

**SARFIELD EXPANSION PROJECT  
INITIAL ADVICE STATEMENT**

**CARPENTARIA GOLD PTY LTD**





# INITIAL ADVICE STATEMENT

Sarsfield Expansion Project  
Carpentaria Gold Pty Ltd

September 2011

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**Coffey Environments Australia Pty Ltd** ABN 65140765902  
(formerly Coffey Natural Systems)  
Level 2, 12 Creek Street Brisbane QLD 4000 Australia  
T (+61) (7) 3002 0400 F (+61) (7) 3002 0444  
[coffey.com](http://coffey.com)

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Project director	Anna Dennis		
Project manager	Sam Blanco		
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# 1. INTRODUCTION

## 1.1 Project Overview

Carpentaria Gold Pty Ltd (Carpentaria Gold), which is 100% owned by ASX listed Resolute Mining Limited proposes to expand the existing open pit mine at Ravenswood, North Queensland, 120 km south of the Port City of Townsville (refer Figure 1). The pit originally comprised five smaller pits but was consolidated into one large pit in 2000. Carpentaria Gold operated the Sarsfield Pit until February 2009, when mining ceased due to the dewatering of the pit becoming economically unviable based upon the gold price at the time, heavy rainfall activity and increasing dewatering costs. After the operations ceased the pit void was utilised as a tailings storage facility, and tailings was deposited into the pit.

The Sarsfield Expansion Project (project) footprint is shown on Figure 2 and comprises:

- Extending the Nolans Pit floor to a depth of 105 metres from the surface, and by extending the pit wall to the south by 120 metres, and involving:
  - 4.48 Mt of waste, 2.01 Mt of ore at 1.09 g/t mined to produce 61.3 Koz recovered ounces.
  - Production peak at 6 Mtpa total movement.
  - Processing life of 0.5 years of feed.
- Continued processing of Sarsfield ore with the existing Mt Wright underground mine ore at the existing process plant.
- The construction of two new lined Tailings Storage Facilities (TSF) to house dredged tailings from the Sarsfield Pit (i.e., relocation of 8 to 9 Mt of dredge material over a 8 -12 month duration, with rate of dredging controlled by the rate at which the Tailings Storage Facility (TSF) can accept tails and remain stable), and additional capacity to accommodate the tailings from the proposed project.
- Removal and re-establishment of a portion of the existing acoustic bund (an earthen embankment approximately 10 m in height) to the west and north of the pit.
- Recommence mining the Sarsfield Pit, by extending the pit wall to the north and west involving:
  - 92 Mt of waste, 38 Mt of ore at 0.84 g/t mined to produce 933 Koz recovered ounces.
  - Production peak at 22 Mtpa total movement.

- Processing life of 10 years of feed at 5.0 Mtpa to the operation to bring the current mill to full capacity of 5.0 Mtpa when added to the 1.5 Mtpa production from Mt Wright.
- Creation of a landform of a single and rounded hill by infilling between the Sarsfield waste rock dump and the scats heap for waste rock storage.
- Sewage treatment plant replacement to accommodate planned infrastructure growth.
- Upgrading of the Suhrs Creek raw water dam spillway to achieve 75 % conformance with AFC requirements by 2025 and full conformance by 2035.
- New mining area workshop and offices.
- New fuel storage (i.e., 240,000 litres) with appropriate bunding.
- 100-room ensuite worker camp expansion to accommodate an additional permanent workforce of 160 personnel.
- Relocation of the water treatment plant and power facilities currently on the north face to a position outside the planned areas of activity.
- Realignment of a portion of the 30 metre wide Mt Wright haul road in the vicinity of the pit expansion, and alternative landowner property access.
- Two new leach tanks, if test work indicates that additional residence time is required.
- Comply with new legislative requirements and move towards best practice with the Resolute Cyanide Management Standard with a new mix / storage facility for sodium cyanide (NACN).
- Construction of new hydrochloric acid (HCl) and Liquefied Petroleum Gas (LPG) storage facilities.
- Refurbishment of the existing Sarsfield crushing plant including improvements in the reduction in dust emission reduction methodologies.
- Where deemed necessary road closure and property access relocations.
- Replacement of the existing community waste landfill with a designated two to three hectare community waste landfill facility.
- Re-establishment of a landfill (2-3 ha) on site for uncontaminated industrial site wastes as the existing facility will be covered by the tailings storage landform.

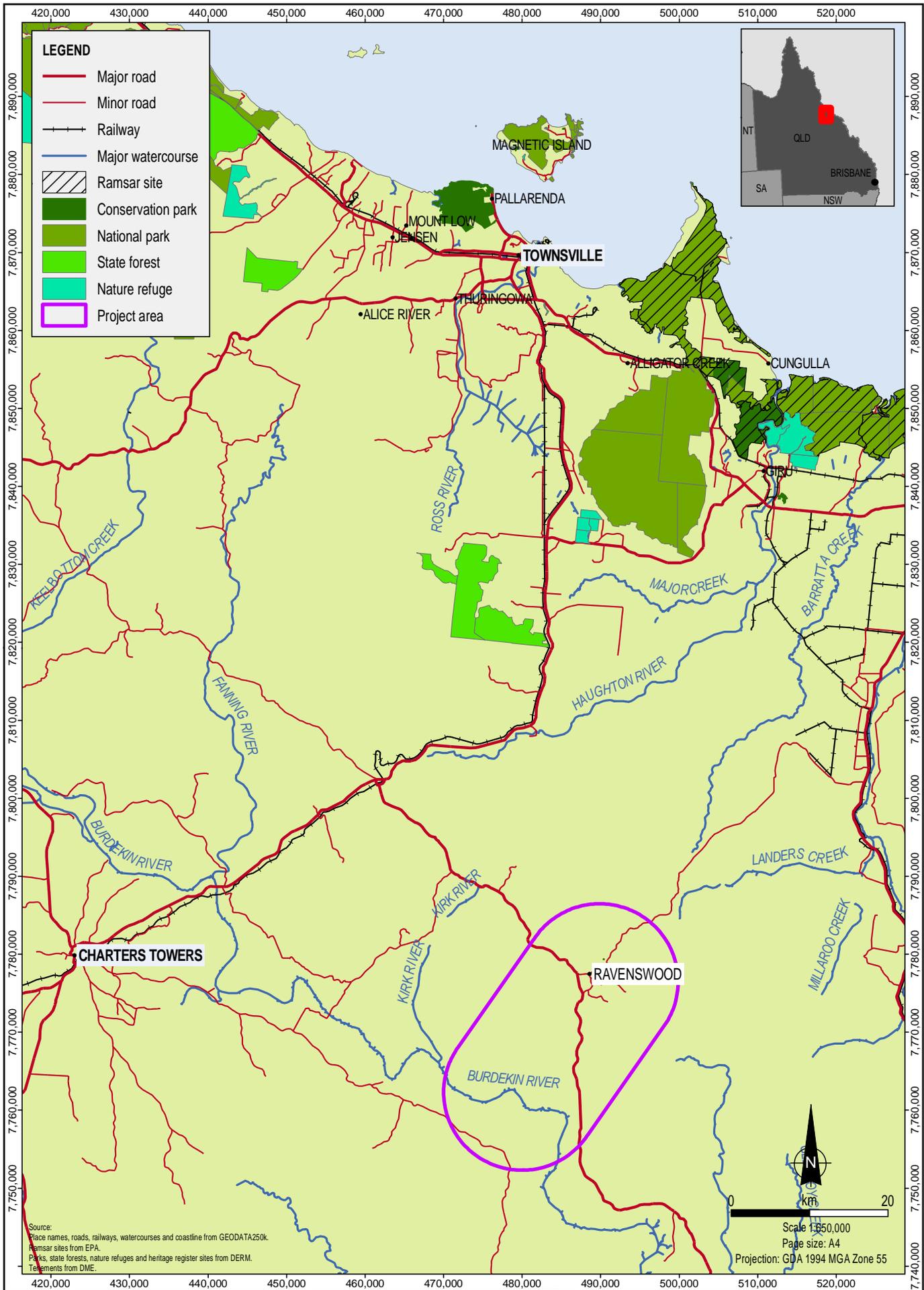
## **1.2 Project Location**

The historic mining town of Ravenswood is also approximately 90 km by road from the town of Charters Towers and 65 km from the head of the Burdekin Dam. Ravenswood is connected to the main towns of Townsville and Charters Towers via the Mount Isa highway.

The expansion project is located within the Charter Towers Regional Council local government area.

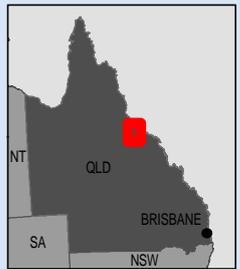
The Ravenswood historic mining township has a total population of approximately 450, not including the mine's existing 300 person camp. The non-mining related sector of the population is made up of mainly local cattle grazing families, retired prospectors and small business operators.

The nearest significant population to Ravenswood is Charters Towers with a population of around 10,000 people, approximately 90 km to the West. Ravenswood is a drive in - drive out operation with its main employment base centred around the Charters Towers and Townsville regional centres, which is approximately 125 km to the east of Ravenswood. Supplies are transported by road haulage from Townsville and Brisbane. Services are sourced from Charters Towers and/or Townsville.



