTICAL FINISH	OES	MS	OES	MS	MS	MS	MS	MS	MS	MS
SAMPLE NUMBERS										
0001 GCA5445	375	122	248	1.27	0.19	6.3	48.87	16.13	0.60	5.28
0002 GCA5446	168	58	959	38.32	1.05	1.9	66.56	2.56	0.74	4.08
CHECKS										
0001 GCA5445	356	123	252	1.33	0.20	6.5	51.00	15.91	0.57	5.20
STANDARDS										
0001 AE12					0.57					
0002 HgSTD										
0003 STSD-2										
0004 TKC4										
0005 TKCLOW-1	1603	206	5925	54.80		47.2	153.50	33.56	1.92	6.55
BLANKS										
0001 Control Blank	X	X	X	X	X	X	X	X	X	X

ANALYSIS

ELEMENTS	V	Zn
UNITS	ppm	ppm
DETECTION	2	1
DIGEST	A/	A/
ANALYTICAL FINISH	OES	OES
SAMPLE NUMBERS		
0001 GCA5445	61	67
0002 GCA5446	310	216
CHECKS		
0001 GCA5445	58	69
STANDARDS		
0001 AE12		
0002 HgSTD		
0003 STSD-2		
0004 TKC4		
0005 TKCLOW-1	88	312
BLANKS		
0001 Control Blank	X	X

METHOD CODE DESCRIPTION

A/MS

Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Beakers. Analysed by Inductively Coupled Plasma Mass Spectrometry.

A/OES

Multi-acid digest including Hydrofluoric, Nitric, Perchloric and Hydrochloric acids in Teflon Beakers. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.

BP/MS

Aqua-Regia digest followed by Precipitation and Concentration. Specific for Selenium. Analysed by Inductively Coupled Plasma Mass Spectrometry.

D/OES

Sodium peroxide fusion (Zirconium crucibles) and Hydrochloric acid to dissolve the melt. Analysed by Inductively Coupled Plasma Optical (Atomic) Emission Spectrometry.

DH/SIE

Alkaline fusion (Nickel crucible) specific for Fluorine. Analysed by Specific Ion Electrode.

CM/CVAP

Low temperature Perchloric acid digest specific for Mercury. Analysed by Cold Vapour Generation Atomic Absorption Spectrometry.

Appendix 18

Waste Characterisation Report (MBS Environmental)

Larranganni Gold Project: Waste Characterisation

Prepared for:

Tanami Gold NL

October 2004

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MBS ENVIRONMENTAL

LARRANGANNI GOLD PROJECT: WASTE CHARACTERISATION

OCTOBER 2004

PREPARED FOR

TANAMI GOLD NL

BY

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1. SUMMARY

Acid base accounting and chemical characterisation has been completed on 26 weathered bedrock and four soil samples taken from the Sandpiper and Kookaburra deposits at the Larranganni Gold Project. The samples include all waste rock materials likely to be mined during open pit operations at the two proposed open pit sites. Both sites have similar chemical characteristics and the chemical data can be treated as a single entity. The physical attributes of material from above the water table differs substantially at each site.

1.1 POTENTIAL ISSUES

Issues examined included possible acid generation, content of residual heavy metals, environmental effects of potential leaching from waste facilities, stability and visual appearance of waste dumps.

1.1.1 Chemical Characteristics

- Sulphur is extremely low and not present in acid producing minerals. Samples have an alkaline reaction and very low salt contents. Analytical data confirms that most of the sulphur recorded in weathered bedrock samples is present as water soluble sulphates, not as sulphides. On this basis, acid generation and related problems are highly unlikely to occur at either of the Larranganni sites.
- No problems are expected from heavy metals, even though arsenic and boron concentrations are slightly elevated. This is despite relatively high total heavy element contents in weathered bedrock. The 20:1w/w leachate to sample test procedures that simulate medium to long term weathering conditions define only a very minor potential problem with arsenic and boron. There is a slight risk from arsenic and boron in waste dumps leachate water contaminating groundwater.
- Low water-soluble sodium, potassium, calcium, magnesium and sulphate contents suggest that salinity and surface crusting will not be a problem.

1.1.2 Physical Characteristics

The surface soils are orange-brown permeable sands, which will be suitable cover for the waste dumps as they will ensure that the waste dumps blend into the surrounding landscape

Light coloured white to yellow mottled clays and saprolitic clays from the Sandpiper and Kookaburra deposits will be visibly obtrusive and should be buried within waste dumps. These materials have a higher dispersivity than the deeper less weathered saprock. The saprock from both sites is a dark-coloured and less erosive rock and is suitable as final surface waste on dumps.

The geological profile of the waste and the sequencing of pit development with a general improvement of physical attributes with depth should allow construction of a stable, non-erosive and aesthetically pleasing waste dump.

1.2 CONCLUSIONS AND RECOMMENDATIONS

There are no significant geochemical, including acid generation, problems likely at Larranganni. A minor anomalous sesquioxide-rich horizon at the saprolite / saprock interface in both pits should be buried within the waste dump if it can be physically characterised. Otherwise there are no strong chemical reasons for segregation of specific waste materials.

Surface soils should be stockpiled for rehabilitation purposes. Indurated near to surface materials from both Larranganni open pits are chemically and possibly structurally suitable for embankment construction, roadbase and hardstand areas.

Saprolitic clays are likely to be visually conspicuous due to their lighter colour, more dispersive due to higher sodium content and are best buried within the waste dumps.

Deep saprock is darker in colour, will blend better with the landscape than the saprolites, is less dispersive and preferred for surface stabilisation. It also has higher potassium and phosphorous, which may improve re-establishment of vegetation cover and avoid the need to apply fertiliser.

2. INTRODUCTION

Waste products generated by this project will consist of:

- Near surface sub-horizontal Tertiary and Recent sediments.
- Weathered sedimentary, mafic volcanic and fine grained dolerite waste rock which enclose the quartz veining in which gold mineralisation is hosted.
- Tailings (ground up rock). Tailings are not discussed further in this report.

There is no intention, as of the date of this report, that any fresh rock resource be mined.

The two Larranganni deposits (Sandpiper and Kookaburra) are situated over the same geological sequence of intercalated sandstones, siltstones, mudstones, cherts, basalts and dolerites. In both cases, dolerite is the dominant lithology, accounting for an estimated 60 to 70% of the planned waste volume from both pits. However, the deposits have distinct geological profiles and the near surface cover rocks have differing characteristics which may be of value in waste dump and associated hardstand construction.

This report is subdivided into three sections, namely Chemical Data Acquisition, Chemical Attributes, and Physical and Material Attributes.

3. CHEMICAL DATA ACQUISITION

Chemical characterisation of samples of all waste rock types was undertaken to define the presence or absence of potentially hazardous constituents. Thirteen weathered bedrock samples and two soil samples were sent from each of the Sandpiper and Kookaburra deposits to a NATA accredited laboratory. The soil samples were analysed for:

- Water soluble leachates.
- Ammonium chloride cation exchange alkali and alkaline earth leachates.
- A selection of anion constituents.

The remaining samples were analysed for Acid - Base Accounting Determination, Strong Acid Soluble Metals, Water Soluble Metals and one sample from each deposit for Buffered pH = 5, Acid Soluble Metals.

4. CHEMICAL ATTRIBUTES

A range of chemical characteristics were inspected to determine:

- Potential for acid generation.
- Aqua regia soluble metals in concentrations likely to be harmful to the environment.
- Water soluble metals in concentrations likely to be harmful to the environment.
- Metals soluble at pH = 5.0 in concentrations likely to be harmful to the environment.
- Potential salinity problems.
- Plant nutritional imbalances and deficiencies.

4.1 POTENTIAL FOR ACID GENERATION

Waste rock generated will be predominantly weathered dolerite with lesser weathered clay-rich sediments and meta-sediments. Data supplied indicated that carbonate minerals in the host rocks are principally present as the iron carbonate ankerite ($FeCO_3$), which has poor acid neutralising capacity and sulphides are dominantly arsenopyrite (FeAsS) which has low acid generating capacity.

Analytical data has indicated extremely low sulphur such that acid generation is very unlikely to occur as a result of exposure of these materials to the environment. Also, despite the low carbonate content there is sufficient acid neutralising capacity for all rock types tested.

4.1.1 Acid Base Accounting

Sulphuric acid is formed initially by the reaction between iron-bearing sulphides and oxygen dissolved in pore water. The overall effect of oxidation of pyrite or marcasite that has run to completion at circum-neutral pH is summarised by the equation:

$$FeS_2 + 15/4O_2 + 7/2H_2O = Fe(OH)_3 + 2H_2SO_4$$

This is an abiotic reaction at pH values higher than pH = 4.5 but can be enhanced by bacterial action and the presence of ferric ions at lower pH values. Of the 26 samples tested, 25 had alkaline pH values between 7.6 and 9.5 and one (SW-07) had a weakly acidic pH of 5.5. At pH values $\geq$ 4.9, neutralisation of acid is dominantly by dissolution of carbonate minerals with minor contribution from aluminium hydroxides and alumino-silicates at pH values exceeding pH values of 8.4. The single very weakly acidic pH sample had the highest sulphate-S content of all samples but is still Non-Acid Forming.

All Larranganni samples have been interpreted in the tables on the basis of total Sulphur content, not total Sulphur minus Sulphate-Sulphur. All contain substantial percentages of Sulphate-Sulphur which moves them further into the non-acid forming field. All samples are Non-Acid Forming.

Evidence at Larranganni is that effectively 100% of the sulphide present is arsenopyrite. The mean values of sulphur and arsenic are in approximately 1:1 stoichiometric balance, the same ratio as for arsenopyrite. Arsenopyrite produces only 37% as much acid as pyrite for the same sulphur content. Table 1 and 2 are calculated on the basis that all sulphur present is in pyrite and since most sulphur is actually as arsenopyrite, the MPA values are over-estimated by a factor of approximately 2.7.

In the Larranganni weathered rock, almost 100% of all carbon can be expected to be present as carbonate minerals. Total carbon values have been converted to carbonate and quoted as such in Tables 1 and 2 for Sandpiper and Kookaburra respectively. For total neutralisation of acid, the carbonate content needs to exceed 2.4 times the total sulphur content. All but one of the Larranganni samples meets these criteria.

There appears to be no possibility of acid generation occurring at either Kookaburra or Sandpiper deposits.

Table 1: Waste Rock Acid Rock Drainage Characterisation Results - Sandpiper

Elements	**ANC**	**C-Total as CO_3**	**S-Total**	**MPA**	**NAPP**	**NAG**	**ANC/ MPA**	**Comments**
Units	kg H_2SO_4/t	%	%	kg H_2SO_4/t	kg H_2SO_4/t	kg H_2SO_4/t	kg H_2SO_4/t	
Sample Numbers		Calc	Leco					
SW-03	6	0.40	0.068	2.1	-3.9	Nil	2.9	NAF
SW-04	17	0.25	0.136	4.2	-12.8	Nil	4.1	NAF
SW-05	17	0.20	0.016	0.5	-16.5	Nil	34.7	NAF
SW-06	12	0.60	0.015	0.5	-11.5	Nil	26.1	NAF
SW-07	4	0.25	0.072	2.2	-1.8	Nil	1.8	NAF
SW-08	8	0.35	0.016	0.5	-7.5	Nil	16.3	NAF
SW-09	17	0.05	<0.005	0.2	-16.8	Nil	>111.1	NAF
SW-10	7	0.15	0.015	0.5	-6.5	Nil	15.3	NAF
SW-11	5	0.20	<0.005	0.2	-4.8	Nil	>32.7	NAF
SW-12	12	0.20	0.025	0.8	-11.2	Nil	15.7	NAF
SW-13	6	0.15	0.007	0.2	-5.8	Nil	28.0	NAF
SW-14	21	0.10	0.02	0.6	-20.4	Nil	34.3	NAF
SW-15	21	0.25	<0.005	0.2	-20.8	Nil	>137.3	NAF

Table 2: Waste Rock Acid Rock Drainage Characterisation Results - Kookaburra

Elements	ANC	C-Total as CO_3	S-Total	MPA	NAPP	NAG	ANC/ MPA	Comments
Units	kg H_2SO_4/t	%	%	kg H_2SO_4/t	kg H_2SO_4/t	kg H_2SO_4/t	kg H_2SO_4/t	
Sample Numbers		Calc	Leco					
KW-03	20	1.35	0.055	1.7	-18.3	Nil	11.9	NAF
KW-04	7	0.30	0.030	0.9	-6.1	Nil	7.6	NAF
KW-05	10	0.30	0.033	1.0	-9.0	Nil	9.9	NAF
KW-06	13	2.25	0.038	1.2	-11.8	Nil	11.2	NAF
KW-07	24	3.40	0.052	1.6	-22.4	Nil	15.1	NAF
KW-08	10	1.00	0.021	0.6	-9.4	Nil	15.6	NAF
KW-09	9	0.70	0.012	0.4	-8.6	Nil	24.5	NAF
KW-10	11	0.85	0.007	0.2	-10.8	Nil	51.4	NAF
KW-11	18	0.55	0.065	2.0	-16.0	Nil	9.0	NAF
KW-12	18	0.60	<0.005	0.2	-17.8	Nil	>117.6	NAF
KW-13	32	1.40	0.006	0.2	-31.8	Nil	174.3	NAF
KW-14	17	0.25	0.079	2.4	-14.6	Nil	7.0	NAF
KW-15	13	0.20	0.052	1.6	-11.4	Nil	8.2	NAF

Where:
ANC = Acid Neutralising Capacity
MPA = Maximum Potential Acidity
NAPP = Net Acid Producing Potential (NAPP = MPA - ANC)
NAG = Net Acid Generation
NAF = Non Acid Forming
CO3-C is calculated as 5.0x C-Tot.
Definitions of these terms and methodology for these measurements are included in Appendix 1.