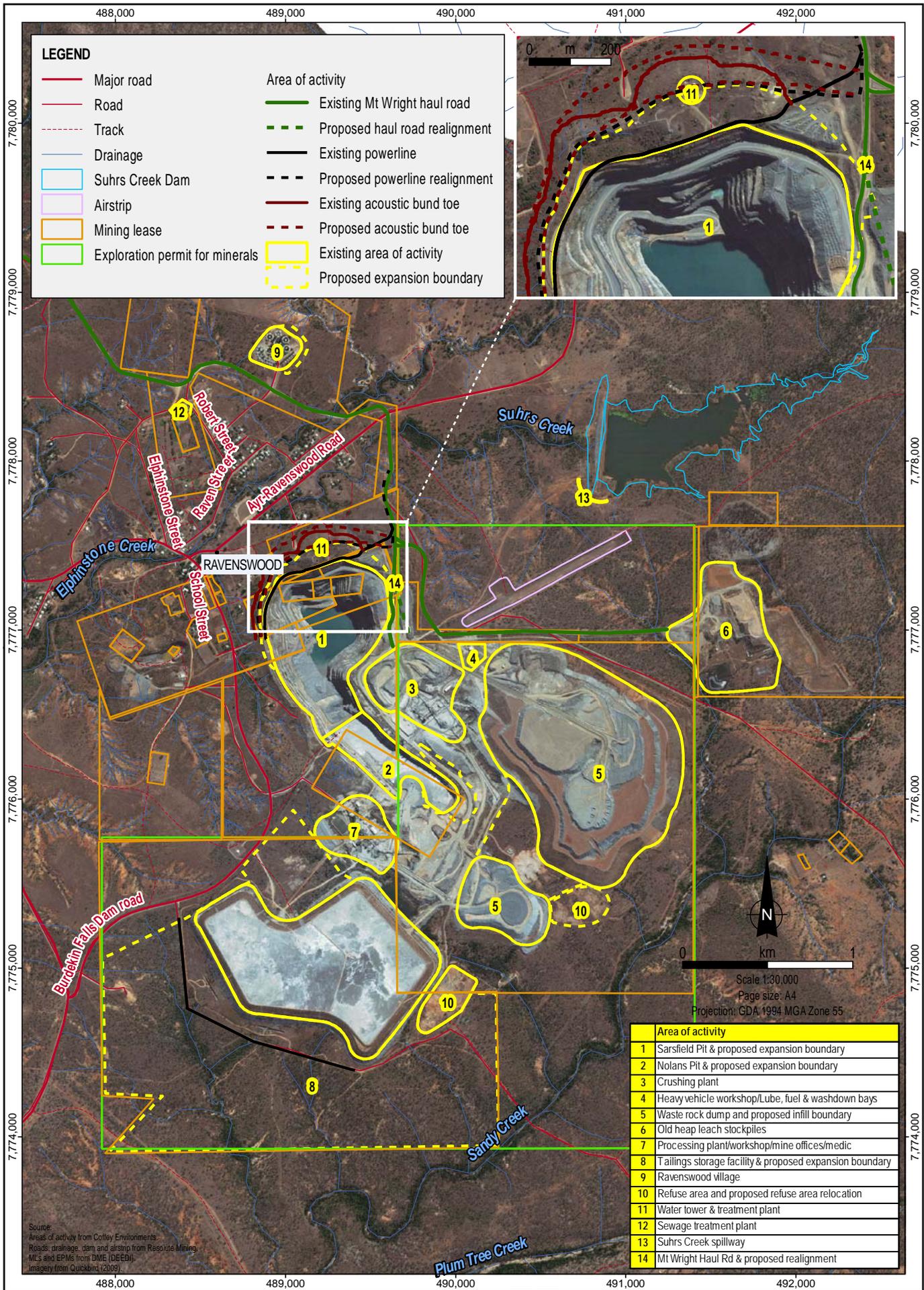
**LEGEND**

- Major road
- Minor road
- Railway
- Major watercourse
- Ramsar site
- Conservation park
- National park
- State forest
- Nature refuge
- Project area



Source:  
 Place names, roads, railways, watercourses and coastline from GEODATA250k.  
 Ramsar sites from EPA.  
 Parks, state forests, nature refuges and heritage register sites from DERM.  
 Telements from DME.

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 Projection: GDA 1994 MGA Zone 55



**LEGEND**

	Major road		Area of activity
	Road		Existing Mt Wright haul road
	Track		Proposed haul road realignment
	Drainage		Existing powerline
	Suhrs Creek Dam		Proposed powerline realignment
	Airstrip		Existing acoustic bund toe
	Mining lease		Proposed acoustic bund toe
	Exploration permit for minerals		Existing area of activity
			Proposed expansion boundary



Area of activity
1 Sarsfield Pit & proposed expansion boundary
2 Nolans Pit & proposed expansion boundary
3 Crushing plant
4 Heavy vehicle workshop/Lube, fuel & washdown bays
5 Waste rock dump and proposed infill boundary
6 Old heap leach stockpiles
7 Processing plant/workshop/mine offices/medic
8 Tailings storage facility & proposed expansion boundary
9 Ravenswood village
10 Refuse area and proposed refuse area relocation
11 Water tower & treatment plant
12 Sewage treatment plant
13 Suhrs Creek spillway
14 Mt Wright Haul Rd & proposed realignment

Scale 1:30,000  
Page size: A4  
Projection: GDA 1994 MGA Zone 55

Source:  
Areas of activity from Coffey Environments  
Roads, drainage, dam and airstrip from Resolute Mining  
M.L.s and E.P.M.s from DME (DEEDJ)  
Imagery from Quickbird (2009)

### **1.3 Project Tenements and Land Ownership**

The Ravenswood properties are subject to *Mineral Resources Act 1989* (Qld), which provides the legislative framework for exploration, development and mining tenure in the state. A mining lease is granted for mining operations, which entitles the holder to machine - mine specified minerals and carry out activities associated with mining or promoting the activity of mining, is not restricted to a maximum term. This is determined in accordance with the amount of reserves identified and the projected mine life, and can be granted for those minerals specified in either the prospecting permit, exploration permit or mineral development licence held prior to the grant of the lease.

Under the Act, an exploration permit is issued for the purpose of exploration, allows the holder to take action to determine the existence, quality and quantity of minerals on, in or under land by methods which include prospecting, geophysical surveys, drilling, and sampling and testing of materials to determine mineral bearing capacity or properties of mineralisation. This exploration may eventually lead to an application for a mineral development licence or mining lease, which can be granted for a period of up to five years and can be renewed.

Mining royalties represent a payment to the state for the right of use of the state's mineral resources. Generally royalty is payable when mineral is sold, disposed of or used. The rates of royalty payable on minerals are determined in accordance with the Mineral Resources Regulation 2003 (Qld). The current royalty to the Queensland government on gold sold is 5.0 %.

The mine area is located within mining leases ML 1639, ML 1379, ML1574, ML 1380, ML 1416, ML 1417, ML 1337, ML 1574, ML 1640, ML 1682, ML1692, ML1753, ML10170, ML10237, ML 1418 and ML 1394 held by Carpentaria Gold. ML 10237 may require extension to relocate part of the existing Mt Wright haul road. ML1753 covers the existing camp.

Carpentaria Gold also holds exploration permits for minerals (EPM) around the existing mine area, namely EPM's 14778, 15098, 15099 as shown on Figure 3.

### **1.4 Project Investment and Significance**

The expansion project will contribute approximately A\$72 m in capital expenditure to the local economy and additional ongoing operational expenditure on the goods and services for the additional twelve year mine life. The project presently has a positive pre-tax net present value.

The resource estimate is of the order of 1.5 M ounces.

The project will result in a significant upgrade in mine infrastructure and is expected to bring significant economic benefit to Ravenswood and the regional economy.

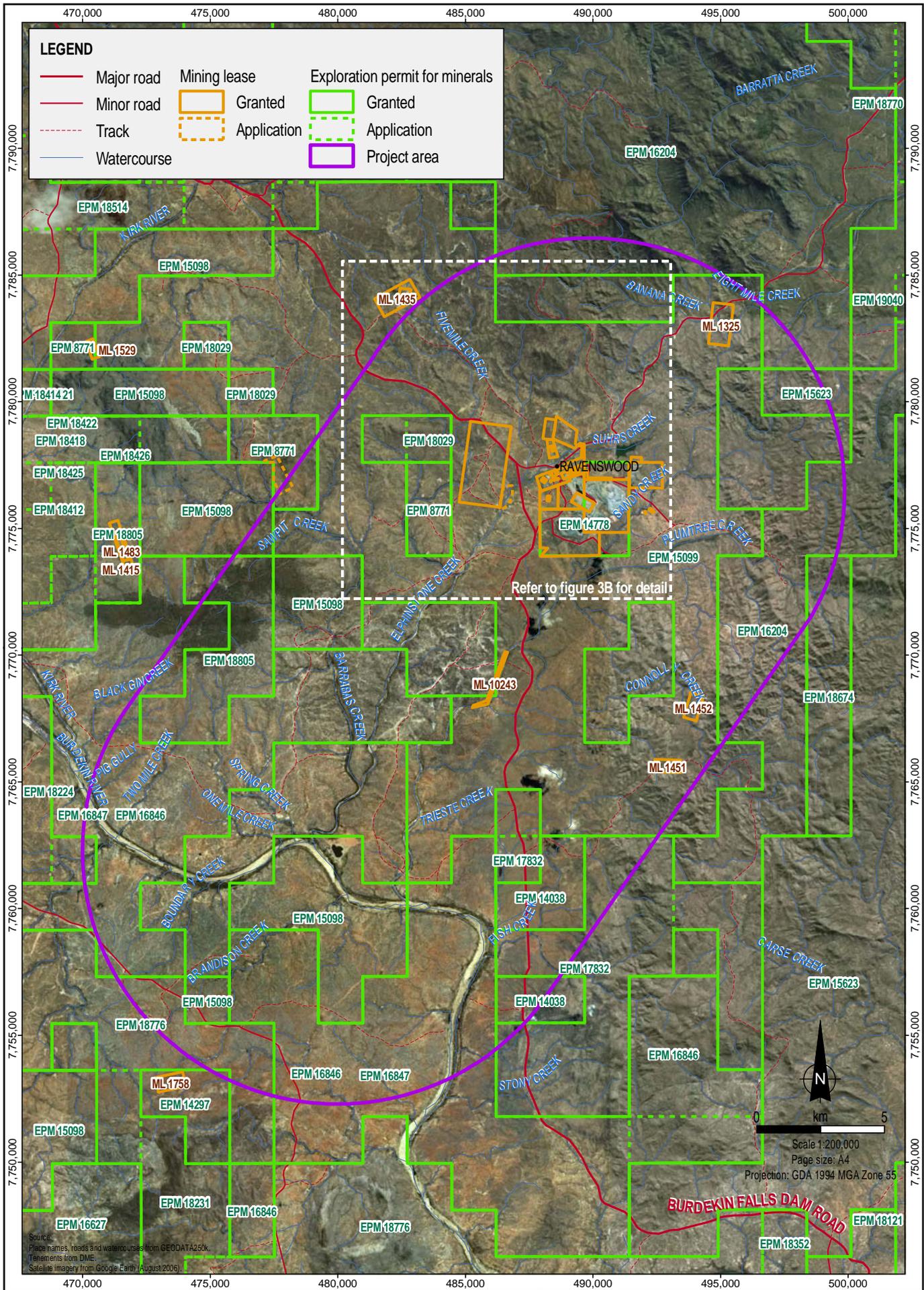
Carpentaria Gold's mining and processing operations are becoming a popular exhibition for the tourist that visit Ravenswood. A public viewing platform has