4.2 AQUA REGIA DIGEST CHEMICAL CHARACTERISATION OF WASTE MATERIALS

The 26 waste rock samples from Larranganni have been analysed by ICP-OES following an aqua regia digest. This digest dissolves all iron and manganese oxide minerals, extracts most elements adsorbed onto clay minerals and titanium dioxide and has a variable effect on silicate minerals. The samples were analysed for 26 elements, namely: Ag, Al, As, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Sc, Te, Ti, V and Zn.

The results of 16 selected elements are presented in Table 4 (Sandpiper) and Table 5 (Kookaburra). Data for Ag, Bi, Cd, Mo, P, S, Sb, Sc and Te are not included as there are no potentially contaminant anomalous values. Chromium is not included because of preparation contamination and the lack of anomalous values. Values for Al, Fe, Cr and Ti are partial only as sesquioxide precipitates of these elements are soluble in this digest but silicate minerals are only partially soluble or non-soluble. The full set of results are provided in Appendix 1.

Nine elements from the acid digest show values for more than two samples which exceed accepted background values for mafic volcanic and intrusive rocks. These elements have the potential to leach significantly at pH values ≤3.7 within a waste dump and report in underground waters. Such pH values are unlikely to ever occur at Larranganni. The data is provided in Table 3.

Table 3: Potentially Contaminant Elements based on Strong Acid Digest

Element	No. of Samples	Worldwide Mafic Rock Value mg/kg	Local Background Median Value mg/kg	Median Value mg/kg	Maximum Value mg/kg	Toxicity Rating	Inferred location
Arsenic	26	2	40	174	1011	High	Strongly adsorbed on Fe oxides, loosely bound on clay minerals
Barium	3	250	n.d.	162	1829	Low	Adsorbed on Mn oxides
Cobalt	2	50	23	52	1478	Low	Adsorbed on Mn oxides
Copper	12	100	27	98	273	Moderate	Strongly adsorbed on Fe oxides, loosely bound on Mn oxides and clay minerals
Lead	11	5	6	14	284	High	In quartz veining
Manganese	6	2200	92	1103	9760	Low	Manganese oxide
Nickel	5	150	n.d.	102	297	Low	Adsorbed on Fe and Mn oxides
Vanadium	12	250	n.d.	310	517	Very low	Tightly bound to titanium oxides
Zinc	12	100	9	154	561	Low	Partly adsorbed on Mn oxides, partly loosely bound on clays

Worldwide Mafic Rock Values are derived from Levinson, A.A. (1974) 'Average Abundance of Selected Minor Elements in the Earth's Crust' which lists values for eight separate rock groupings. This is the preferred abundance values by the Australasian Institute of Mining and Metallurgy. Local background is median data calculated from the Tanami Gold rock database for Larranganni Regional.

4.2.1 Specific Anomalous Samples and Metals

Two samples, KW-05 and SW-10 have anomalous values for all of the nine elements listed in Table 3. These samples are both abnormally rich in manganese and relatively high in sesquioxides of Al, Fe, Ti and V. From geological description one is weathered dolerite, the other weathered metasediment. These two samples come from a similar down-hole depth at both deposits, in each case approximately 27 metres below standing water table. Other samples from similar depth are less anomalous.

Comparing the median[1] and background values for the anomalous elements, only arsenic and lead show median/background ratios of greater than twice the worldwide and local background figures. The values are 2.8 (2.3) times for lead and 87 (4.35) times for arsenic. Lead does not show positive correlation with iron or manganese values, and arsenic only shows a moderate correlation with iron and no correlation with manganese. Both may have a substantial proportion adsorbed onto clay minerals.

Vanadium shows a strong correlation with titanium. All other anomalous elements show a moderate to strong correlation with manganese and to a lesser extent iron. Even copper and zinc show moderate correlation with iron and manganese respectively. None of these elements are expected to leach at pH values likely to occur within the Larranganni waste dumps.

Potentially contaminant metals Bi, Cd, Mo and Te are absent or at very low levels. The same applies to the Tanami database. A single high Sb value of 52mg/kg was recorded with other samples all below the detection limit. The Tanami database indicates a median value of <1mg/kg.

Values for iron, nickel, cobalt, vanadium and titanium average slightly higher in regolith samples derived from dolerite compared with those derived from sediments. Although values in the weathered sediments are higher than expected from the mineral compositions of the differing rock types, the different rock types do not differ sufficiently to be specifically separated in the waste dumps.

1. Median values, not 'mean' values are the accepted procedure in interpretation of log-normal data. All geochemical data is log-normal.

Table 4 Sandpiper Deposit. Geological Data in Depth order, Drill Data and Aqua Regia Acid Digest information, Selected Elements

Elements	Description	Drill	Location	Al	As	Ba	Ca	Co	Cu	Fe	K	Mg	Mn	Na	Ni	Pb	Ti	V	Zn
Units		Data		%	mg/kg	mg/kg	%	mg/kg	mg/kg	%	%	%	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LLD				0.02	2	2	0.01	1	1	0.01	0.01	0.01	1	0.01	1	2	5	2	1
Sample Numbers																			
SW-06	**Hardpanised** white and brown mottled clays	LGC0005, 4-5m.	Mottled zone	3.86	16	240	0.37	24	47	8.16	0.20	1.43	152	0.38	46	14	727	195	52
SW-03	Very soft reddish-brown and white mottled clay	LGC0004, 8-9m.	Mottled zone	3.19	170	532	0.24	40	132	11.40	0.161	1.29	595	0.32	43	156	410	374	253
SW-04	Soft greenish-yellow clays with a remnant massive medium-grained texture after **dolerite** protolith	LGC0004, 24-25m.	Completely oxidised upper saprolite	4.38	369	259	0.48	140	105	10.84	0.26	1.63	3335	0.48	107	13	460	280	178
SW-05	Light grey fine-grained sericite-clay schist after **sedimentary** protolith	LGC0004, 39-40m.	Completely oxidised upper saprolite	3.86	572	34	0.36	34	94	11.46	0.43	1.92	415	0.26	113	10	215	304	106
SW-07	Soft light yellow and subordinate white clays with a remnant massive medium-grained texture after **dolerite** protolith	LGC0005, 12-13m.	Mottled zone	3.46	27	241	0.2	27	90	11.46	0.33	1.40	317	0.40	48	16	1042	325	107
SW-08	Brown clay with fragments of fine-grained sericite-clay schist after **sedimentary** protolith	LGC0005, 23-24m.	Completely oxidised upper saprolite	3.24	34	387	0.24	330	213	10.21	0.11	1.57	3174	0.45	126	13	93	335	181
SW-12	Yellowish-green chlorite/smectite-kaolinite schist after sheared **dolerite** protolith, weakly mineralised	LGC0008, 35-36m.	Partially oxidised lower saprolite	4.03	145	16	0.27	36	69	11.21	0.42	2.08	406	0.36	102	6	155	361	147

Elements	Description	Drill	Location	Al	As	Ba	Ca	Co	Cu	Fe	K	Mg	Mn	Na	Ni	Pb	Ti	V	Zn
Units		**Data**		%	mg/kg	mg/kg	%	mg/kg	mg/kg	%	%	%	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SW-09	Dark olive-green fine-grained **chlorite schist**	LGC0005, 44-45m.	Partially oxidised lower saprolite	4.87	22	20	0.36	68	101	10.35	1653	3.43	653	0.36	195	113	291	311	196
SW-13	Light grey fine-grained sericite-kaolinite schist after **sedimentary** protolith	LGC0013, 50-51m.	Partially weathered saprock	1.69	469	186	0.09	28	51	4.19	6946	0.67	1417	0.10	19	14	290	65	34
SW-10	Interbedded chert and fine-grained sericite-goethite-haematite-clay rock after thinly bedded **siltstone and fine-grained sandstone** protolith	LGC0005, 53-54m.	Partially oxidised lower saprolite	2.79	946	504	0.23	70	182	13.12	7725	1.45	9172	0.24	51	84	607	367	93
SW-14	Reddish-green weathered massive medium-grained **dolerite** now composed of haematite-chlorite-kaolinite	LGC0015, 57-58m.	Partially oxidised lower saprolite	4.37	205	31	0.39	58	76	11.90	1978	3.34	648	0.30	103	4	146	338	129
SW-11	Grey sericite-clay schist after **sedimentary** protolith	LGC0005, 63-64m.	Partially weathered saprock	1.29	384	177	0.1	21	55	4.40	3710	0.54	2216	0.12	17	31	79	92	33
SW-15	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0015, 63-64m.	Partially weathered saprock	4.19	212	96	0.68	57	82	11.11	1427	3.57	1392	0.19	81	5	1051	322	116

LLD = Lower Limit of Detection

Table 5 Kookaburra Deposit. Geological Data in Depth order, Drill Data and Aqua Regia Acid Digest information, Selected Elements

Elements	Description	Drill	Location	Al	As	Ba	Ca	Co	Cu	Fe	K	Mg	Mn	Na	Ni	Pb	Ti	V	Zn
Units		Data		%	mg/kg	mg/kg	%	mg/kg	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LLD				0.002	2	2	0.01	1	1	0.01	0.01	0.01	1	.01	1	1	5	2	1
Sample Numbers																			
KW-04	Indurated grey foliated clay-sericite rock after **sedimentary** protolith	LGC0023 6-7m.	Hardpanised upper saprolite	2.84	397	40	0.12	69	123	16.82	6848	0.81	1195	0.14	111	146	641	517	363
KW-07	Hard yellowish-brown foliated finely-crystalline **ironstone**	LGC0024 11-12m.	Completely oxidised upper saprolite	1.52	178	119	0.82	36	120	12.07	915	0.33	887	0.20	67	236	243	309	149
KW-03	Yellow and subordinate white mottled limonitic schistose saprolitic clay	LGC0022 16-17m.	Mottled saprolitic clay	3.89	300	95	0.73	15	248	7.73	895	0.22	858	0.20	34	284	581	325	53
KW-08	Dark brown foliated cherty-haematitic ironstone probably after **shale** protolith	LGC0024 27-28m.	Completely oxidised upper saprolite	1.99	117	149	0.44	26	89	9.38	942	0.24	1012	0.16	43	165	558	291	101
KW-09	Soft yellow limontic saprolitic clay after **dolerite** protolith	LGC0024 39-40m.	Completely oxidised upper saprolite	4.18	7	336	0.27	110	116	14.37	3156	1.18	1704	0.42	170	11	1722	384	184
KW-05	Yellow clay with subordinate black weathered **dolerite** fragments	LGC0023 47-48m.	Completely oxidised upper saprolite	3.89	27	1829	0.30	1478	273	12.46	1521	1.04	9760	0.41	297	8	1025	369	352
KW-10	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0024 47-48m.	Partially weathered saprock	2.42	3	24	2.32	35	77	6.32	1501	1.18	461	0.28	251	3	3804	204	159

Elements	Description	Drill	Location	Al	As	Ba	Ca	Co	Cu	Fe	K	Mg	Mn	Na	Ni	Pb	Ti	V	Zn
Units		Data		%	mg/kg	mg/kg	%	mg/kg	mg/kg	%	mg/kg	%	mg/kg	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
KW-13	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0026 50-51m.	Partially weathered saprock	3.83	74	306	1.96	79	113	9.65	1042	2.05	1534	0.36	198	8	1856	251	200
KW-11	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0024 60-61m.	Partially weathered saprock	3.41	5	403	1.24	46	82	9.71	1386	1.51	1361	0.36	61	12	1868	275	98
KW-06	Light yellow clay with a remnant massive medium-grained texture after **dolerite** protolith	LGC0023 64-65m	Completely oxidised upper saprolite	3.49	507	175	0.26	72	166	22.20	1819	1.35	1462	0.33	141	81	83	291	383
KW-12	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0024 70-71m.	Partially weathered saprock	3.56	16	56	0.92	40	74	12.84	1178	1.71	842	0.32	54	5	1549	289	90
KW-14	Dark reddish-brown fine-grained schist probably after a **chlorite schist** protolith, weakly mineralised	LGC0026 81-82m.	Partially oxidised lower saprolite	3.66	1011	89	0.18	72	79	17.20	2875	1.86	2292	0.25	102	46	360	304	493
KW-15	Grayish-green fine-grained **chlorite schist**	LGC0026 93-94m.	Partially weathered saprock	5.50	498	9	0.13	87	133	15.97	370	4.15	879	0.15	175	76	453	321	561

LLD = Lower Limit of Detection

4.3 WATER DIGEST CHEMICAL CHARACTERISATION OF WASTE MATERIALS

The 26 waste rock samples from Larranganni have been analysed by ICP-OES following a de-ionised 1:20w/w sample/water digest which closely approximates the Australian Standards Leaching Protocol for "Landfill category - In situ - to be left undisturbed at the site." This digest dissolves only soluble salts and weakly adsorbed metals on oxides and clay minerals. Constant agitation over an 18 hour period with a five percent volume headspace in the digest container ensures that oxygenated water is brought into contact with any reactive sulphides during the procedure. The samples were analysed for 30 elements, namely:- Ag, Al, As, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sc, Si, Sn, Te, Ti, V, Zn and Zr. On a separate 1:5w/w sample/water digest, pH and electrical conductivity have been measured.

Many elements are below the detection limits of the method. The results of pH, electrical conductivity and 17 selected elements, including potentially contaminant elements are presented in Table 7 (Sandpiper) and Table 8 (Kookaburra). The full set of test results is provided in Appendix 1.

Eight elements from the water digest show values for one or more samples which exceed permissible levels for these elements in drinking water. These elements, which have the potential to leach from within a waste dump and report in underground waters are provided in Table 6. In addition, elevated amounts of aluminium, iron and silicon are present in solution.

Table 6: Potentially Contaminant Elements based on Water Digest

Element	No. of samples	Permissible Value mg/L*	Median mg/L	Maximum Value mg/L	Toxicity Rating	Inferred Location
Arsenic	2	0.007	<0.10	2.1	High	Strongly adsorbed on Fe oxides, loosely bound on clay minerals
Boron	20	0.3	0.70	2.2	Low	In quartz veining
Barium	2	0.7	<0.10	0.9	Very low	Adsorbed on Mn oxides
Cadmium	5	0.002	<0.1	1.2	High	In quartz veining
Chromium (Cr^{III})	9	n.a. Value for Cr^{VI} is 0.05	<0.10	3.7	Low.	Strongly adsorbed on Fe oxides, loosely bound on Mn oxides and clay minerals
Copper	2	2.0	<0.10	1.5	High	Loosely bound on clay minerals
Manganese	10	0.50	<0.10	6.1	Low	As Manganese oxides
Lead	2	0.01	<0.10	0.9	High	In quartz veining

* Values from Agriculture & Resource Management Council of Australia and New Zealand Drinking Water Guidelines, 1996.
n.a. No data is available from ARMC or any other organisation for Cr^{III}.
LLD Lower Level of Detection.

Of these elements, barium, chromium, copper and manganese are all unlikely to present any problems as the median values are well below permissible levels. Boron is likely to exceed, but will be close to the permissible limit. The permissible level is based on plant, not human toxicity levels. Lead is close to permissible limits. Spot high values for manganese are above permissible limits but the median value is well within permissible limits. There is no limit set for Cr^{III}, and Cr^{VI} will not occur in this environment.

The permissible level for cadmium is 50 times lower than the detection limit. However, an ICP-MS check of the highest value recorded, detected only 0.03µg/kg of cadmium in the TCLP test (Section 4.4). This value is only 0.7% of the permissible level. Median value for cadmium in the Tanami rock and soil sample database is also below the permissible level, at <0.002mg/kg.

Table 7 Sandpiper Deposit. Geological Data in Depth order, Drill Data and Water Digest information, Selected Elements

Elements	Description	Drill	Location	EC	pH	As	B	Ba	Ca	Cd	Co	Cr	Cu	K	Mg	Mn	Na	Ni	Pb	SO4	V	Zn
Units		**Data**		µS/cm	None	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LLD				10	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1	1	0.1	0.2	3	0.1	0.1
Sample Numbers																						
SW-06	**Hardpanised** white and brown mottled clays	LGC0005 4-5m.	Mottled zone	1300	9.4	<0.5	2.2	<0.1	23.2	<0.1	<0.1	<0.1	<0.1	52	36.7	<0.1	1337	<0.1	<0.2	545	0.3	<0.1
SW-03	Very soft reddish-brown and white mottled clay	LGC0004 8-9m.	Mottled zone	860	7.7	<0.5	0.3	1.1	76.3	0.7	0.3	1	1.5	64	404	2.9	1323	0.4	0.3	810	1	1.5
SW-07	Soft light yellow and subordinate white clays with a remnant massive medium-grained texture after **dolerite** protolith	LGC0005 12-13m.	Mottled zone	600	5.5	<0.5	0.4	0.1	26.8	<0.1	<0.1	<0.1	<0.1	62	46.5	<0.1	1868	<0.1	<0.2	1600	<0.1	<0.1
SW-08	Brown clay with fragments of fine-grained sericite-clay schist after **sedimentary** protolith	LGC0005 23-24m.	Completely oxidised upper saprolite	880	7.7	<0.5	1.1	<0.1	14.4	<0.1	<0.1	<0.1	<0.1	29	24.8	<0.1	1631	<0.1	<0.2	920	<0.1	<0.1
SW-04	Soft greenish-yellow clays with a remnant massive medium-grained texture after **dolerite** protolith	LGC0004 24-25m.	Completely oxidised upper saprolite	1770	8.3	<0.5	1.5	<0.1	33.1	<0.1	<0.1	0.1	<0.1	28	51.9	0.1	1584	0.1	<0.2	1000	<0.1	<0.1

Elements	Description	Drill	Location	EC	pH	As	B	Ba	Ca	Cd	Co	Cr	Cu	K	Mg	Mn	Na	Ni	Pb	SO4	V	Zn
Units		Data		µS/cm	None	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SW-12	Yellowish-green chlorite/smectite-kaolinite schist after sheared **dolerite** protolith, weakly mineralised	LGC0008 35-36m.	Partially oxidised lower saprolite	1340	8.1	<0.5	0.7	<0.1	151.8	1.2	0.3	3	0.9	28	552.8	1.5	749	1.2	<0.2	250	2	<0.1
SW-05	Light grey fine-grained sericite-clay schist after **sedimentary** protolith	LGC0004 39-40m.	Completely oxidised upper saprolite	460	8.1	2.1	1.9	<0.1	116.9	<0.1	<0.1	0.3	<0.1	24	174.6	0.5	1963	0.3	<0.2	960	0.5	<0.1
SW-09	Dark olive-green fine-grained **chlorite schist**	LGC0005 44-45m.	Partially oxidised lower saprolite	540	8.0	<0.5	0.5	<0.1	103.4	0.8	0.3	2.1	0.8	18	392.7	4.7	594	0.6	0.9	230	1.3	<0.1
SW-13	Light grey fine-grained sericite-kaolinite schist after **sedimentary** protolith	LGC0013 50-51m.	Partially weathered saprock	360	7.8	<0.5	0.2	<0.1	7.3	<0.1	<0.1	<0.1	<0.1	8	9	0.1	441	<0.1	<0.2	235	X	<0.1
SW-10	Interbedded chert and fine-grained sericite-goethite-haematite-clay rock after thinly bedded **siltstone and fine-grained sandstone** protolith	LGC0005 53-54m.	Partially oxidised lower saprolite	470	8.1	<0.5	0.8	0.2	48.3	<0.1	<0.1	0.1	<0.1	17	65.5	1.9	1221	0.2	<0.2	630	0.5	<0.1

Elements	Description	Drill	Location	EC	pH	As	B	Ba	Ca	Cd	Co	Cr	Cu	K	Mg	Mn	Na	Ni	Pb	SO4	V	Zn
Units		**Data**		µS/cm	None	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
SW-11	Grey sericite-clay schist after **sedimentary** protolith	LGC0005 63-64m.	Partially weathered saprock	430	8.2	<0.5	0.3	0.1	13.1	<0.1	<0.1	<0.1	<0.1	8	17.3	0.8	478	<0.1	<0.2	245	0.3	<0.1
SW-14	Reddish-green weathered massive medium-grained **dolerite** now composed of haematite-chlorite-kaolinite	LGC0015 57-58m.	Partially oxidised lower saprolite	230	8.9	<0.5	0.5	0.7	62.4	0.5	0.3	1.7	0.9	27	361.7	6.1	312	0.3	<0.2	145	3.5	<0.1
SW-15	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0015 63-64m.	Partially weathered saprock	310	8.4	<0.5	0.8	0.1	81.9	<0.1	0.2	0.2	<0.1	16	157.5	1.2	688	0.2	<0.2	430	0.5	0.4

LLD = Lower Limit of Detection

Table 8 Kookaburra Deposit. Geological Data in Depth order, Drill Data and Water Digest information, Selected Elements

Elements	Description	Drill	Location	EC	pH	As	B	Ba	Ca	Cd	Co	Cr	Cu	K	Mg	Mn	Na	Ni	Pb	SO4	V	Zn
Units		**Data**		µS/cm	None	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LLD				10	0.1	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1		0.1	0.2	3	0.1	0.1
Sample Numbers																						
KW-04	Indurated grey foliated clay-sericite rock after **sedimentary** protolith	LGC002 3 6-7m.	Hardpanised upper saprolite	850	8.3	<0.5	0.3	<0.1	32.3	<0.1	<0.1	<0.1	<0.1	36	0.8	<0.1	798	<0.1	<0.2	470	<0.1	<0.1
KW-07	Hard yellowish-brown foliated finely-crystalline **ironstone**	LGC002 4 11-12m.	Completely oxidised upper saprolite	1910	8.7	<0.5	1.3	<0.1	109.9	<0.1	<0.1	<0.1	<0.1	93	0.3	<0.1	1592	<0.1	<0.2	1180	<0.1	<0.1
KW-03	Yellow and subordinate white mottled limonitic schistose saprolitic clay	LGC002 2 16-17m.	Mottled saprolitic clay	2110	8.5	<0.5	0.8	<0.1	253.5	<0.1	<0.1	<0.1	<0.1	89	241.5	<0.1	1623	<0.1	<0.2	1275	<0.1	<0.1
KW-08	Dark brown foliated cherty-haematitic ironstone probably after **shale** protolith	LGC002 4 27-28m.	Completely oxidised upper saprolite	1110	9.1	<0.5	1.1	<0.1	44.5	<0.1	<0.1	<0.1	<0.1	50	42.7	<0.1	1052	<0.1	<0.2	605	<0.1	<0.1
KW-09	Soft yellow limontic saprolitic clay after **dolerite** protolith	LGC002 4 39-40m.	Completely oxidised upper saprolite	1320	7.9	<0.5	0.9	<0.1	11.4	<0.1	<0.1	<0.1	<0.1	31	16.2	<0.1	1289	<0.1	<0.2	845	<0.1	<0.1
KW-05	Yellow clay with subordinate black weathered **dolerite** fragments	LGC002 3 47-48m.	Completely oxidised upper saprolite	1360	7.8	<0.5	0.8	<0.1	16.0	<0.1	<0.1	<0.1	<0.1	28	20.9	<0.1	1362	<0.1	<0.2	980	<0.1	<0.1
KW-10	Massive medium-grained **dolerite** with approx. 20% light	LGC002 4 47-48m.	Partially weathered saprock	280	9.0	<0.5	0.3	<0.1	25.2	<0.1	<0.1	0.1	<0.1	17	35.0	<0.1	413	0.6	<0.2	230	0.3	0.4

Elements	Description	Drill	Location	EC	pH	As	B	Ba	Ca	Cd	Co	Cr	Cu	K	Mg	Mn	Na	Ni	Pb	SO4	V	Zn
Units		Data		µS/cm	None	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	green weathered joint surfaces																					
KW-13	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0026 50-51m.	Partially weathered saprock	620	9.5	0.5	1.2	0.7	81.7	<0.1	0.2	0.2	<0.1	53	117.0	1.3	1602	0.9	<0.2	920	1.5	0.8
KW-11	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0024 60-61m.	Partially weathered saprock	1060	7.8	<0.5	0.5	<0.1	19.4	<0.1	<0.1	<0.1	<0.1	30	20.6	<0.1	1162	<0.1	<0.2	1910	<0.1	<0.1
KW-06	Light yellow clay with a remnant massive medium-grained texture after **dolerite** protolith	LGC0023 64-65m	Completely oxidised upper saprolite	960	7.6	<0.5	0.5	<0.1	7.4	<0.1	<0.1	<0.1	<0.1	10	10.5	<0.1	957	<0.1	<0.2	710	<0.1	<0.1
KW-12	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces	LGC0024 70-71m.	Partially weathered saprock	3700	8.5	<0.5	0.8	0.9	149.4	1.1	1.1	3.7	1.3	63	671.3	7	695	0.9	<0.2	305	8.5	0.5
KW-14	Dark reddish-brown fine-grained schist probably after a **chlorite schist** protolith, weakly mineralised	LGC0026 81-82m.	Partially oxidised lower saprolite	750	8.0	<0.5	0.5	<0.1	5.7	<0.1	<0.1	<0.1	<0.1	4	8.7	<0.1	776	<0.1	<0.2	460	<0.1	0.2
KW-15	Grayish-green fine-grained **chlorite schist**	LGC0026 93-94m.	Partially weathered saprock	1370	7.6	<0.5	0.5	<0.1	52.2	<0.1	<0.1	<0.1	<0.1	34	82.7	<0.1	1152	<0.1	<0.2	780	<0.1	<0.1

LLD = Lower Limit of Detection

4.4 METALS SOLUBLE AT pH = 5.0 CHEMICAL CHARACTERISATION OF WASTE MATERIALS

The two most mineralised samples from Larranganni were pre-selected on the basis of geological descriptions and submitted for analysis by ICP-MS plus other techniques following a 1:20 w/w sample/leach fluid Toxicity Characteristic Leach Protocol (TCLP) digest at pH = 4.9 to 5.0. This closely approximates the most acidic conditions ever likely in the proposed waste dumps at Larranganni and exceeds the requirements of the Australian Standards Leaching Procedure for “Landfill category - In situ - to be left undisturbed at the site.”