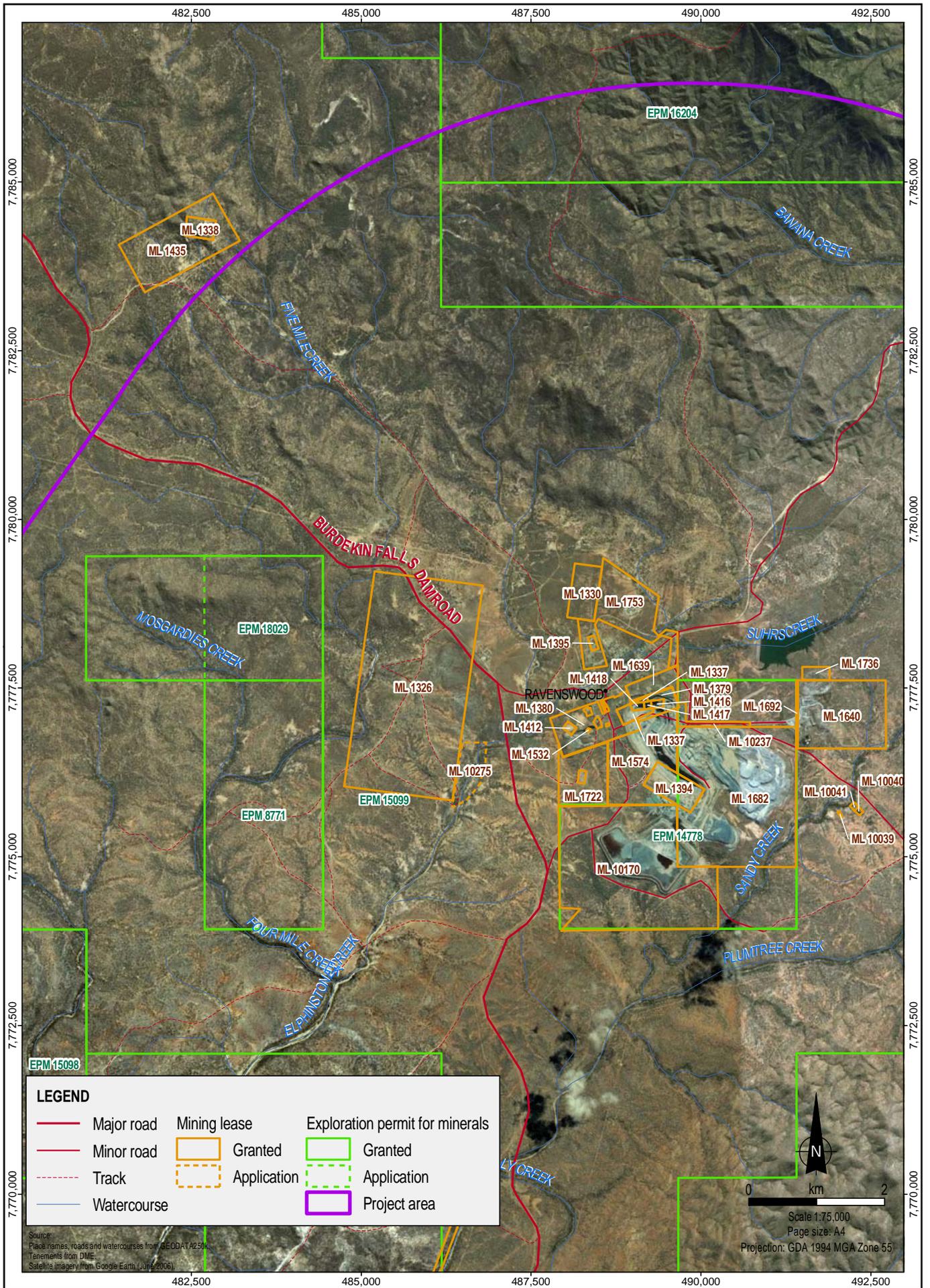
been built to give members of the public a better view of the mining operations. Carpentaria Gold plays a major role in the township of Ravenswood and the wider community. Direct and indirect job creation, regional stability and domestic productivity are key areas of benefit resultant from this project. In addition, Carpentaria Gold plays an integral role in enhancing regional community life through involvement and sponsorship of groups including:

- Ravenswood Restoration and Preservation Association.
- Landcare.
- Local schools, sporting groups, research, student development.

A major benefit to the town is the provision of 24 hour emergency medical assistance by nursing/paramedic staff employed by Carpentaria Gold and is provided as a service to the community.

Carpentaria Gold also sponsor monthly visits by the Royal Flying Doctor Service (RFDS) and maintain facilities for the emergency helicopter evacuations for the wider community.





## **2. DESCRIPTION OF EXISTING ENVIRONMENT**

### **2.1 Environmentally Sensitive Areas**

The district of Ravenswood is located in the southeastern corner of the Broken River Province in the Einsleigh Uplands Bio-Region. The bio-region is bordered to the east by the Wet Tropics, to the north by Cape York Peninsula, to the west by the Gulf Plains, and to the south by the Mitchell Grass Downs, Desert Uplands and Brigalow Belt Bio-regions. The Einsleigh Uplands Bio-Region consists of ranges and plateaux varying in elevation from 100 metres in the west to 1100 metres in the east. The upper catchments of the Flinders, Burdekin, Herbert, Barron, Normandy, Mitchell and Gilbert Rivers are within the bio-region. Regional landforms vary from gently undulating plains adjacent to the Burdekin River to the relatively steep escarpment of the Leichhardt Range to the northeast and east of Ravenswood. The town of Ravenswood lies on Elphinstone Creek, a minor tributary of the regional drainage system.

Figure 4 shows the places on the Register of National Estate:

- Ravenswood Environmental Park (natural).
- Barrabas Scrub (natural).
- Ravenswood Township (historic).
- Trolley Mine Area (historic).

In addition, White Blow Conservation Park is located several kilometres from the existing pit and no mining activities are proposed in or immediately adjacent to this conservation park. No nationally important wetlands, regional forest agreements, critical habitats or Commonwealth Reserves were identified.