The samples were previously analysed by ICP-OES in strong acid and water digests. In addition, these samples were analysed after the TCLP leach by:

- ICP-OES for the following elements: Ag, Al, As, B, Ba, Bi, Ca, Cd, Co, Cr, Cu, Fe, K, Li, Mg, Mn, Mo, Ni, P, Pb, S, Sc, Si, Sn, Sr, Te, Ti, V, Zn and Zr.
- ICP-MS for the following elements: As, Ba, Be, Bi, Cd, Sb, Se, Te and U.

The ICP-MS detection limits are from one to three orders of magnitude lower than for ICP-OES and give reliable indications of the maximum likely amount of potential contaminants. The data is reported in Table 9. Elements where no values are above the lower limit of detection or are not potential contaminants are not reported. Full results are available in Appendix 1.

Table 9: Potentially Contaminant Metals -- TCLP Digest

Elements	As	B	Ba	Be	Bi	Cd	Mn	Ni	Pb	SO4	Sb	Se	Te	U
Units	**µg/l**	**mg/l**	**µg/l**	**µg/l**	**µg/l**	**µg/l**	**mg/l**	**mg/l**	**mg/l**	**mg/l**	**µg/l**	**µg/l**	**µg/l**	**µg/l**
LLD	0.1	0.01	0.05	0.1	0.005	0.02	0.01	0.01	0.02	0.3	0.01	0.5	0.1	0.005
Method	**MS**	**OES**	**MS**	**MS**	**MS**	**MS**	**OES**	**OES**	**OES**	**OES**	**MS**	**MS**	**MS**	**MS**
Permissible Levels *	7	0.3	700	n.a.	n.a.	2	0.5	0.02	0.01	500	3	10	n.a.	9
Sample Numbers														
SW-12	4.3	0.04	5.39	0.5	0.005	0.03	<0.01	<0.01	<0.02	12.9	0.02	0.8	<0.1	4.54
KW-14	14.5	0.07	18.13	0.6	0.009	0.16	0.09	0.01	<0.02	22.8	0.02	1.3	<0.1	6.2

* Values from Agriculture & Resource Management Council of Australia and New Zealand Drinking Water Guidelines, 1996.
n.a. No data is available from ARMC or any other organisation for any of these elements.
LLD Lower Level of Detection.

No elements apart from As are in concentrations likely to contaminate groundwater. The only other element that approaches the permissible limits is uranium. For Be, Bi and Te, no levels are listed in the ARMC documentation. The values recorded are below permissible limits listed for drinking waters by the World Health Organisation. Due to the dilution factor in the digest, the proportion of element extracted approximates the quantity likely to be extracted in an approximately 135 year period given the nominal 336 millimetres average annual rainfall for the district and neglecting the 3,250 millimetres average annual evaporation rate which would increase that time period.

4.5 POTENTIAL FOR SALINITY PROBLEMS

The electrical conductivity measurements for the Water Digest, suggest calculated total dissolved solids (TDS) values ranging from 140 to 1,310 mg/kg. These values are low to moderately saline and do not present salinity problems likely to require rehabilitation.

No gravimetric TDS values have been undertaken, but all the necessary data excluding chloride is available from the analyses. If all sodium is assumed to be present as NaCl, the calculated "total" TDS values from analyses are in the range 150 to 1,400mg/kg. Local groundwater has gravimetric TDS values of 23,000 to 27,000mg/L of which >96% is due to NaCl.

None of the 26 rock samples or the four soils, which have lower values than those quoted above, present salinity problems likely to require rehabilitation.

4.6 PLANT NUTRITIONAL IMBALANCES AND DEFICIENCIES

Four soil samples from previously undisturbed ground, one from above the layout of each deposit and one each from the proposed sites for waste dumps at Larranganni were supplied. These were submitted for analysis by the following procedures:

- Ammonium chloride digestion for cation exchange capacity (CEC) determination.
- Specific conductance (EC) and pH.
- APHA Code analyses for total alkalinity, nitrate-nitrogen.
- ICP-OES following a 1:20 water leach as described in Section 3.1 for the following elements: Ag, Al, As, B, Ba, Bi, Ca, Cd, Cl, Co, Cr, Cu, F, Fe, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sc, Si, Sn, Sr, Ti, V, Zn and Zr.

Table 10 shows results from CEC determination, and Table 11 shows results from the other three procedures. The following elements were not detected in the ICP-OES scan: Ag, As, B, Bi, Cd, Co, Cr, Cu, Li, Mo, Ni, P, Pb, Sc, Sn, Sr and Zr.

All soils are very slightly acidic and there are no toxic elements present. The contents of NaCl and sulphate are low and no salinity problems can be foreseen. Values for Fe, Mn and Ni are directly comparable with the regional soil database.

All soils are deficient in copper, zinc and molybdenum. Potassium is low, nitrogen and in particular, phosphorous is very deficient. Because of boron values in the underlying rocks, the soils are unlikely to have boron deficiency. The cation exchange capacity is low but adequate. The soils are extremely similar to one another and all are suitable for future rehabilitation procedures.

Table 10: Larranganni Soils -- Cation Exchange Capacity Information

Element	Ca	Ca	Ca	K	K	K	Mg	Mg	Mg	Na	Na	Na	CEC
Method	**NH_4Cl/ OES**	**%**	**W/OES**	**NH_4Cl/ OES**	**%**	**W/OES**	**NH_4Cl/ OES**	**%**	**W/OES**	**NH_4Cl/ OES**	**%**	**W/OES**	
Units	**meq/ 100g**	**CEC**	**meq/ 100g**	**meq/ 100g**	**CEC**	**meq/ 100g**	**meq/ 100g**	**CEC**	**meq/ 100g**	**meq/ 100g**	**CEC**	**meq/ 100g**	
KW-01	1.51	0.55	0.05	0.20	0.07	0.03	0.67	0.24	0.04	0.37	0.13	0.13	2.76
KW-02	1.36	0.56	0.01	0.23	0.10	0.02	0.62	0.26	0.01	0.21	0.09	0.01	2.42
SW-01	2.15	0.61	0.05	0.33	0.09	0.05	0.90	0.25	0.03	0.14	0.04	0.02	3.52
SW-02	1.01	0.55	0.01	0.19	0.11	0.02	0.49	0.27	0.00	0.13	0.07	0.01	1.83

Table 11: Larranganni Soils - Geological Data, Location Data and Digests Information, Elements recording Positive Values

Elements	Description	AMG Grid	Location	EC	pH	Al	Ba	CO3	Ca	Cl	F	Fe	HCO3	K	Mg	Mn	N-NO3	Na	Ni	OH	SO4
Units				µS/cm	None	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LLD				10	0.1	0.1	0.1	5	0.1	5	0.5	0.10	5	1	0.1	0.1	1	1	0.1	0	3
Method						W/OES	W/OES	W/VOL	W/OES	W/COL	W/SIE	W/OES	W/VOL	W/OES	W/OES	W/OES	W/COL	W/OES	W/OES	W/VOL	/CALC
Sample Numbers																					
SW-01	Orange-brown poorly sorted very fine to medium-grained aeolian sand	AMG Zone 84-52; 485700E, 7834050 N	Soil over Sandpiper Deposit	40	5.9	1.1	0.1	<5	11.0	10	0.5	0.04	21	19	4.1	0.6	10	31	<0.1	0	7
SW-02	Orange-brown poorly sorted very fine to medium-grained aeolian sand with minor 1-4mm polished ferruginous lateritic grains	AMG Zone 84-52; 485600E, 7834300 N	Sandpiper Soil, Waste Dump location	10	5.8	0.8	<0.1	<5	2.0	<5	0.5	0.03	10	6	0.6	0.2	<1	3	<0.1	0	8
KW-01	Orange-brown poorly sorted very fine to medium-grained aeolian sand with minor 1-4mm polished ferruginous lateritic fragments. Ten point composite, 0-25cm.	AMG Zone 84-52; 485450E, 7833750 N	Surface soil over Kookaburra Deposit	80	6.0	0.7	0.1	<5	9.6	80	0.5	0.6	20	13	4.4	0.4	<1	<1	31	0	13

Elements	Description	AMG Grid	Location	EC	pH	Al	Ba	CO3	Ca	Cl	F	Fe	HCO3	K	Mg	Mn	N-NO3	Na	Ni	OH	SO4
Units				µS/cm	None	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
KW-02	Orange-brown poorly sorted very fine to medium-grained aeolian sand. Ten point composite, 0-25cm.	AMG Zone 84-52; 485300E, 7834300 N	Surface soil proposed Kookaburra Wastes Dump Site.	20	6.0	1.9	<0.1	<5	2.5	<5	0.5	0.4	16	8	1.0	0.2	<1	<1	3	0	5

5. PHYSICAL AND MATERIAL ATTRIBUTES

All supplied samples excluding the soils were of reverse circulation drill chips with very little material of gravel and coarser sizes. Descriptions supplied by Tanami staff appear accurate. It is not possible to describe the materials satisfactorily from the chips.

5.1 SURFACE SOILS

Descriptions supplied plus examination indicate these are all fine to medium-grained polished but iron-stained quartz sands with <25% of silt and clay-size material. Organic content is low. There is a small but variable content of coarse sand to fine gravel, this being of iron-rich lateritic origin. The sand grains show moderate to excellent rounding and are probably of transported aeolian origin. Overall, the soils will be porous and likely to overlie impervious clay layers.

The surface soils are orange-brown permeable sands, which will be suitable cover for the waste dumps as they will allow the waste dumps to blend into the surrounding landscape

5.2 WEATHERED BEDROCK SAMPLES - SANDPIPER DEPOSIT

The type and distribution of the waste within the proposed Sandpiper pit is provided in Table 12 and the full geochemical data provided in Appendix 1. The weathered bedrock profile is clay-rich and divides into three reasonably defined zones, namely:

- Zone A: Mottled clays

  Mottled clays to at least 13 metres and probably to the standing water table at about 21 metres. Within this zone the clays are partially cemented to at least five metres depth, have relatively high sesquioxide (TiO_2, Fe_2O_3, Al_2O_3, V_2O_5) contents and are largely leached of potential contaminants (Mn, Co and Cd). Copper, lead and zinc correspond to average regional background whilst sodium and arsenic contents are respectively well below, and below their median values.

- Zone B: Partially to totally oxidised saprolite

  Partially to totally oxidised saprolites from above 23 metres to a depth varying between 35 and 45 metres dependent on the rock-type protolith. This zone has intermediate values for almost all elements, excluding As which is at and below the median value.

- Zone C: Well oxidised saprolites and saprock

  Well oxidised saprolites and saprock at greater depths, with a specific level at the top of the zone strongly enriched in potential contaminants cobalt, copper, lead, manganese, zinc and to a lesser extent sodium and boron. Arsenic is above median values throughout this zone which continues to the proposed open pit base.

The Zone A clays are generally white mottled brown and should be buried within the waste dump. The partially cemented materials at the top of the zone could be used for lining of ponds or other containment structures. Chemically these clays are suitable for use as an impermeable liner due to:

- The low contaminant levels, particularly arsenic and lead.
- High sesquioxide levels which are capable of adsorbing contaminants leached from upper layers of waste and/or tailings.
- Very low sodium contents and therefore likely to be very low in dispersive kaolinite.
- Probable low to very low permeability.

Zone B partially to totally oxidised saprolites are generally yellow, yellow-green, green and grey-green rocks which will contrast with the darker orange browns and browns of the surface. This material is likely to have higher porosity and permeability than either Zone A or Zone C, and where possible should be buried within the waste dumps.

The Zone C saprocks range from a top zone of relatively contaminant-rich rocks high in manganese, cobalt, chromium, vanadium, titanium, zinc and potassium to weathered rock at the base of the proposed pit with values directly reflecting fresh bedrock where the only elevated elements are arsenic, lead and zinc. Rocks from near the base of the pit are the freshest and least anomalous excluding arsenic values. All the arsenic is present as arsenopyrite, an extremely non-reactive sulphide.

The lower Zone C saprock should be dark greenish – brown non-acid forming material ideal for armouring and surface coating of the upper surface and embankments of waste dumps. The upper relatively contaminant – high material should be buried within the waste dumps. The deeper material which has high pH ranging from 7.8 to 8.9, low in sodium and is strongly NAF should be used for surface erosion prevention. The waste dumps can be rehabilitated with the surface soils and topsoil stockpiled at the commencement of the mining operation. The relatively higher potassium content may prove advantageous during rehabilitation.

Table 12: Waste Rock Characterisation Samples from the Sandpiper Deposit

Sample	Hole ID	Depth		Zone	Description
		From (m)	To (m)		
SW06	LGC0005	4	5	Mottled zone	Hardpanised white and brown mottled clays
SW03	LGC0004	8	9	Mottled zone	Very soft reddish-brown and white mottled clay
SW07	LGC0005	12	13	Mottled zone	Soft light yellow and subordinate white clays with a remnant massive medium-grained texture after dolerite protolith
SW08	LGC0005	23	24	Completely oxidised upper saprolite	Brown clay with fragments of fine-grained sericite-clay schist after sedimentary protolith
SW04	LGC0004	24	25	Completely oxidised upper saprolite	Soft greenish-yellow clays with a remnant massive medium-grained texture after dolerite protolith
SW12	LGC0008	35	36	Partially oxidised lower saprolite	Yellowish-green chlorite/smectite-kaolinite schist after sheared dolerite protolith, weakly mineralised
SW05	LGC0004	39	40	Completely oxidised upper saprolite	Light grey fine-grained sericite-clay schist after sedimentary protolith
SW09	LGC0005	44	45	Partially oxidised lower saprolite	Dark olive-green fine-grained chlorite schist
SW13	LGC0013	50	51	Partially weathered saprock	Light grey fine-grained sericite-kaolinite schist after sedimentary protolith
SW10	LGC0005	53	54	Partially oxidised lower saprolite	Interbedded chert and fine-grained sericite-goethite-hematite-clay rock after thinly bedded siltstone and fine-grained sandstone protolith
SW14	LGC0015	57	58	Partially oxidised lower saprolite	Reddish-green weathered massive medium-grained dolerite now composed of hematite-chlorite-kaolinite
SW11	LGC0005	63	64	Partially weathered saprock	Grey sericite-clay schist after sedimentary protolith
SW15	LGC0015	63	64	Partially weathered saprock	Massive medium-grained dolerite with approx. 20% light green weathered joint surfaces

5.3 WEATHERED BEDROCK SAMPLES - KOOKABURRA DEPOSIT

The type and distribution of the waste within the Kookaburra deposit is provided in Table 13 and the full geochemical data provided in Appendix 1. The weathered bedrock profile differs in some particulars from that at Sandpiper, but still divides into three reasonably defined zones, namely:

- Zone A: Strongly indurated saprolite and clay.

  Strongly indurated saprolite and clay to at least 17 metres and probably to the standing water table at about 21 metres. Within this zone the saprolite and clay is partially to totally indurated to at least 12 metres depth, all samples have relatively high sesquioxide (TiO_2, Fe_2O_3, Mn_2O_3, Al_2O_3, V_2O_5) contents. Arsenic, copper, lead and zinc are elevated above average regional background whilst sodium contents are well below the median value.

- Zone B: partially to totally oxidised saprolite.

  Partially to totally oxidised saprolites from above 27 metres to a depth of about 47 metres. As at Sandpiper, this zone has intermediate values for almost all elements, excluding As which is well below the median value.

- Zone C: Well oxidised saprolite and saprock

  The Zone C saprocks commence with a top zone of relatively contaminant-rich rocks high in manganese, iron, cobalt, chromium, copper, vanadium, titanium and zinc underlain by less weathered rock. This precisely reflects the situation at Sandpiper. At both sites there is a pronounced sesquioxide – rich heavy elements and potassium – rich layer at a distinct change in geology occurring at an equivalent reduced level in the profile.

  This sesquioxide – rich layer overlies less weathered rocks to the base of the proposed pit with values directly reflecting fresh bedrock. The only elevated elements in this zone are arsenic, lead and zinc but values for water and TCLP digests are not anomalous. As at Sandpiper, the arsenic is present as arsenopyrite, an extremely non-reactive sulphide.

Zone A saprolite and clays are generally yellowish brown and differ from Sandpiper in being strongly indurated. The saprolitic clay is potentially dispersive and its light colour very visible. This waste should be buried within the dump.

Zone B partially to totally oxidised saprolites are yellow and brown clays, which are potentially dispersive and should be buried within the waste dumps.

The lower Zone C saprock is similar to Sandpiper. The upper relatively contaminant – high material should be buried centrally in the waste dump. The deeper material which has high pH ranging from 7.6 to 9.5, is low in sodium and strongly NAF should be used for surface erosion prevention. It can be rehabilitated with the original surface soil and topsoil stockpiled at the commencement of the mining operation.

Table 13: Waste Dump Characterisation Samples from the Kookaburra Deposit

Sample	Hole ID	Depth		Zone	Description
		From (m)	To (m)		
KW04	LGC0023	6	7	Hardpanised upper saprolite	Indurate grey foliated clay-sericite rock after **sedimentary** protolith
KW07	LGC0024	11	12	Completely oxidised upper saprolite	Hard yellowish-brown foliated finely-crystalline **ironstone**
KW03	LGC0022	16	17	Mottled saprolitic clay	Yellow and subordinate white mottled limonitic schistose saprolitic clay
KW08	LGC0024	27	28	Completely oxidised upper saprolite	Dark brown foliated cherty-haematitic ironstone probably after **shale** protolith
KW09	LGC0024	39	40	Completely oxidised upper saprolite	Soft yellow limonitic saprolitic clay after **dolerite** protolith
KW05	LGC0023	47	48	Completely oxidised upper saprolite	Yellow clay with subordinate black weathered **dolerite** fragments
KW10	LGC0024	47	48	Partially weathered saprock	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces
KW13	LGC0026	50	51	Partially weathered saprock	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces
KW11	LGC0024	60	61	Partially weathered saprock	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces
KW06	LGC0023	64	65	Completely oxidised upper saprolite	Light yellow clay with a remnant massive medium-grained texture after **dolerite** protolith
KW12	LGC0024	70	71	Partially weathered saprock	Massive medium-grained **dolerite** with approx. 20% light green weathered joint surfaces
KW14	LGC0026	81	82	Partially oxidised lower saprolite	Dark reddish-brown fine-grained schist probably after a **chlorite schist** protolith, weakly mineralised
KW15	LGC0026	93	94	Partially weathered saprock	Greyish-green fine-grained **chlorite schist**

APPENDICES

Appendix 1.1 - Aqua Regia Digest Analytical Results

ELEMENTS	Ag	Al	As	Ba	Bi	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn
UNITS	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	%	ppm
DETECTION	0.5	20	2	2	10	0.01	0.5	1	2	1	0.01	20	0.01	1
METHOD	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-03	X	38887	300	95	X	0.73	X	15	154	248	7.73	895	0.22	858
KW-04	X	28373	397	40	X	0.12	X	69	90	123	16.82	6848	0.81	1195
KW-05	X	38943	27	1829	X	0.3	X	1478	108	273	12.46	1521	1.04	9760
KW-06	X	34907	507	175	X	0.26	X	72	127	166	22.2	1819	1.35	1462
KW-07	X	15200	178	119	X	0.82	X	36	116	120	12.07	915	0.33	887
KW-08	X	19919	117	149	X	0.44	X	26	116	89	9.38	942	0.24	1012
KW-09	X	41776	7	336	X	0.27	X	110	100	116	14.37	3156	1.18	1704
KW-10	X	24206	3	24	X	2.32	X	35	51	77	6.32	1501	1.18	461
KW-11	X	34127	5	403	X	1.24	X	46	67	82	9.71	1386	1.51	1361
KW-12	X	35618	16	56	X	0.92	X	40	82	74	12.84	1178	1.71	842
KW-13	X	38315	74	306	X	1.96	X	79	72	113	9.65	1042	2.05	1534
KW-14	X	36563	1011	89	X	0.18	X	72	89	79	17.2	2875	1.86	2292
KW-15	X	54972	498	9	X	0.13	X	87	154	133	15.97	370	4.15	879
SW-03	X	31905	170	532	X	0.24	X	40	85	132	11.4	1556	1.29	595
SW-04	0.5	43821	369	259	X	0.48	X	140	97	105	10.84	2608	1.63	3335
SW-05	X	38601	572	34	X	0.36	X	34	98	94	11.46	4301	1.92	415
SW-06	X	38613	16	240	X	0.37	X	24	69	47	8.16	2034	1.43	152
SW-07	X	34639	27	241	X	0.2	X	27	65	90	11.46	3295	1.4	317
SW-08	1.1	32366	34	387	X	0.24	X	330	125	213	10.21	1077	1.57	3174
SW-09	X	48652	22	20	X	0.36	X	68	131	101	10.35	1653	3.43	653
SW-10	X	27887	946	504	X	0.23	X	70	98	182	13.12	7725	1.45	9172
SW-11	X	12873	384	177	X	0.1	X	21	11	55	4.4	3710	0.54	2216
SW-12	X	40316	145	16	X	0.27	X	36	95	69	11.21	4165	2.08	406
SW-13	X	16937	469	186	X	0.09	X	28	21	51	4.19	6946	0.67	1417
SW-14	X	43694	205	31	X	0.39	X	58	114	76	11.9	1978	3.34	648
SW-15	X	41860	212	96	X	0.68	X	57	111	82	11.11	1427	3.57	1392

ELEMENTS	Mo	Na	Ni	P	Pb	S	Sb	Sc	Te	Ti	V	Zn
UNITS	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
DETECTION	2	0.01	1	20	2	10	10	1	5	5	2	1
METHOD	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES	BT/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1												
SAMPLE NUMBERS												
KW-01												
KW-02												
KW-03	X	0.2	34	113	284	617	X	45	X	581	325	53
KW-04	X	0.14	111	414	146	332	X	37	X	641	517	363
KW-05	X	0.41	297	385	8	423	X	47	X	1025	369	352
KW-06	X	0.33	141	552	81	374	X	36	X	83	291	383
KW-07	X	0.2	67	513	236	596	X	27	X	243	309	149
KW-08	X	0.16	43	133	165	311	X	26	X	558	291	101
KW-09	X	0.42	170	222	11	363	X	48	X	1722	384	184
KW-10	X	0.28	251	690	3	131	X	19	X	3804	204	159
KW-11	X	0.36	61	662	12	688	X	28	X	1868	275	98
KW-12	X	0.32	54	776	5	161	X	33	X	1549	289	90
KW-13	X	0.36	198	665	8	212	X	28	X	1856	251	200
KW-14	X	0.25	102	150	46	247	X	37	X	360	304	493
KW-15	X	0.15	175	286	76	344	X	47	X	453	321	561
SW-01												
SW-02												
SW-03	X	0.32	43	447	156	566	X	38	X	410	374	253
SW-04	X	0.48	107	658	13	210	X	37	X	460	280	178
SW-05	X	0.26	113	836	10	161	X	31	X	215	304	106
SW-06	X	0.38	46	202	14	220	X	22	X	727	195	52
SW-07	X	0.4	48	214	16	776	X	31	X	1042	325	107
SW-08	X	0.45	126	889	13	311	X	38	X	93	335	181
SW-09	X	0.36	195	578	113	133	X	34	X	291	311	196
SW-10	X	0.24	51	333	84	158	52	25	X	607	367	93
SW-11	3	0.12	17	119	31	144	X	4	X	79	92	33
SW-12	X	0.36	102	351	6	138	X	33	X	155	361	147
SW-13	X	0.1	19	121	14	147	X	5	X	290	65	34
SW-14	X	0.3	103	765	4	150	X	33	X	146	338	129
SW-15	X	0.19	81	764	5	105	X	33	X	1051	322	116