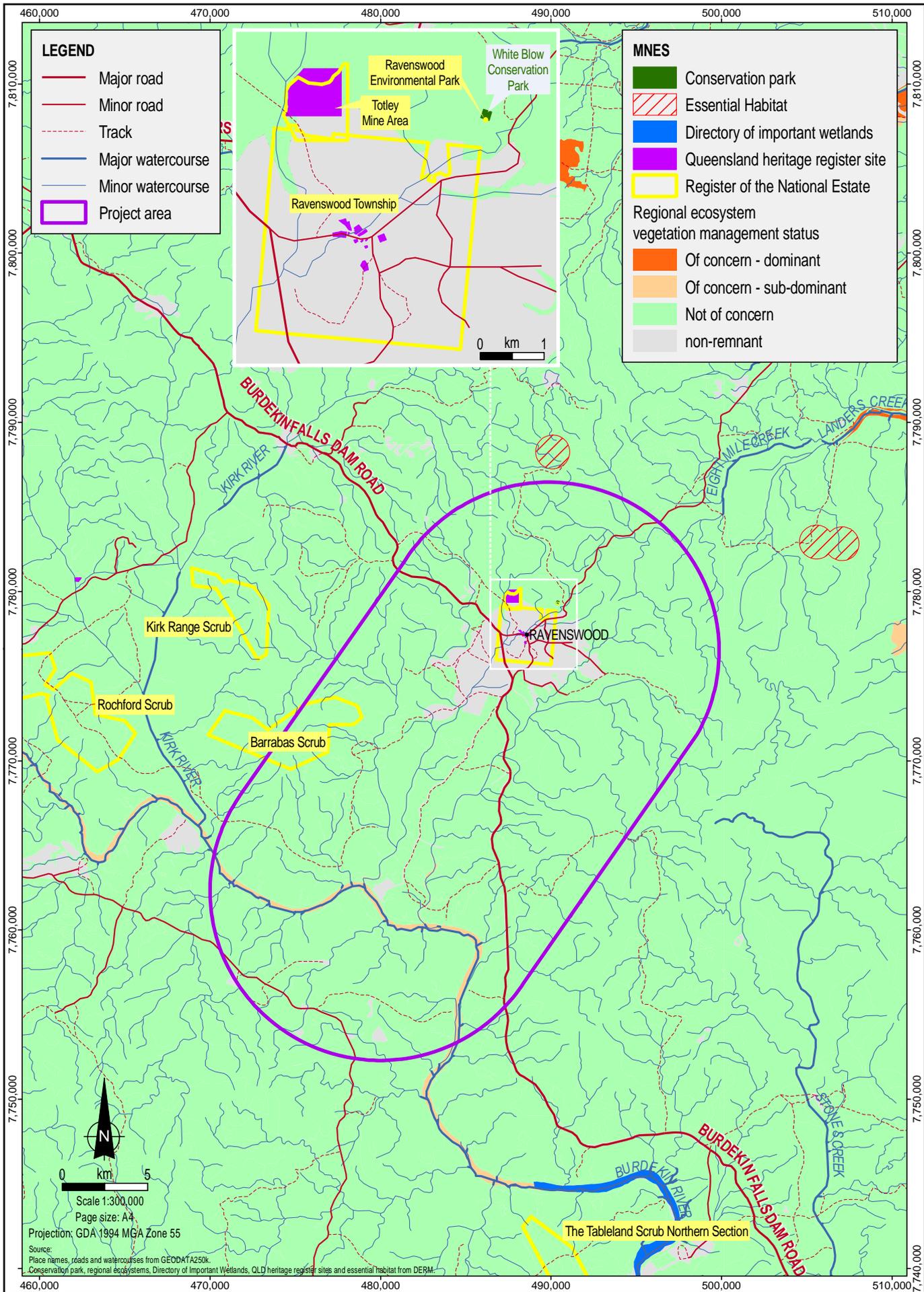
### **2.2 Regional climate**

The Ravenswood area is in the tropical sub-humid climatic zone with a distinct hot wet summer and warm dry winter. Although rainfall records for Ravenswood go back to 1871, a more or less continuous record exists since 1887. The average annual rainfall for Ravenswood is about 714 millimetres with about two thirds of this occurring from December to March, with July to October being the driest period. The main rain influence is derived from moist on-shore northeasterly trade winds during the mid to late summer period. Storms can be common during the early summer due to the influence of the monsoon while cyclones moving inland from the coast can cause heavy rainfall in summer. Rainfall variability is high.

The average annual evaporation rate of 2906 millimetres is well in excess of annual rainfall, with evaporation also exceeding rainfall in every month of the year. The mean daily maximum temperature varies between 24.4<sup>0</sup>C - 34.3<sup>0</sup>C and minimum temperature range from 10.5<sup>0</sup>C -21.8<sup>0</sup>C recorded at Charters Towers, the closest temperature recording station to Ravenswood. Due to geographical

proximity, the two towns are considered to experience very similar climatic conditions.

Wind records for Charters Towers have been summarised into wind roses for the months of February, May, August and November based on 30 years of data. The data shows that wind directions are predominantly from the north to east sectors.



**LEGEND**

- Major road
- - - Minor road
- - - - - Track
- Major watercourse
- - - Minor watercourse
- Project area

**MNES**

- Conservation park
- Essential Habitat
- Directory of important wetlands
- Queensland heritage register site
- Register of the National Estate

Regional ecosystem vegetation management status

- Of concern - dominant
- Of concern - sub-dominant
- Not of concern
- non-remnant

Scale 1:300,000  
Page size: A4

Projection: GDA 1994 MGA Zone 55

Source:  
Place names, roads and watercourses from GEODATA250k.  
Conservation park, regional ecosystems, Directory of Important Wetlands, QLD heritage register sites and essential habitat from DERM.

## 2.3 Current land use activities

The natural vegetation of the Ravenswood area, including the mining leases, has been significantly modified by historic mining and pastoral activities. Extensive clearing and overgrazing by cattle and goats has resulted in extensive woody weed infestations of Chinese Apple, Rubber Vine, Lantana as well as some Prickly Acacia. The landscape also exhibits significant areas bare of vegetation with severe sheet and gully erosion.

The Ravenswood district is primarily low intensity cattle and goat grazing. Historically, gold mining has been the major focus of land use in the Ravenswood area. Recreational and cultural heritage tourism provided by the historic mine workings and township are also becoming of significant activity in the Ravenswood area.

Carpentaria Gold's Ravenswood mining and processing operations commenced in October 1987, with the establishment of a processing facility at the Sandy Creek site (MLs 1640, 1692 and 1736), 4 km to the east of Ravenswood. Since then, eight open cut pits and five underground mines have been worked, which have provided ore feed to both the Carbon-in-Pulp (CIP) plant and a Heap Leach plant at Sandy Creek. In 1997, the Sandy Creek plant was decommissioned and in 1998 it was removed and the site rehabilitated. The operations were expanded in October 1995, with construction of the Nolans Processing Facility and administration complex, due to the processing of ore from the Nolans Pit (ML 1394). Open-cut mining at the Nolans Pit was completed in 2005. In July 2000 mining recommenced in the Sarsfield area (ML 1574, 1337, 1379, 1380, 1416, 1417 and 1418), as part of the Sarsfield Project. Mining in the Sarsfield area was last undertaken in the period 1987 to 1991, when the OCA, SYC, Area 3, Area 4 and Area 5 Pits were operated and these pits have now been consumed by the Sarsfield Pit. Mining from the Sarsfield Pit has produced ore for the Ravenswood Processing Plant at Nolans. The majority of waste rock from the Sarsfield Pit was put into the Sarsfield Waste Rock Dump (ML 1682), since the start of 2006 waste rock was dumped into the Nolans Pit. The Sarsfield Pit was completed in early February 2009. Mining took place at Buck Reef (Area 2) Underground Mine between January 2003 and 2006.

In February 2005, underground mining started at Nolans North, as an underground extension of the mined out Nolans Pit. Mining of Nolans North ceased in early 2006.

Underground mining recommenced at Mount Wright in 2006. All underground ore is processed through the Nolans processing facility.

Historically between 1868 and 1917, there has been considerable disturbance of the land surface around Ravenswood associated with the early gold mining activities and town growth. For two to three kilometres around Ravenswood, much of the native vegetation was removed during this time for fuel, mining ground support and infrastructure. Also, the area around the Ravenswood

Township and surrounding area bears numerous abandoned shafts, mullock heaps and gold workings.

The landscape in which the recent mining activity has taken place is significantly degraded by previous mining activity at the turn of the century. Noxious woody weeds are characteristic in these areas, although the surrounding area is dominated by grazed low open eucalypt woodland.

## **2.4 Geology**

The Ravenswood Goldfield lies in the eastern portion of the Ravenswood Batholith (6,000 km<sup>2</sup> in area) which is dominated by early Ordovician to early Permian (500 - 260 Myr) granitoids of the Ravenswood Granodiorite Complex. Shear zones are common throughout the Ravenswood Batholith.

The Ravenswood gold deposits are found within the Jessops Creek Tonalite (quartz diorite) and were formed about 320 million years ago, in the Carboniferous Period. Hot, mineralising fluids have concentrated the gold, in mainly pyrite veins and fractures, with minor amounts of quartz, calcite and other sulphides. Faults and shear zones in the area appear to constrain the known gold mineralisation.

The regional structure is dominated by north west (NW) to north north west (NNW) trending faults, which are essentially transfer faults perpendicular to the basin margins. The Sarsfield and Nolans gold deposits are located within and around the junction of three prominent fault systems in the southern part of the Ravenswood goldfield. Weathering over the known mineral deposits persists to an average of 15 m below surface. Supergene effects are restricted to a discontinuous horizon within a partially oxidised zone, less than 5 m thick.

## **2.5 Hydrogeology and groundwater**

There are no significant groundwater aquifers in the Ravenswood area due to the geology, with only small supplies obtained from bores and wells on the banks of creeks. Past attempts to locate supplies from deep bores (up to 150 metres) have been unsuccessful and this is supported by the fact that the early underground mines could be worked to many hundreds of metres below surface without significant dewatering problems.

Ravenswood is located on the Ravenswood Granodiorite Complex, being made up of tonalite, a form of granite. Tonalite is extremely hard and has a very low porosity and permeability resulting in a very low capacity to hold water, hence the majority of the groundwater is contained in the shallow weathered zone and in the thin joints and fracture zones within the tonalite.

## **2.6 Surface water and drainage**

The majority of Carpentaria Gold mining operations at Ravenswood lies within the catchment of Sandy Creek, located to the south of the Nolans and Sarsfield

expansion project. Elphinstone Creek is located to the north of the mining operations and drains the town of Ravenswood as well as the old SYC, OCA and Buck Reef Waste Rock Dump areas and historic mining and processing sites.

Elphinstone and Sandy Creeks each have a catchment area of about 20 km<sup>2</sup> above the area of existing and proposed mining operations and both creeks flow into the Burdekin River approximately 18 km downstream from Ravenswood (Elphinstone Creek directly and Sandy Creek via Plumwood and Connolly Creeks). The Burdekin River flows into the Burdekin Dam whose ponded area is about 15 km downstream of the Elphinstone and Connolly Creek junctions.

Elphinstone and Sandy Creeks are ephemeral streams that generally maintain a low continuous flow during the wet season, except when significant rain events cause a relatively rapid rise and fall in the stream levels. During the dry season flow in these creeks usually retreats to sub-surface flows in the sandy alluvial aquifer, although water holes persist at some locations.

## **2.7 Soils and land suitability**

The main soil type identified for the Ravenswood area being a neutral red duplex soil. These duplex soils were described as having a red, strongly structured clay subsoil overlain by slightly acid loamy surface soil, commonly hard-setting and without a pale A2 horizon. The subsoil is generally neutral to mildly alkaline. The soils are moderately well drained with a low available soil water capacity. Fertility and soluble salt content were noted as generally low while the potential for erosion is considered to be high. Topsoil coverage and depth within the lease areas is variable due to the extensive erosion that has occurred, particularly in the steeper areas of the terrain and around the drainage lines. Soil sampling and analyses has shown that there is no significant constraints to using the topsoils or weathered overburden in the lease areas for rehabilitation of mined areas given appropriate establishment, revegetation and management procedures.

Using the land class criteria detailed in the Division of Lands Technical Bulletin Number 14, the majority of the Carpentaria Gold's operational lease areas occur within the Classes VII and VIII land types, although there are limited areas of Class VI. These classes can be summarised as follows:

- Class VI Land, which is not suitable for cultivation but is well suited to pastoral use and on which pastoral improvement involving the use of machinery is practicable. Class VII Land, which is not suitable for cultivation but on which pastoral use is possible only with careful management. Pastoral improvement involving the use of machinery is not practicable.
- Class VIII Land, which has such severe limitations that it is unsuited for either cultivation or grazing.