X = below detection limit

Appendix 1.2 - Water Digest Analytical Results

ELEMENTS	EC	pH	Ag	Al	As	B	Ba	Bi	Ca	Cd	Cl	Co	CO3	Cr
UNITS	µS/cm	NONE	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DETECTION	10	0.1	0.1	0.1	0.5	0.1	0.1	1	0.1	0.1	5	0.1	5	0.1
METHOD	W/METER	W/METER	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	W/COL	W/OES	W/VOL	W/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-01	80	6.0	X	1.7	X	X	0.1	X	9.6	X	80	X	X	X
KW-02	20	6.0	X	0.9	X	X	X	X	2.5	X	X	X	X	X
KW-03	2110	8.5	X	0.7	X	0.8	X	X	253.5	X		X		X
KW-04	850	8.3	X	0.2	X	0.3	X	X	32.3	X		X		X
KW-05	1360	7.8	X	0.3	X	0.8	X	X	16.0	X		X		X
KW-06	960	7.6	X	0.5	X	0.5	X	X	7.4	X		X		X
KW-07	1910	8.7	X	0.1	X	1.3	X	X	109.9	X		X		X
KW-08	1110	9.1	X	0.5	X	1.1	X	X	44.5	X		X		X
KW-09	1320	7.9	X	0.4	X	0.9	X	X	11.4	X		X		X
KW-10	280	9.0	X	18.4	X	0.3	X	X	25.2	X		X		0.1
KW-11	1060	7.8	X	0.6	X	0.5	X	X	19.4	X		X		X
KW-12	370	8.5	X	1998.6	X	0.8	0.9	1	149.4	1.1		1.1		3.7
KW-13	620	9.5	X	40.4	0.5	1.2	0.7	X	81.7	X		0.2		0.2
KW-14	750	8.0	X	1.5	X	0.5	X	X	5.7	X		X		X
KW-15	1370	7.6	X	0.4	X	0.5	X	X	52.2	X		X		X
SW-01	40	5.9	X	1.1			0.1	X	11.0	X	10	X	X	X
SW-02	10	5.8	X	0.8			X	X	2.0	X	X	X	X	X
SW-03	1300	7.7	X	1446.2	X	0.3	1.1	X	76.3	0.7		0.3		1
SW-04	860	8.3	X	17.1	X	1.5	X	X	33.1	X		X		0.1
SW-05	600	8.1	X	68.3	2.1	1.9	X	1	116.9	X		X		0.3
SW-06	880	9.4	X	11.6	X	2.2	X	X	23.2	X		X		X
SW-07	1770	5.5	X	0.5	X	0.4	0.1	X	26.8	X		X		X
SW-08	1340	7.7	X	2.4	X	1.1	X	X	14.4	X		X		X
SW-09	460	8.0	X	2164.6	X	0.5	X	X	103.4	0.8		0.3		2.1
SW-10	540	8.1	X	20.0	X	0.8	0.2	X	48.3	X		X		0.1
SW-11	360	8.2	X	6.4	X	0.3	0.1	X	13.1	X		X		X
SW-12	470	8.1	X	3217.8	X	0.7	X	2	151.8	1.2		0.3		3
SW-13	430	7.8	X	1.9	X	0.2	X	X	7.3	X		X		X
SW-14	230	8.9	X	978.7	X	0.5	0.7	X	62.4	0.5		0.3		1.7
SW-15	310	8.4	X	66.1	X	0.8	0.1	X	81.9	X		0.2		0.2

ELEMENTS	Cu	F	Fe	HCO3	K	Li	Mg	Mn	Mo	N-NO3	Na	Ni	OH	P
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DETECTION	0.1	0.5	0.1	5	1	1	0.1	0.1	0.1	1	1	0.1	0	1
METHOD	W/OES	W/SIE	W/OES	W/VOL	W/OES	W/OES	W/OES	W/OES	W/OES	W/COL	W/OES	W/OES	W/VOL	W/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-01	X	0.5	0.6	20	13	X	4.4	0.4	X	X	31	X	0	X
KW-02	X	0.5	0.4	16	8	X	1.0	0.2	X	X	3	X	0	X
KW-03	X		0.4		89	X	241.5	X	X		1622	X		2
KW-04	X		0.3		36	X	32.0	X	X		798	X		X
KW-05	X		0.3		28	X	20.9	X	X		1362	X		2
KW-06	X		0.5		10	X	10.5	X	X		957	X		2
KW-07	X		X		93	X	136.3	X	X		1592	X		4
KW-08	X		0.2		50	X	42.7	X	X		1052	X		2
KW-09	X		0.5		31	X	16.2	X	X		1289	X		3
KW-10	X		16.8		17	X	35.0	X	X		413	0.6		2
KW-11	X		0.5		30	X	20.6	X	X		1162	X		2
KW-12	1.3		2662.0		63	X	671.3	7.0	X		695	0.9		X
KW-13	X		27.6		53	X	117.0	1.3	X		1602	0.9		2
KW-14	X		2.8		4	X	8.7	X	X		776	X		X
KW-15	X		0.2		34	X	82.7	X	X		1152	X		X
SW-01	X	0.5	0.4	21	19	X	4.1	0.6	X	10	5	X	0	X
SW-02	X	0.5	0.3	10	6	X	0.6	0.2	X	X	2	X	0	X
SW-03	1.5		1175.5		64	X	404.0	2.9	X		1323	0.4		X
SW-04	X		7.5		28	X	51.9	0.1	X		1584	0.1		2
SW-05	X		42.6		24	X	174.6	0.5	X		1963	0.3		X
SW-06	X		6.4		52	X	36.7	X	X		1337	X		X
SW-07	X		0.5		62	X	46.5	X	X		1868	X		X
SW-08	X		1.6		29	X	24.8	X	X		1631	X		1
SW-09	0.8		1589.5		18	X	392.7	4.7	X		594	0.6		X
SW-10	X		14.1		17	X	65.5	1.9	X		1221	0.2		1
SW-11	X		6.3		8	X	17.3	0.8	X		478	X		X
SW-12	0.9		2404.9		28	X	552.8	1.5	X		749	1.2		X
SW-13	X		0.8		8	X	9.0	0.1	X		441	X		X
SW-14	0.9		809.7		27	X	361.7	6.1	X		312	0.3		X
SW-15	X		71.1		16	X	157.5	1.2	X		688	0.2		X

ELEMENTS	Pb	S	SO_4	Sc	Si	Sn	Sr	Ti	V	Zn	Zr
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DETECTION	0.2	1	3	0.1	0.5	1	0.05	0.1	0.1	0.1	0.1
METHOD	W/OES	W/OES	/CALC	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1											
SAMPLE NUMBERS											
KW-01	X	4	13	X	8.0	X	X	X	X	X	X
KW-02	X	2	5	X	8.2	X	X	X	X	X	X
KW-03	X	425	1275	X	18.0	X	0.61	X	X	X	X
KW-04	X	156	468	X	38.4	X	0.08	X	X	X	X
KW-05	X	327	981	X	28.8	X	X	X	X	X	X
KW-06	X	237	711	X	18.5	X	X	X	X	X	X
KW-07	X	393	1179	X	17.1	X	0.30	X	X	X	X
KW-08	X	202	606	X	18.1	X	0.08	X	X	X	X
KW-09	X	282	846	X	28.9	X	X	X	X	X	X
KW-10	X	76	228	X	71.9	X	X	X	0.3	0.4	X
KW-11	X	634	1902	X	32.2	X	X	X	X	X	X
KW-12	X	102	306	1.9	7271.1	X	0.45	16.7	8.5	0.5	0.3
KW-13	X	306	918	X	199.5	X	0.11	X	1.5	0.8	0.1
KW-14	X	154	462	X	15.1	X	X	X	X	0.2	X
KW-15	X	254	762	X	9.6	X	0.14	X	X	X	X
SW-01	X	2	7	X	8.7	X	X	X	X	X	X
SW-02	X	3	8	X	6.2	X	X	X	X	X	X
SW-03	0.3	271	813	1.6	4588.7	X	0.38	2.1	1	1.5	0.2
SW-04	X	333	999	X	82.2	X	0.06	X	X	X	X
SW-05	X	320	960	X	231.2	X	0.13	0.1	0.5	X	0.2
SW-06	X	181	543	X	128.3	X	0.06	X	0.3	X	X
SW-07	X	534	1602	X	58.9	X	0.11	X	X	X	X
SW-08	X	307	921	X	44.7	X	X	X	X	X	X
SW-09	0.9	77	231	0.6	5698.7	X	0.31	1.7	1.3	X	0.2
SW-10	X	210	630	X	78.7	X	0.08	X	0.5	X	X
SW-11	X	81	243	X	24.1	X	X	X	0.3	X	X
SW-12	X	84	252	1.1	8051.1	X	0.40	2	2	X	0.3
SW-13	X	79	237	X	11.2	X	X	X	X	X	X
SW-14	X	48	144	0.8	3239.5	X	0.18	7.1	3.5	X	0.1
SW-15	X	144	432	X	204.9	X	0.11	X	0.5	0.4	X

X = below detection limit

Appendix 1.3 - Toxicity Characteristic Leach Protocol (TCLP) Digest Analytical Results

ELEMENTS	Ag	Al	As	As	B	Ba	Ba	Be	Bi	Bi	Ca	Cd	Cd	Co
UNITS	mg/L	mg/L	mg/L	μg/L	mg/L	mg/L	μg/L	μg/L	mg/L	μg/L	mg/L	mg/L	μg/L	mg/L
DETECTION	0.01	0.01	0.05	0.1	0.01	0.01	0.05	0.1	0.1	0.005	0.01	0.01	0.02	0.01
METHOD	TC/OES	TC/OES	TC/OES	TC/MS	TC/OES	TC/OES	TC/MS	TC/MS	TC/OES	TC/MS	TC/OES	TC/OES	TC/MS	TC/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-14	X	0.05	X	14.5	0.07	0.02	18.13	0.6	X	0.009	27.48	X	0.16	X
SW-12	X	0.03	X	4.3	0.04	0.01	5.39	0.5	X	0.005	32.13	X	0.03	X

ELEMENTS	Cr	Cu	Fe	K	Li	Mg	Mn	Mo	Ni	P	Pb	pH	S	Sb
UNITS	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	NONE	mg/L	μg/L
DETECTION	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.01	0.01	0.1	0.02	0.1	0.1	0.01
METHOD	TC/OES	TC/OES	TC/OES	TC/OES	TC/OES	TC/OES	TC/OES	TC/OES	TC/OES	TC/OES	TC/OES	TC/METER	TC/OES	TC/MS
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-14	X	X	0.07	4.1	X	32.09	0.09	X	0.01	X	X	5.0	7.6	0.02
SW-12	X	X	X	7.7	X	44.53	X	X	X	X	X	5.0	4.3	0.02

ELEMENTS	Sc	Se	Si	Sn	Sr	Te	Ti	U	V	Zn	Zr
UNITS	mg/L	μg/L	mg/L	mg/L	mg/L	μg/L	mg/L	μg/L	mg/L	mg/L	mg/L
DETECTION	0.01	0.5	0.05	0.1	0.01	0.1	0.01	0.005	0.01	0.01	0.01
METHOD	TC/OES	TC/MS	TC/OES	TC/OES	TC/OES	TC/MS	TC/OES	TC/MS	TC/OES	TC/OES	TC/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1											
SAMPLE NUMBERS											
KW-14	X	1.3	2.49	X	0.38	X	X	6.171	X	X	X
SW-12	X	0.8	3.15	X	0.43	X	X	4.536	X	X	X

X = below detection limit

Appendix 1.4 - Soil Chemical Analysis Results

ELEMENTS	Ag	Al	As	B	Ba	Bi	Ca	Ca	Cd	Cl	Co	CO3	Cr	Cu
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DETECTION	0.1	0.1	0.5	0.1	0.1	1	0.1	0.01	0.1	5	0.1	5	0.1	0.1
METHOD	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	NH4Cl/OES	W/OES	W/COL	W/OES	W/VOL	W/OES	W/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-01	X	1.7	X	X	0.1	X	9.6	303.32	X	80	X	X	X	X
KW-02	X	0.9	X	X	X	X	2.5	271.74	X	X	X	X	X	X
SW-01	X	1.1	X	X	0.1	X	11	431.24	X	10	X	X	X	X
SW-02	X	0.8	X	X	X	X	2	202.18	X	X	X	X	X	X

ELEMENTS	EC	F	Fe	HCO3	K	K	Li	Mg	Mg	Mn	Mo	N-NO3	Na	Na
UNITS	µS/cm	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DETECTION	0.01	0.5	0.1	5	1	0.1	1	0.1	0.01	0.1	0.1	1	1	10
METHOD	W/METER	W/SIE	W/OES	W/VOL	W/OES	NH4Cl/OES	W/OES	W/OES	NH4Cl/OES	W/OES	W/OES	W/COL	W/OES	NH4Cl/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-01	0.08	0.5	0.6	20	13	78.4	X	4.4	81.62	0.4	X	X	31	85
KW-02	0.02	0.5	0.4	16	8	91	X	1	74.64	0.2	X	X	3	49
SW-01	0.04	0.5	0.4	21	19	127.6	X	4.1	108.95	0.6	X	10	5	33
SW-02	0.01	0.5	0.3	10	6	76.4	X	0.6	60.12	0.2	X	X	2	31

ELEMENTS	Ni	OH	P	Pb	pH	S	SO4	Sc	Si	Sn	Sr	Ti	V	Zn
UNITS	mg/kg	mg/kg	mg/kg	mg/kg	NONE	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
DETECTION	0.1	0	1	0.2	0.1	1	3	0.1	0.5	1	0.05	0.1	0.1	0.1
METHOD	W/OES	W/VOL	W/OES	W/OES	W/METER	W/OES	/CALC	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES	W/OES
COMMENTS: 282.0/0405953 (17/09/2004) CLIENT O/N: WCLP-1														
SAMPLE NUMBERS														
KW-01	X	0	X	X	6.0	4	13	X	8	X	X	X	X	X
KW-02	X	0	X	X	6.0	2	5	X	8.2	X	X	X	X	X
SW-01	X	0	X	X	5.9	2	7	X	8.7	X	X	X	X	X
SW-02	X	0	X	X	5.8	3	8	X	6.2	X	X	X	X	X

X = below detection limit

Appendix 19

Coyote Project Stage 2 Ground and Surface Water Management Plan

Ground and Surface Water Management Plan

Coyote Project

Stage 2

TANAMI GOLD NL

September 2006

Table of Contents

1 INTRODUCTION

The Coyote Project area is semi arid with an average rainfall of 336 mm (Balgo Hills). Most of the rain falls from December to March but the amount varies greatly both seasonally and annually. The highest recorded daily rainfall is 117 mm, thus surface water runoff and containment within storage facilities is a recognised issue.

Stage 2 of the Coyote Project is located approximately 35km north of the existing mine site. This stage of the mining project will consist of two relatively small open pits, a waste dump, evaporation dam and basic support infrastructure. All ore will be trucked via a purpose built haul road to the existing processing plant at the Coyote mine site. Stage 2 is expected to take approximately 12 months.

Mining in the open pits at the Kookaburra and Sandpiper deposits will extend below the water table and subsequently dewatering will be required. Dewatering is likely to commence prior to mining and will continue throughout the life of the operation. Groundwater extracted by dewatering operations will be used primarily for dust suppression with excess water being contained in a purpose-built evaporation dam.

Although the Coyote Project is located within the defined catchment for Sturt Creek, the water course is over 100km to the northwest of the site. There are no water courses, drainage lines or surface water bodies within the mining area although a large palaeochannel exists between the Stage 2 area and the existing mine site. This may serve as a catchment for Sturt Creek in extreme rainfall events. The topography of the area is generally flat with hills becoming apparent to the north of the site. Soils are lateritic or sandy and generally highly permeable, resulting in little surface water flow following typical rainfall events. On occasion extreme rainfall events do occur, at which time there can are expected to be extensive short-term surface flows in the area. It is considered highly unlikely that the Stage 2 mining operation will have any impact on quality of water periodically flowing through Sturt Creek.

Sub-surface water in the area varies in depth and quality. Shallow groundwater aquifers are relatively fresh but are generally seasonal, existing during and for a period after the wet season. Groundwater encountered at depth is generally saline and is not suitable for irrigation or stock water, as stated in the Australian and New Zealand Water Quality Guidelines (2000). Salinity concentrations within the Stage 2 area are around 30,000 mg/L TDS (gravimetric). A Dewatering Feasibility report was prepared by consulting firm URS in 2004. The aquifers in the Stage 2 area appear to be discrete bodies formed in fractured rock coinciding with the deposit. The recharge rates of these aquifers are not known at this time.

Storage of fuel will be required on site. Bunding will be constructed to meet the requirements of environmental legislation and the appropriate Australian Standard.

Vegetation in the Project area is predominately Acacia Shrubland underlain and interspersed with spinifex. Clearing of vegetation for the Stage 2 mining operation is considered unlikely to have any impact on the groundwater system.

2 SURFACE WATER MANAGEMENT

2.1 Objectives

The main objectives of Tanami's surface water management during Stage 2 of the Coyote Project are to:

- minimise erosion; and
- prevent discharge of contaminated surface water to the surrounding environment.

2.2 Targets

During the Project, Tanami aims to:

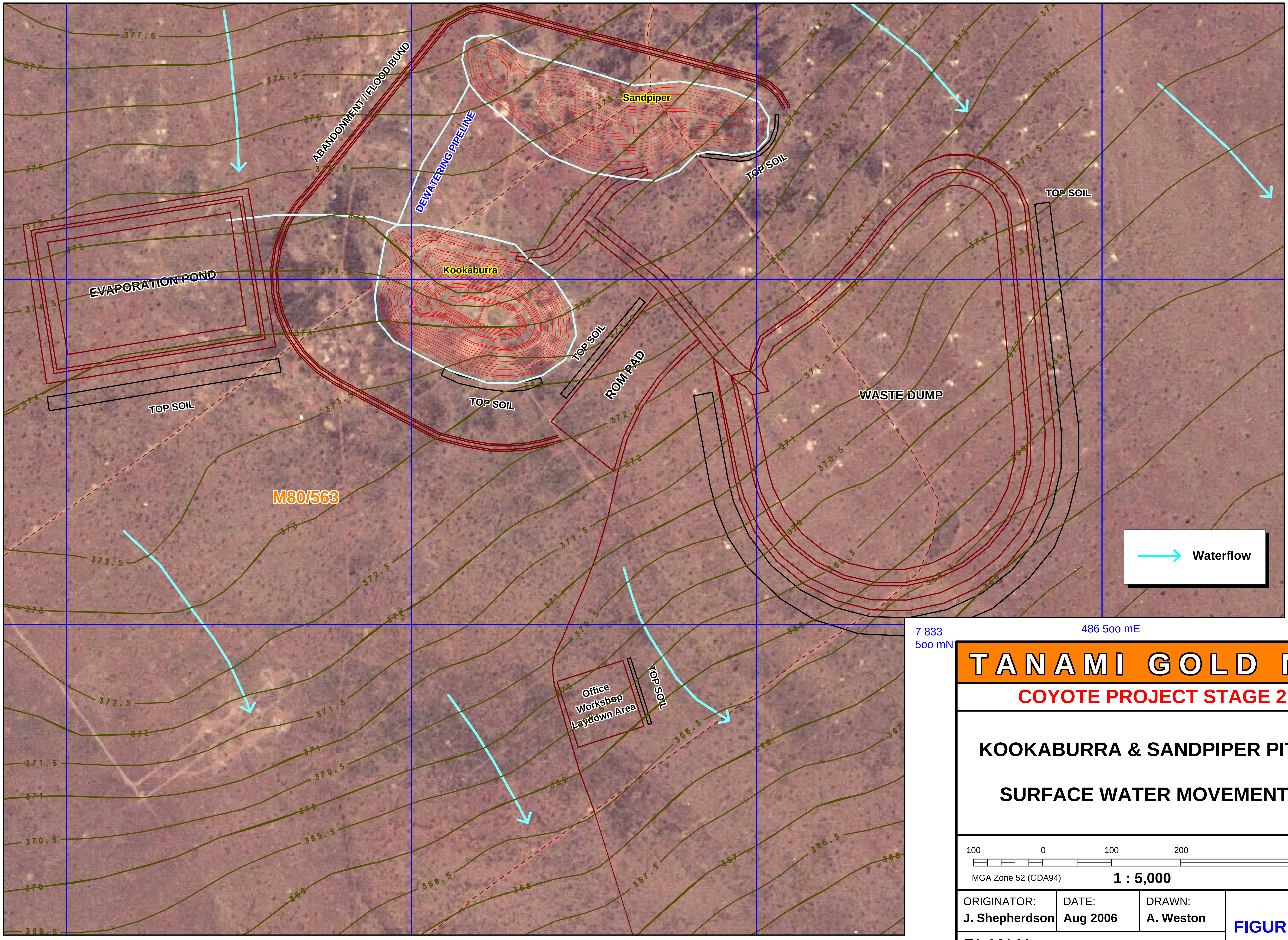
- prevent the direct or indirect release of contaminated runoff resulting from mining operations to surface waters; and
- prevent incidences of accelerated water erosion as a result of mining activities.

2.3 Management Methods

To assist in surface water management during the Project, Tanami will employ the following methods:

- Installation of bunded storage areas for fuel and any other chemicals required for the mining operation;
- Bunded areas will be constructed to contain a minimum of 110% of the capacity of the storage tank;
- Provision of spill kits in strategic locations and training of site personnel in their use;
- Implementation of controls to ensure all transfer of fuels and chemicals is managed to prevent spillage:
- Waste is to be stored appropriately to prevent escape of contaminants with rainfall runoff;
- Drainage systems and catchment areas will be constructed to cater for a 1 in 100 year rainfall event;
- Diversion bunds and sediment traps will be installed where necessary to prevent runoff entering the natural drainage system;
- Vegetation will be cleared progressively to limit disturbance and reduce potential for soil erosion;
- The time that bare soil is left exposed to surface runoff will be minimised; and
- The rehabilitation process will include contour ripping of disturbed areas to control surface runoff.

Figure 1 shows the surface water movement of the mine site and surrounds based on the natural contours of the area.



TANAMI GOLD NL		
COYOTE PROJECT STAGE 2		
KOOKABURRA & SANDPIPER PITS SURFACE WATER MOVEMENT		
MGA Zone 52 (GDA94) 1 : 5,000 metres		
ORIGINATOR: J. Shepherdson	DATE: Aug 2006	DRAWN: A. Weston
PLAN No: WTP_BHG_KB_0_4_002		FIGURE 1

3 GROUNDWATER MANAGEMENT

3.1 Objectives

The main objectives of Tanami's groundwater management during Stage 2 of the Coyote Project are to:

- protect the quality of the groundwater resource;
- ensure groundwater abstraction does not adversely impact on the natural environment; and
- ensure the continued supply of groundwater for processing and domestic needs.

3.2 Target

The primary goal of groundwater management is to maintain groundwater quality and prevent adverse impact on the surrounding environment. This will be achieved through continued monitoring of the quality and levels of the groundwater and condition of the surrounding vegetation.

3.3 Potential Threats to the Groundwater System

Recognised threats to the quality of the groundwater system include:

- A major hydrocarbon spill; and
- Over-drawing from the aquifer, resulting in permanent alteration of the system.

3.4 Management Methods

To ensure the groundwater system is not affected by contamination or over-extraction, the following management strategies will be employed throughout Stage 2 of the Coyote Project:

- Facilities designed for the storage and containment of hydrocarbons will be lined with an impermeable membrane;
- Monitoring of drawdown levels will be conducted to assess the efficiency of the dewatering program and to confirm the predicted drawdown effects; and
- Emergency procedures to deal with a major spill of hydrocarbon or other chemical.

3.5 Groundwater Monitoring

Groundwater depth monitoring will be conducted weekly to enable determination of groundwater levels and thus the effectiveness of the dewatering program.

The locations of the existing bores are shown on Figure 2. Additional bores will be installed early in 2007.

A full chemical analysis will be conducted annually as a comparison to baseline data. Analysis will determine levels of:

- EC;
- Hardness;
- pH;
- TDS;
- Total alkalinity;
- Al;
- As
- Ca;
- Cl;
- CO_3;
- Fe;
- HCO_3;
- K;
- Mg;
- Mn;
- Na;
- NO_2;
- NO_3;
- OH;
- Pb;
- SiO_2; and
- SO_4.