Although the land class system outlined above has been used extensively to define the capability of the land and hence determine the success of minesite rehabilitation, there has not been full agreement on this system. In 1996,

Carpentaria Gold recognised that the question of demonstrable rehabilitation success was a significant environmental issue confronting the mining industry and consequently contributed to the AMIRA Research Project “Indicators of Ecosystem Rehabilitation Success and Benchmark Sites” undertaken by the CSIRO. The CSIRO have refined their Landscape Functional Analysis model and this new methodology has been adopted by Carpentaria Gold to assess revegetation success.

## 2.8 Terrestrial ecology

Fauna and flora surveys were conducted for the 1989 Impact Assessment Study and in 1997 by Woodward-Clyde for the Mount Wright, Southern Tailings Dam, Sarsfield Waste Rock Dump and Connolly Creek Dam areas. Since 1999, there have been twice yearly flora surveys conducted in the Ravenswood area as part of Carpentaria Gold’s native seed collection activities. As a result of the conducted flora surveys, a definitive plant list has been assembled and an onsite plant herbarium established.

The Ravenswood district is located in the southeastern corner of the Broken River Province of the Eidsleigh Uplands Bio-Region, although it is highly disturbed landscape with natural ecosystems having been severely impacted by extensive clearing, weed invasion and soil erosion. Past broad scale vegetation mapping of the Burdekin-Townsville Region indicated that the Ravenswood district is situated within a large expanse of Narrow-leaved ironbark Open Woodland (*Eucalyptus drepanophylla* - *Eucalyptus dichromophloia*, although recent research indicates the species being *Eucalyptus crebra* and *Corymbia erythrophloia*).

The Narrow-leaved Ironbark Open woodland occurs on a variety of landforms, ranging from undulating plains to high hills. Locally, the community may grade into woodland where *Eucalyptus papuana* is the most common and constant associated species, although in some less well drained sites *Eucalyptus brownii* and occasionally *Eucalyptus alba* may occur. On some more stoney sites, small areas of *Eucalyptus shirleyi* low-open woodlands are associated.

A shrub layer is normally absent and the ground flora is dominated by *Heteropogon contortus*, *Bothriochloa ewartiana* and *Themeda australis*, each of which may vary locally in dominance. *Aristida pruinosa* and *Aristida armata* may be locally prominent in overgrazed areas.

The Bio-region contains a number of protected areas; Bulleringa National Park (54,000 ha), Chillagoe-Mingana Caves National Park (1,870 ha), Dalrymple National Park (1,640 ha), Forty Mile Scrub National Park (6,180 ha), Great Basalt Wall National Park (35,200 ha), Hann Tableland National Park (4,839 ha), part of Lumholz National Park (125,000 ha) and Porcupine Gorge National Park (61,000 ha). It also contains the Palmer River Goldfields Resources Reserve (16,200 ha).

Fauna and flora studies indicate that there are no species that are of significant conservation value. The presence of the southern race of the Squatter pigeon

(*Geophaps scripta var scripta*), although listed as Vulnerable under the Nature Conservation (Wildlife) Regulation 1994, is only a northerly extension of its distribution from central NSW to central Queensland.

There are no rare or endangered species or unusual association of flora present on the Carpentaria Gold leases.

For a number of kilometres around Ravenswood, much of the native vegetation was removed for fuel during the late 1800's. This created ideal conditions for the establishment of Chinese Apple (*Ziziphus mauritiana*), a plant introduced by the Chinese miners as a food source and is an aggressive coloniser. Rubber vine (*Cryptostegia grandiflora*), which was favoured as a garden ornamental of the time due to its ability to adapt to harsh conditions, was also introduced to the Ravenswood area and now dominates most of the ephemeral streams in the area. The recent introduction of a "rust" as a biological control for Rubber vine has seen an increase in Lantana (*Lantana camara*), replacing some areas of Rubber vine.

The grazing effects of feral goats and to a lesser extent cattle, feral pigs and horses are, significantly hampering the establishment of native vegetation. Carpentaria Gold continues to implement the Plan of Operations EPRO-012 Weed Management Plan.

## 2.9 Freshwater ecology

The principles of the site water management strategy is to establish a twofold drainage scheme, such that clean water can be discharged directly into the natural environment and unacceptable water can be collected and used in the processing plant or disposed of by evaporation.

Control strategies to minimise the release of contaminated water from the lease areas include:

- Seepage collection trenches.
- Pump back systems from trenches and creeks.
- Use of tailings decant system.
- Collection ponds.
- Use of thickened tailings.
- Segregation of clean and dirty water.
- Chemical treatment.

A collection dam has been constructed to contain all runoff from the Ravenswood Processing Area. Seepage from the Nolans Tailings dam is the most significant potential impact on water. The existing operations have been undertaken under an approved Environmental Management Plan (EMP) under the *Environmental Protection Act 1994* (Qld). The EMP will be updated for the expansion project.

Investigations have been undertaken into the geochemical aspects of the tailings, impact on downstream flora and the long term risks. Seepage collection trenches

have been installed with a pump back-system to the processing area for recycling. The water use is minimised in the process circuit whereby tailings are put through a thickener to raise the solids content. Tailings supernatant water from the tailings dam and tailings dam seepage water is recycled through the process plant.

The main way to reduce the impact of sediment in runoff is to intercept the sediment prior to entry to a watercourse. Sediment traps will be constructed to intercept runoff from disturbed areas where the potential impact is considered high. Sediment traps will be maintained to ensure that they are in working order and will be cleaned out when required.

These measures in combination minimise impact on the freshwater ecology within the surrounding creeks and waterbodies. A full fresh water ecology and water quality survey will be conducted to establish a baseline river and creek system health. Both a wet and dry season survey will be undertaken to capture any variability in seasonality.

## **2.10 Noise and vibration**

The community of Ravenswood is set in a rural environment with the main sources of noise being local traffic and the mining and processing activities. Carpentaria Gold is aware of the close proximity of the operations to the town. There are ongoing investigations to further reduce or prevent noise, particularly from further mining of the Sarsfield Pit e.g., relocation of part of the acoustic bund.

Potential additional control strategies to minimise noise are:

- Sarsfield Crusher has been inset into the hill and partly underground.
- Additional noise suppression equipment on haul trucks.
- Use of smart alarms and strobe lights for reversing of equipment.
- Radio communication for reversing and load completion instead of using horns.
- Day shift mining only while working within 15 metres of the natural surface.
- Rock-breaking undertaken during the day time and up to 9 pm. at night.

Carpentaria Gold will take reasonable measures to ensure that noise emanating from mining activities during the expansion project do not cause environmental harm and complies with limits set out in existing Environmental Authority conditions.

Ravenswood mining operations has the potential to generate airblast overpressure and blast vibration from its blasting activities in the Sarsfield Pit. Excessive airblast overpressure can damage buildings through the generation of pressure waves in the air, which can shake window panes. Excessive ground

vibration generated from blasting can result in damage to foundations and walls. The historical nature of many of the buildings in the Ravenswood area suggests that some may be susceptible to damage from excessive airblast overpressure and vibration. Carpentaria Gold has implemented a series of initiatives to ensure that any potential for damage is minimised. These initiatives include:

- Slowing the blast initiation system by increasing the delay time can decrease the airblast overpressure.
- Changing the shape of the blasts to long narrow blasts orientated east-west and initiated from the corner nearest the closest residence, again projecting airblast overpressure and vibration away from the town.
- Monitoring will be undertaken in accordance with AS 1055.1-1997 and AS 1055.2-1997. There are four permanent blasting monitors located around the Sarsfield Pit and two portable monitors are used for investigations and coverage for routine calibration testing.

Several changes have been made to the monitoring program as a result of continuous review to increase the accuracy and amount of data collected, these include:

- The level at which the blast monitors are triggered has been increased to minimise nuisance triggering, which was being caused by the wind and vehicle traffic. This minimises blasts not being recorded as the monitors cannot record and monitor at the same time.
- A fourth permanent station was installed to increase coverage to the north of the Sarsfield Pit.
- Weather conditions at the time of blasting are now recorded to enable consideration of meteorological effects on the level of airblast overpressure recorded.
- Blasts are monitored for noise emissions to give better assessment of what the community actually hears (comparing dB(Lin) with dBA).

The airblast overpressure nuisance will not be more than 120 dB (linear) peak for nine out of any ten consecutive blasts initiated regardless of the interval between blasts, with the following vibration limits

- 25 mm/s particle velocity for vibrations of more than 35 Hz.
- 10 mm/s peak particle velocity for vibrations equal to or less than 35 Hz.

Each blast will be monitored for airblast overpressure and ground vibration for the expansion project.

Blasting will be only conducted during daylight hours for the expansion project. Current projections propose a blasting time between 4 pm and 6 pm. All blasts over 120 dB(Lin) and/or a ground vibration of 10 mm/s at a sensitive place will be

regarded as environmental incidents and investigated to minimise future occurrence of the excess emission for the expansion project.

## **2.11 Air quality**

The regional airshed is of moderate quality with relatively few sources of emissions to the atmosphere. The main emission being fugitive dust due to the variable climate, highly disturbed and eroded land around Ravenswood and frequently trafficked unsealed roads. Environmental dust monitoring, carried out by Carpentaria Gold using the gravimetric method (as per Australian Standard AS3580.10.1), shows that ambient dust deposition rates are highly variable throughout the year and from year to year.

Dust generation from the operation is minimised by regular watering of roads, progressive revegetation, water sprays within crushing circuits, vehicle speed restrictions and the use of dust suppressants, where practicable. Since mining the Sarsfield Pit, dust from the Nolans Tailings Dam has not been a significant issue due to depositional practises keeping the tailings bed wet. Twenty seven dust monitoring stations are currently operational.

Carpentaria Gold will take reasonable measures to ensure that dust levels emanating from mining activities during the expansion project does not cause environmental harm and complies with limits set out in existing Environmental Authority conditions.