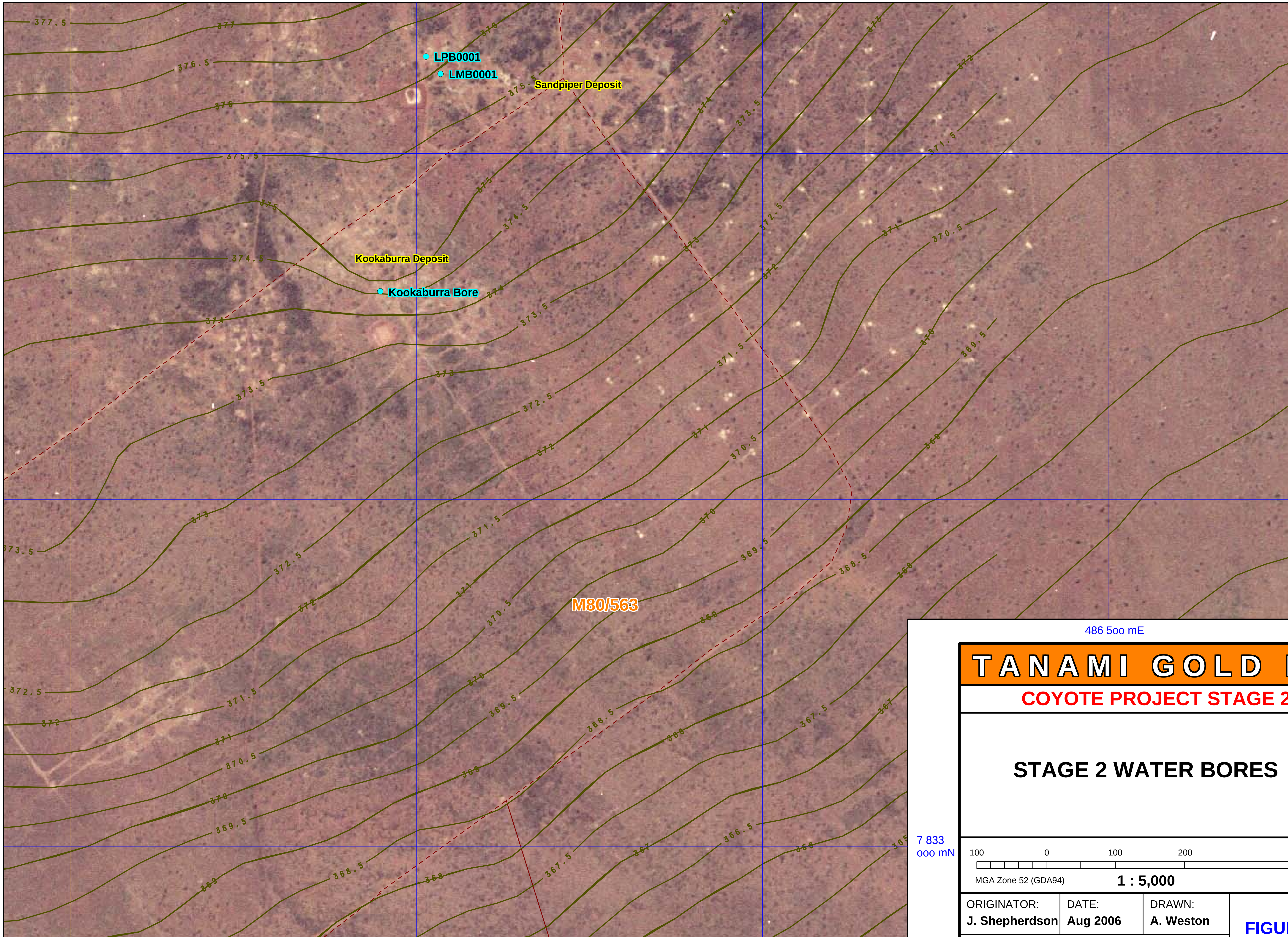
Baseline groundwater data was collected by URS during Dewatering Feasibility Investigations in 2004. Comparative analysis will be conducted when the additional bores are installed. Results of the 2004 analysis are included as Appendix 1.

All water samples shall be collected in accordance with AS/NZS 5667.1:1998, or another method approved by the Department of Water. Samples will be submitted to a laboratory with current NATA registration for the analysis specified, and analysed in accordance with the current “Standard Methods for Examination of Water and Wastewater-APHA-AWWA-WEF”, or by a method approved by the Department of Water.

3.6 Vegetation Monitoring

In addition to groundwater monitoring, photographic vegetation monitoring sites will be established around the perimeter of mine operations. The intention of vegetation monitoring is to determine whether groundwater abstraction has an impact on native vegetation.

Baseline data will be recorded early in 2007 and the sites shall be monitored bi-annually (March and September) and results included in the Annual Environmental Report. Data collected from within the monitored areas will include species present, number of individuals of each species and health of vegetation. Mature trees close to each monitoring site and around the mine site will also be monitored for health.



TANAMI GOLD NL

COYOTE PROJECT STAGE 2

STAGE 2 WATER BORES

100 0 100 200 400

MGA Zone 52 (GDA94) 1 : 5,000 metres

ORIGINATOR:	DATE:	DRAWN:	
J. Shepherdson	Aug 2006	A. Weston	FIGURE 2

PLAN No: WTP_BHG_KB_0_4_003

3.7 Contingency Plan

Groundwater abstraction will be conducted for the purposes of dewatering the mine area. Abstraction will be controlled to allow groundwater levels to be safely ahead of mining depth. There are no contingency plans in place for either excessive lowering of the groundwater level beyond mining requirements, (as this will not occur) nor for increased salinity of the groundwater that is abstracted and either used or contained on site.

Should dewatering abstraction not meet water supply requirements at later stages of mining, additional supply can be obtained from either the same hard rock aquifers more distant from the mine or from the sediments of the nearby palaeochannel. The DoW shall be kept informed of any perceived need to obtain additional supply and a request would be made to DoW for permission to obtain that supply. The trigger for this shall be firstly from the groundwater model, and then from actual aquifer performance determined from monitoring of the bores.

There is expected to be no significant effect on groundwater abstraction levels should drought conditions apply.

Significant changes in the levels of the parameters being monitored will be investigated to determine the cause. Should the cause be found to emanate from the mining operation, action will be taken immediately to prevent further contamination. Appropriate remediation measures will be developed and implemented.

Procedures are have been developed for dealing with hydrocarbon and chemical spills and training will be undertaken by site personnel.

Appendix 1
Baseline Groundwater Monitoring Results

SGS

LABORATORY REPORT COVERSHEET

DATE:	22 July 2004
TO:	URS Corporation Level 3, The Hyatt Centre 20 Terrace Road EAST PERTH WA 6004
ATTENTION:	Mr Vern Wilson
YOUR REFERENCE:	53850-002
OUR REFERENCE:	82122
SAMPLES RECEIVED:	02/07/04
SAMPLES/QUANTITY:	9 Waters

The above samples were received intact and analysed according to your written instructions. Unless otherwise stated, solid samples are reported on a dry weight basis and liquid samples as received.

NATA Accredited Laboratory
Number: 2562 (1705)

NATA ENDORSED TEST REPORT
This document shall not be reproduced, except in full.

JANICE VENNING
Manager, Perth

LIEN TANG
Manager Reporting Systems

This report supersedes our preliminary results that were reported by facsimile.
This report must not be reproduced except in full.

REG No.	16-2004-1037			
DATE	26/7/04			
NAME	INFO	ACTION	Complete (Sign)	DATE
VW				
FILE No				

SGS Australia Pty Ltd ABN 44 000 964 278 | Environmental Services t +61 (0)8 9458 7278 | 52 Murray Road f +61 (0)8 9451 3505 | Welshpool 6106 Western Australia | www.au.sgs.com

Member of the SGS Group

SGS

CLIENT: URS Corporation **OUR REFERENCE:** 82122
PROJECT: 53850-002

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	LPB1-30 minutes 82122-1 Water	CYPB1 - 60 minutes 82122-2 Water	Kookaburra Bore - 40mins 82122-5 Water
pH	pH Units	7.0	7.6	7.3
Electrical Conductivity @ 25 oC	µS/cm	40000	9900	35000
Total Dissolved Solids (calc as NaCl)	mg/L	26000	6200	22000

Your Reference Our Reference Type of Sample	Units	Kookaburra Bore - 1200 mins 82122-3 Water	LMB1 82122-4 Water	CYPB1 - 1400mins 82122-6 Water	CYMB1 82122-7 Water	CYMB2 82122-8 Water
pH	pH Units	7.3	7.4	7.6	7.8	8.0
Electrical Conductivity @ 25 oC	µS/cm	36000	41000	9300	13000	11000
Total Dissolved Solids (calc as NaCl)	mg/L	23000	26000	5900	7700	6500
Total Dissolved Solids (grav) @ 180°C	mg/L	23000	27000	6700	10000	8500
Total Alkalinity as $CaCO_3$	mg/L	250	180	440	480	460
Iron, Fe (soluble)	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Aluminium, Al	mg/L	<0.1	0.2	<0.1	0.2	0.1
Sodium, Na	mg/L	5600	6000	1700	2700	2300
Potassium, K	mg/L	140	140	140	180	160
Calcium, Ca	mg/L	940	1100	110	160	140
Magnesium, Mg	mg/L	1200	1600	250	370	330
Chloride, Cl	mg/L	13000	12000	2400	3800	3100
Hydroxide, OH	mg/L	<1	<1	<1	<1	<1
Carbonate, CO_3	mg/L	<1	<1	<1	<1	<1
Bicarbonate, HCO_3	mg/L	300	210	540	590	560
Hardness (equivalent $CaCO_3$)	mg/L	7300	9300	1300	2300	1700

CLIENT: URS Corporation **OUR REFERENCE:** 82122
PROJECT: 53850-002

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	Kookaburra Bore - 1200 mins 82122-3 Water	LMB1 82122-4 Water	CYPB1 - 1400mins 82122-6 Water	CYMB1 82122-7 Water	CYMB2 82122-8 Water
Sulphate, SO_4	mg/L	3200	4900	1600	2400	2100
Nitrate, NO_3	mg/L	8.7	5.8	9.9	8.5	9.3
Nitrite, NO_2	mg/L	<0.2	<0.2	<0.2	<0.2	<0.2
Manganese, Mn	mg/L	<0.05	0.20	0.15	0.30	<0.05
Silica, SiO_2	mg/L	28	21	17	17	17
Sum of Ions (calc.)	mg/L	24389	25956	6843	10183	8684
Cation/Anion balance	%	-5.48	0.79	-2.42	-1.60	-0.76

Your Reference Our Reference Type of Sample	Units	LPB1 - 1420 mins 82122-9 Water
pH	pH Units	7.3
Electrical Conductivity @ 25 oC	µS/cm	41000
Total Dissolved Solids (calc as NaCl)	mg/L	26000
Total Dissolved Solids (grav) @ 180°C	mg/L	27000
Total Alkalinity as $CaCO_3$	mg/L	250
Iron, Fe (soluble)	mg/L	<0.05
Aluminium, Al	mg/L	0.2
Sodium, Na	mg/L	5700
Potassium, K	mg/L	140
Calcium, Ca	mg/L	1000
Magnesium, Mg	mg/L	1700
Chloride, Cl	mg/L	12000
Hydroxide, OH	mg/L	<1
Carbonate, CO_3	mg/L	<1
Bicarbonate, HCO_3	mg/L	310
Hardness (equivalent $CaCO_3$)	mg/L	9500

SGS

CLIENT: URS Corporation **OUR REFERENCE:** 82122
PROJECT: 53850-002

LABORATORY REPORT

Your Reference Our Reference Type of Sample	Units	LPB1 - 1420mins 82122-9 Water
Sulphate, SO_4	mg/L	4900
Nitrate, NO_3	mg/L	4.7
Nitrite, NO_2	mg/L	<0.2
Manganese, Mn	mg/L	<0.05
Silica, SiO_2	mg/L	30
Sum of Ions (calc.)	mg/L	25755
Cation/Anion balance	%	-0.49

TEST PARAMETERS	UNITS	LOR	METHOD
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pH	pH Units	0.1	PEI-001
Electrical Conductivity @ 25°C	µS/cm	1	PEI-032
Total Dissolved Solids (calc as NaCl)	mg/L	5	PEI-032
Standard 2			
pH	pH Units	0.1	PEI-001
Electrical Conductivity @ 25°C	µS/cm	1	PEI-032
Total Dissolved Solids (calc as NaCl)	mg/L	5	PEI-032
Total Dissolved Solids (grav) @ 180°C	mg/L	10	PEI-002
Total Alkalinity as $CaCO_3$	mg/L	5	PEI-006
Iron, Fe (soluble)	mg/L	0.05	PEM-001
Aluminium, Al	mg/L	0.1	PEM-002
Sodium, Na	mg/L	0.5	PEM-001
Potassium, K	mg/L	0.5	PEM-001
Calcium, Ca	mg/L	0.5	PEM-002
Magnesium, Mg	mg/L	0.5	PEM-002
Chloride, Cl	mg/L	1	PEI-020
Hydroxide, OH	mg/L	1	PEI-006
Carbonate, CO_3	mg/L	1	PEI-006
Bicarbonate, HCO_3	mg/L	5	PEI-006

SGS

CLIENT: URS Corporation **OUR REFERENCE:** 82122

PROJECT: 53850-002

LABORATORY REPORT

TEST PARAMETERS	UNITS	LOR	METHOD
Hardness (equivalent $CaCO_3$)	mg/L	5	PEI-043
Sulphate, SO_4	mg/L	1	PEI-020
Nitrate, NO_3	mg/L	0.2	PEI-020
Nitrite, NO_2	mg/L	0.2	PEI-020
Manganese, Mn	mg/L	0.05	PEM-001
Silica, SiO_2	mg/L	2	PEM-002
Sum of Ions (calc.)	mg/L		Calc.
Cation/Anion balance	%		Calc.

NOTES:

LOR - Limit of Reporting.