Regionally, smoke is generated on a regular basis by pastoralists burning off to promote new growth pasture, the Rural Fire Brigade burning off under prescribed burning practices and accidental fires.

Due to the dominance in land use being rural activities and grazing, background emissions of greenhouse gases are limited and are not expected to be significant.

## **2.12 Cultural heritage**

### **2.12.1 Indigenous cultural heritage**

In contrast to European heritage evidence in the Ravenswood area, indigenous occupational evidence is very scarce. This has been suggested to be due to low density occupational levels associated with the more arid conditions compared with the coast and along the Burdekin River.

Research on linguistic and/or clan territorial boundaries produced by Tindale (1974) suggests that a number of indigenous communities are affiliated with the Ravenswood area, those being the Kudjala, Jangga and Warungu. There has been some research, which suggests that the Kudjala were the main group affiliated with the Ravenswood area.

In late 1997, a native title land claim was registered over the Ravenswood area as part of a much larger area approximately bordered by the towns of Mingela,

Charters Towers, Belyando Crossing, Moranbah and Mackay. The title claimants are the Wiri/Yuwiburra/Juangga Birria people, with the claim usually referred to as the Birri Gubba Land Claim. The Kudjala, based in Charters Towers, registered an interested party claim.

Prior to 1989, there were only two recorded indigenous artefacts located on the Carpentaria Gold leases.

In 1997, an archaeological survey was conducted in the Connolly Creek (potential water storage dam site) and Teatree Creek (Sarsfield Waste Rock Dump site) areas by representatives of the Birri Gubba and Kudjala peoples. The survey revealed only isolated finds and low density artefact scatters, which were amenable to salvage.

In 2002, surveys conducted in the areas to be disturbed by the construction of the Suhrs Creek and Burdekin Turkey Nest dams revealed only isolated finds and low density artefact scatters which were amenable to salvage.

The *Aboriginal Cultural Heritage Act 2003* (Qld) places a duty of care on proponents, which includes consultation with relevant Aboriginal parties.

The cultural heritage assessment process involves:

- Detailed consultation with the relevant Aboriginal stakeholders.
- Systematic archaeological field surveys of developmental impact areas in conjunction with Aboriginal representatives.
- Preparation of a cultural heritage report on the results and recommendations of archaeological field surveys and Traditional Owner consultation.
- Preparation of a Cultural Heritage Management Plan (CHMP), in parallel with the EIS.

Identification of indigenous stakeholders and interest groups is a crucial first step in undertaking any cultural heritage investigations for the project. Sections 34 to 37 of the Act define a 'Native Title party', an 'Aboriginal party' and an 'Aboriginal Cultural Heritage Body'.

Where an EIS is triggered for the project, section 87 of the Act requires a CHMP to be prepared in parallel with the EIS. The CHMP should include appropriate and effective mechanisms for the protection and management of identified and potentially existing cultural heritage sites and values.

A cultural heritage assessment will be undertaken for the project site in accordance with *Aboriginal Cultural Heritage Act 2003* (Qld).

### **2.12.2 Non-indigenous cultural heritage**

Gold mining operations have been carried out in Ravenswood since the discovery of the mineral field in 1868 and is a town with a rich mining history, although many of the historic buildings and relics have been destroyed, removed

or have gradually decayed to ruins. Although still present and indicative of the heritage of that era, there are a number of buildings, associated infrastructure and mining artefacts scattered throughout the Ravenswood township and environs.

The closest town to the project is the historic gold mining town of Ravenswood, situated approximately 1 km to the south-east of the project area. Both alluvial and reef gold was discovered at Ravenswood in 1868 and the centre rapidly became the largest inland town in Queensland. By late 1871 the easily won gold had been exhausted and deeper mining was needed. The deeper ores were found to be rich in sulphides which made extraction of the gold difficult. This mundic ore turned many miners away and when gold was discovered at Charters Towers in 1872 an exodus began. Only a few miners remained at Ravenswood, while Charters Towers boomed to be Queensland's second city. A method of extracting the gold was discovered in 1897 and this led to another boom that lasted until 1903.

Ravenswood contains a number of state heritage listed buildings and structures, and has an established and active heritage committee. The Ravenswood community currently supports two historic hotels in town.

In Queensland, both Commonwealth and State legislation protects non-indigenous heritage sites. The legislation mainly considers sites of National or State significance. State legislation also provides protection for sites of local significance, placing obligations on the Charters Towers Regional Council to consider these sites in their planning schemes (sections 112 and 113).

The key legislation will be the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) as regulated by DSEWPC, and the *Queensland Heritage Act 1992* (Qld) as administered by DERM.

A cultural heritage assessment, including desktop assessment and survey will be undertaken for the project in accordance with the Burra Charter (cultural heritage guidelines), having regard to and complementing the following completed studies:

- Review and Repair Recommendations for Historic Structures (Ravenswood) (Osborn, 1990).
- Heritage Management at Ravenswood: Some Preliminary Observations (Gordon Grimwade & Associates, 1996).
- Cultural Heritage Reconnaissance Surveys of Five Areas near Ravenswood (Gordon Grimwade & Associates, 1996).
- Baseline Study for the Historic Buildings in Ravenswood (SKM, 1998).
- Cultural Heritage Reconnaissance: Area 2, Ravenswood (Gordon Grimwade & Associates, 1998).
- Heritage Reconnaissance: Bailey's Prospect, Ravenswood (Gordon Grimwade & Associates, 1998).

- Sarsfield Project Heritage Issues - Sarsfield Pit, Penna Residence & Proposed Drill Sites in Town Area Ravenswood (Gordon Grimwade & Associates, 2000).
- Ravenswood Conservation Management Plan (Bell, 2000).
- Heritage Assessment Proposed New Dam Sites: Suhrs Creek & Burdekin River Ravenswood (Gordon Grimwade & Associates, 2001).
- Cultural Heritage Reconnaissance: Donnybrook Lease Area, Ravenswood (Gordon Grimwade & Associates, 2002).
- Cultural Heritage Assessment Donnybrook Area Ravenswood (Gordon Grimwade & Associates, 2002).
- Cultural Heritage Assessment Mt Wright Lease Area (Gordon Grimwade & Associates, 2002).
- Visual Structural Assessment of Brick Chimneys in Ravenswood (Qantec McWilliam, 2003).
- Visual Structural Assessment of Imperial Hotel, Ravenswood (Qantec McWilliam, 2003)
- Heritage Action Plan - Ravenswood Heritage Area (Ravenswood Heritage Advisory Committee, 2004).
- Visual Structural Assessment of Imperial Hotel, Ravenswood (Qantec McWilliam, 2006).

The Ravenswood sites on the Queensland Heritage Register are identified in Table 1.

**Table 1 Queensland Heritage Register Ravenswood listed sites**

<b>QHR Ref No.</b>	<b>Site Name</b>	<b>Address</b>	<b>Status</b>
600443	Railway Hotel	Barton St, Ravenswood	Ongoing maintenance and repairs required.
600444	Roman Catholic Convent	Chapel St, Ravenswood	Removed, some foundations left.
600445	Ambulance Building	Deighton St, Ravenswood	Restored.
600446	Imperial Hotel	Macrossan St, Ravenswood	Ongoing maintenance and repairs required.
600447	Post Office and Residence	Macrossan St, Ravenswood	Satisfactory.
600448	Butchers Shop	Macrossan St, Ravenswood	Removed, some foundations left.
600449	Shop adjacent to School of Arts Library	Macrossan St, Ravenswood	Barbara McGrath's shop.

**Table 1 Queensland Heritage Register Ravenswood listed sites (cont'd)**

QHR Ref No.	Site Name	Address	Status
600450	School of Arts Library	Macrossan St, Ravenswood	Removed, some foundations left.
600451	Browne's Building - Hotel adjacent to the Imperial Hotel	Macrossan St, Ravenswood	Removed, some foundations left.
600452	Thorp's Building	Macrossan St, Ravenswood	Ongoing maintenance and repairs required.
600453	School of Arts Hall	Macrossan St, Ravenswood	Restored.
600454	Shop adjacent to Thorp's Building	Macrossan St, Ravenswood	Ongoing maintenance and repairs required.
600455	School Residence	School St, Ravenswood	Satisfactory.
600456	Mine Manager's Residence	School St, Ravenswood	Removed, some foundations left.
600457	Totley Township	Ravenswood	Removed, some foundations left.
601204	Court House Group of Buildings	Raven St, Ravenswood	Restored.
601206	Mabel Mill	Barton St, Ravenswood	Partly removed with some machinery and foundations left.
601207	London North Mine	Elphinstone St, Ravenswood	Headframe in need of repair.

Blasting and open pit mining activities will move closer to the historic town of Ravenswood which is made up off timber and tin, and brick facade buildings and other structures. A further cultural heritage study (i.e., desktop review of the abovementioned studies, and further supplementary field work) and selective structural assessments will be undertaken as part of the voluntary EIS to assess the significance of impacts on heritage values and identify mitigation measures.

## 2.13 Native Title

The *Native Title (Queensland) Act 1993* (Qld) confirms Queensland's existing ownership of any natural resources. The National Native Title Tribunal (NNTT) is the body that rules on disputes between mining tenement applicants and native title parties. The Queensland Government is liable for any compensation payable as a result of validation of past acts (before 1 January 1994) or intermediate period acts (between 1 January 1994 and 23 December 1996), and the past extinguishment of native title. The Scoping Study (RML, 2011) advises that the Ravenswood MLs are not subject to native title, having been granted prior to 23 December 1996.

In 1998 the Birri People lodged a native title claim QC98/12 (Federal Court file number QUD6244/1998) across an area of 14,900 km<sup>2</sup> that was accepted by the NNTT on 7 February 2000.

During 2005-2006 a Native Title agreement was reached with the Birri People with respect to compensation for MLA10237. The lease was required for waste rock only and contains no known gold mineralisation. On 26 September 2006 an overlapping Native Title claim (Kudjala#2) was dismissed because the Applicants failed to amend their claims to resolve the overlaps.

## **2.14 Landscape and Visual Amenity**

The district of Ravenswood is located in the southeastern corner of the Broken River Province of the Einsleigh Uplands Bio-Region. The bio-region is bordered to the east by the Wet Tropics, to the north by Cape York Peninsula, to the west by the Gulf Plains, and to the south by the Mitchell Grass Downs, Desert Uplands and Brigalow Belt Bio-regions. The Einsleigh Uplands Bio-Region consists of ranges and plateaux varying in elevation from 100 metres in the west to 1100 metres in the east. The upper catchments of the Flinders, Burdekin, Herbert, Barron, Normandy, Mitchell and Gilbert Rivers are within the bio-region. Regional landforms vary from gently undulating plains adjacent to the Burdekin River to the relatively steep escarpment of the Leichhardt Range to the northeast and east of Ravenswood. The town of Ravenswood lies on Elphinstone Creek, a minor tributary of the regional drainage system.

Historic waste rock dumps located within the town of Ravenswood consist of flat topped rock dumps approximately 5 m high with slope angles of approximately 1:1.5.

The Buck Reef open pit (undergoing rehabilitation), the Sarsfield and Nolans pits, Suhrs Creek raw water dam, tailings storage facility (undergoing progressive rehabilitation), and Sandy Creek heap leach pad (also undergoing progressive rehabilitation) are all dominant landscape features associated with the other historic mining activities located in a rural grazing backdrop.

## **2.15 Socio-economic**

All elements of the project are located in the Charters Towers Regional Council area.

Ravenswood contains a number of heritage listed buildings and structures, and has an established and active heritage committee. Ravenswood supports two hotels in town. The town's economy relies heavily on the neighbouring gold mine. Currently twenty to twenty-five Carpentaria Gold employees live within the township, some in company owned residences. Carpentaria Gold operates a rental subsidy program. The Australian Bureau of Statistics collector district includes approximately 320 people, inclusive of outstations. The broader area surrounding the project generally supports broad-acre activities such as grazing.

The project's primary positive impacts on the socio-economic environment would likely be the retention of the current workforce that supports the town's economy for a further 12-year period. There is also likely to be an increase in local employment of up to 30 staff as well as ongoing procurement opportunities. Effects such as a small increase in the town's population are unlikely to result in impacts on local and regional housing markets, access to community services, as well as changes to community values and lifestyles. However, through consultation and engagement with relevant stakeholders, the EIS will examine these impacts and provide recommendations to enhance the benefits of the project and to minimise any potential adverse impacts.

## **2.16 Hazard and Risk**

Potential identified hazards and risks that will be further studied and mitigated include:

- Tailings dam failure.
- Failure of Suhrs Creek raw water dam.
- Pipeline failure e.g., tailings or leach solution.
- Fuel storage tank rupture.
- Cyanide or acid tank rupture / reagent store damage.
- Transport of chemicals to and from site (inadequate storage areas, unsafe packaging, high-risk transportation routes).
- Fly rock from blasting activities.
- Explosions at explosive store.
- Blasting and explosive accidents
- Atmospheric releases, due to inadequate design of plant, failure to follow procedures or non maintained plant.
- Contamination of surface water and ecological impact due to chemical spills or polluted process water discharge.
- Fire (flammable liquids).

### **3. PROPOSED PROJECT ACTIVITIES**

#### **3.1 Mining and Haulage of Deposits**

To achieve the required mill production rates, the project will employ a contractor mining method with the use of either electric or mechanical drive haul trucks, including:

- A 10 m drill and blast bench for all material types with berms placed at 20 m intervals.
- Dual lane pit ramps, 35 metres wide with the ramp gradient designed at 10 percent (1 in 10).
- Hydraulic 250 tonne excavators in excavator configuration will be used as the primary loading units, with a 120 tonne excavator in the fleet for batter trimming, topsoil removal.
- Drilling, loading and hauling operations will be carried out on two 12-hour shifts (night and day), whilst explosive charging and blasting will be carried out on day shift only.
- Direct mining personnel will be employed on a 8 days on - 6 days off, 7 days on - 7 days off roster.
- Grade control sampling will be undertaken utilising the blast hole rig using the reverse circulation package for grade control.

The mining method will involve:

- Drill and blast.
- Loading.
- Hauling.
- Grade control.
- De-watering.
- Ancillary services.
- Crushing and rehandle.
- Waste haulage.

##### **3.1.1 Drill and Blast**

Due to the mill production rates required, large diameter rotary drill rigs were evaluated to take advantage of their lower unit costs. Rigs with a hole diameter ranging from 127 mm to 203 mm were evaluated for use in both waste and ore, with waste ranging from 165 to 187mm and ore from 140 to 165 mm.

Geotechnical and blasting studies will further define the final drilling requirements. Ore will require smaller drill patterns to provide adequate samples for assaying and estimation of production grades. An analysis of the rock mechanical and drilling properties will be required to obtain better estimates of the penetration and bit/steel life.

The drill pattern burden and spacing will be a function of the material type and the powder factor required. The majority of oxide material will be free dig but most of the transitional material and fresh rock will be blasted. The explosive type used will depend on the presence of any ground water. Since all proposed mining involves cutting back an existing pit, it is anticipated that ammonium nitrate fuel oil (ANFO) will be used down to the 250 mRL and then emulsion will be used for the remainder of the pit.

Water on pit floors is anticipated for the lower levels of the pit and it may be necessary to collar pipe each hole. Final-wall control will be maintained via the extensive use of pre-splitting and where appropriate, buffer and trim blasting.

Grade control sampling of all vertical blast holes in the ore zone will be undertaken with two samples per 10 m drill bench. All assay samples will be processed at the Nolans assay laboratory.

### **3.1.2 Loading**

Mining is proposed with a standard shovel and truck fleet. Diesel hydraulic excavators will be used as the primary production loading equipment, and will provide a suitable mixture between bulk mining in waste and more selective mining (smaller benches) in ore. The mining operation is anticipated to utilise 12.0 m<sup>3</sup> to 18.0 m<sup>3</sup> excavators in ore and waste operating on a 10 m bench mining 3 x 3.5 m flitches (including blast heave). Excavator sizes will be further optimised relative to capital investment, production rates, selectivity, dilution and equipment utilisation.

The ore and waste boundaries will be delineated on each flitch with colour coded flagging tape to differentiate the grade of the material and be outlined with paint. The flitch blocks were interpreted using data from exploration, development and grade control drilling and once set out on the mining floor by survey, may be field adjusted based on visual controls. The mining operation will excavate and load the ore and waste in accordance with the marked boundaries. To minimise dilution and maximise ore retrieval, a geologist will be present during mining of all ore.

To minimise dilution further, mining along the ore block strike will be the standard practice and all grading or dozer cleanups will be restricted to along strike in the ore zones.

### **3.1.3 Hauling**

Hauling is one of the major costs in the mining operation. Therefore, the optimum truck size will be critical to reduce the truck numbers and associated manpower requirements. Consequently, larger trucks may be used for this operation. Weather conditions are predominantly dry, but challenging ground water and operating conditions may be encountered near the completion of mining. The fresh rock is hard and competent and will not be prone to wash boarding on the production floors. The main ramp gradient will not exceed 10%, except in the bottom of the pit where a 12% gradient will be used.

### **3.1.4 Grade Control**

Ore will be identified by a detailed blast hole sampling program. 130% of the expected ore zones will be sampled and assayed, to ensure sufficient overlap into adjacent low grade or waste areas to ensure that ore will not be missed. Where sample holes will not be utilised for blasting, drilling costs will be assigned to grade control. Every 5 metres, a composite sample will be taken and assayed using the on site laboratory facility.

### **3.1.5 Pit De-Watering**

All existing water in the pits will be pumped out prior to the commencement of mining operations. A large diameter/high capacity pump and pipeline will be established to remove the water into a decant pond with an approximate area of 20.6 hectares for use in processing, haul road dust suppression, and to facilitate dredging operations. All surface and underground water flow into the pit will be drained to sumps and pumped from the pit on a continuous basis to the water cart turkey's nest or, if needed, to the plant process water dam. The pit run-off and sump water will be used as a first preference for haul road dust suppression due to its assumed relatively high suspended solids content.

A minimal amount of sub-surface water flow is expected to enter the pits due to the operation of perimeter de-watering wells. De-watering of the deposits will be necessary to allow the mining operation to proceed, to eliminate the piezometric pressure behind the pit walls and to reduce wet blasting costs. A ring bore system will be re-installed around both the Sarsfield and Nolans pits. The depth of the bores will, at a minimum, match the depth of the pit floors, so as to be able to lower the water table levels sufficiently. The water pumped from the perimeter bores will be delivered to the process water dam and used in the processing plant and mining operations generally.

For further de-watering of the walls during the mining operation, 50-100 m long horizontal drainage holes may be drilled into the pit walls. De-watering requirements will be reviewed as the pit cutbacks are excavated.

### **3.1.6 Ancillary Services**

A small excavator, dozer, water cart and grader will support the production fleet of trucks, drills and primary loading units. The small excavator will be used for cleaning of batter faces, topsoil removal (when spare trucks are available), drainage for dewatering and backup to the production excavator. The dozer will be used for maintenance of pit benches, waste dump management, haul road construction, land clearing and topsoil removal.

Graders and water trucks will be used for haul road maintenance and dust suppression.

### **3.1.7 Crushing and Rehandle**

The crushing circuit will not allow direct tipping, so all ore will be blended and rehandled by a front-end loader at the run-of mine pad.

### **3.1.8 Waste Haulage**

Laterite waste material will be used to construct haul roads, erect windrows, sheet local run-of mine pads and any remaining material will be stockpiled in an easily accessible location. All other waste material will be hauled directly to the waste dumps, sequenced in such a way that fresh rock material will be encapsulated within the dump.

### **3.1.9 Open Pit Mining Equipment**

The scale of the proposed operation (10 - 22 Mtpa of ore and waste movement) will require a conventional truck and shovel operation. New equipment will generally be specified, with opportunities to introduce some used equipment (e.g., water trucks, support trucks). Only diesel powered equipment will be used due to both the capital required to install sufficient additional power generation to support electric equipment, and the high operating cost of power supply at site.

Trucks with a load capacity in the range of 130 – 190 tonne were recognised as suitable, however a Caterpillar 785C truck (or equivalent) with a 150 tonne capacity presented a potential life of mine cost benefit.

Two hydraulic excavators (or equivalent) with a 250 t - 300 t operating weight class machine, with a bucket size of 12 - 18 m<sup>3</sup> will be used. This machine will enable 5 pass loading for a nominal 150 tonne capacity rear dump truck and minimises the fleet size to two machines to satisfy the required annual earthmoving rates.

Drilling and blasting to loosen the rock mass sufficiently for efficient loading by a face shovel is an essential component of the mining process for this deposit. Several units will be used as the main production drilling unit. The drill is required to be capable of drilling the required bench height in a single pass and has the capability to drill a range of hole diameters from 127 mm to 201mm.

For trim blasting and pre-splitting a small top hammer diesel powered hydraulic drill such as the Atlas Copco RocL8 (or equivalent) will be used for improved productivity over the intended 10 m bench height.

A range of essential ancillary equipment, necessary to ensure the cost efficient operation of the primary mining tools (i.e., drills, shovels and haul trucks) will be required, including:

- Three track dozers – required for bench maintenance underfoot and around the shovels, preparing benches for drilling, pushing off waste dumps for truck dumping and many other similar tasks. A machine of capacity equivalent to a Caterpillar D10, and two units compatible with a Caterpillar D9 will be required.
- Rubber tyred dozer - required for bench maintenance underfoot and around the shovels, preparing benches for drilling, pushing off waste dumps for truck dumping and many other similar tasks. A machine of capacity equivalent to a Caterpillar 854K would be required.

- Two road graders – primarily utilised for haul road maintenance to maintain maximum tyre life for the haulage units, equivalent to the Caterpillar 16M (or equivalent).
- Two water trucks – also for haul road maintenance and the suppression of dust along all the high use roads, with a capacity of approximately 85,000 litres, based on a Caterpillar 777 dump truck (or equivalent).
- Two front end loaders – required for maintaining crusher feed by recovery from temporary ROM stockpiles, recovery of low grade from stockpiles and as a backup to a major loss of availability for a shovel. A machine of capacity similar to a Caterpillar 993 (15m<sup>3</sup> bucket) and a unit equivalent to a Caterpillar 988 would be suitable to conduct this work.
- Two field service trucks – required to deliver fuel and lubricants to critical machinery which can only travel slowly and cannot therefore travel to the major workshop and refuelling facility. A larger unit based on a Caterpillar 773 haul truck (or equivalent) for the excavators and drills, and a smaller unit based on a 12 – 15 t road truck for servicing the dozers and pumps.
- Tyre Handler – required to handle the very large earthmoving tyres installed on the heavy equipment fleet. A unit equivalent in size to a Caterpillar 980 equipped as a tyre handler.
- Forty six other units comprising tool carriers, compactors, skid steer loaders, lighting plants, dewatering pumps, light vehicles and support vehicles (i.e., transport bus, flat bed trucks), to facilitate transport of personnel and materials around the mine site.

### **3.1.10 Mine Services**

The project will require external resources throughout the project life including:

- Diesel – for mining fleet, light vehicles and power generation.
- Oils and Lubricants – mining fleet and light vehicle fleet.
- Domestic supplies – transported from Townsville.
- Industrial supplies – spare parts, miscellaneous consumables.
- Maintenance support – personnel and supplies from Townsville and Brisbane.

## **3.2 Processing Activities**

### **3.2.1 Process Plant History**

The Nolans processing plant has been progressively expanded since commissioning in October 1995. The plant achieved a production rate of 2.5 million tonnes per annum at commissioning and was progressively expanded to 2.75 million tonnes per annum in 1999 and 3.2 million tonnes per annum in 2002.

The plant was expanded further in 2003 to a design milling capacity of 4.5 Mtpa. The current treatment rate has exceeded design and, on an annualised basis, is processing approximately 5 Mtpa. The expansion included the addition of a larger

crushing and screening plant, an additional ball mill and two leach tanks, sourced from the now-closed Kidston and Mt Leyhson mines.

The operation currently consists of the Mt Wright underground operations, trucking ore to the Nolans' Mill and the crushing of low grade stockpiles from the previous open pit operations around the Nolans and Sarsfield pits. Currently the underground operations provide approximately 1.5 Mtpa of feed.

### **3.2.2 Mineralogy and Ore Characteristics**

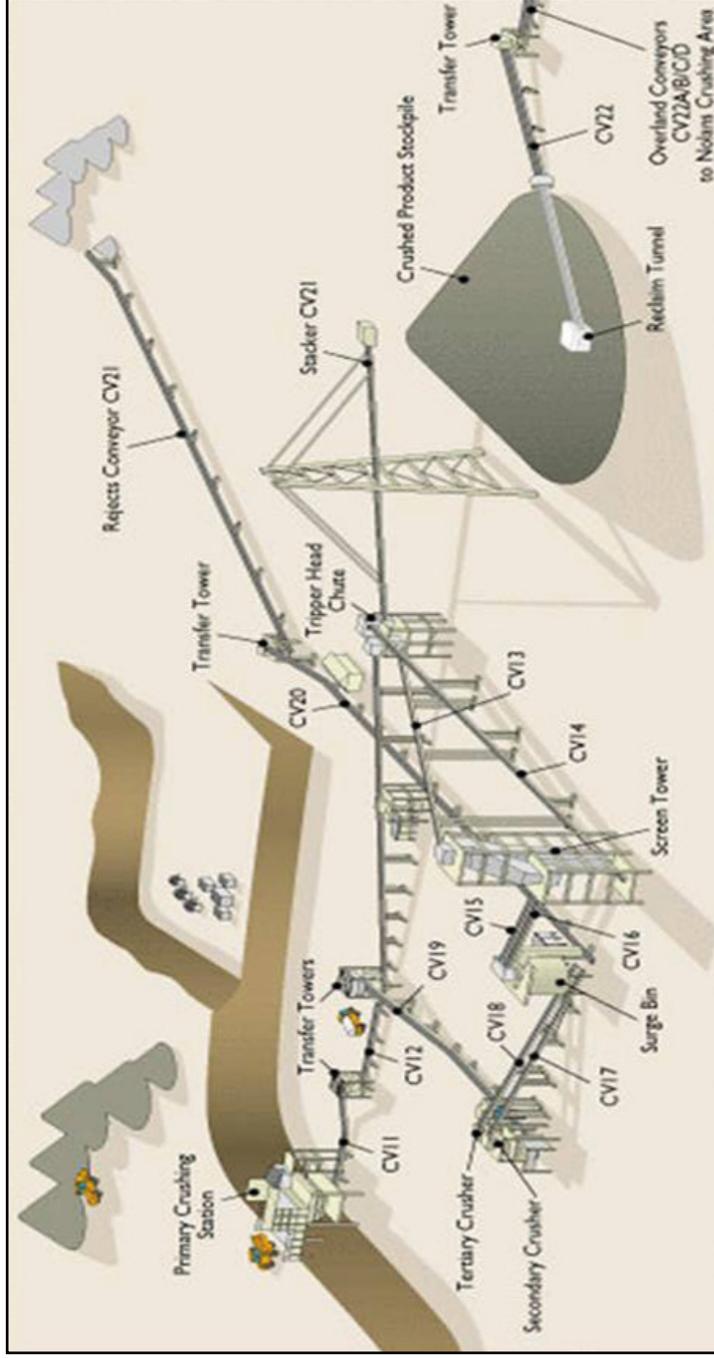
The gold deposit comprises a number of zones of sulphide vein networks in a dioritic host rock. It is known from niche sampling that the veins are host to at least 90% of the gold. Veins are typically sulphide dominant (70%) with quartz and calcite infill. Sulphide minerals are dominantly pyrite and pyrrhotite with, in decreasing order of abundance, sphalerite, chalcopyrite, galena, molybdenite and bismuthinite making up the remaining metal sulphides.

Gold within the sulphide veins is present as free, irregular, infill forming on mineral (mainly sulphide) grain boundaries. The host rock is massive and highly competent.

Complete oxidation of sulphides and decomposition of tonalite occurs to 12 metres in depth. This decomposed material has a bulk density of 2.0 compared to the average of 2.72 for primary ore and is typically excavated without blasting. The lower partial or transitional oxidised zone has an average bulk density of 2.5.

### **3.2.3 Crushing and Milling Processes**

The existing crushing and milling circuit flowsheets are shown in Figure 5 and Figure 6.



Source: Carpentaria Gold



Job No:  
8940  
File Name:  
8940AA\_02\_F005\_JO

Carpentaria Gold Pty Ltd  
Sarsfield Expansion Project



Crushing Circuit

Figure No:

5



## **Crushing and Beneficiation**

The crushing and screening plant was purchased from Kidston and relocated to Ravenswood as part of the Sarsfield upgrade project in 2003. The capacity of the crushing circuit is approximately 5.0 Mtpa (to maintain this rate the current plant requires maintenance and refurbishment, which will be undertaken as part of the project). The primary crusher is a 42 inch x 64 inch gyratory crusher. Two triple deck screens were installed as part of the earlier upgrade, with the intermediate and oversize fractions reporting to a storage bin ahead of secondary (1 x Nordberg MP 1000 cone crusher) and a tertiary (2 x Nordberg Omnicone 1560 cone crushers) crushing circuits.

Ore is either direct tipped to the crusher dump pocket or stockpiled with a front - end loader feeding the crusher. Product is conveyed to a crushed ore stockpile with a capacity of 100,000 tonnes. Ore is reclaimed and passes along overland conveyors to the Nolans' plant mill feed stockpile.

A waste conveyor with a radial stacker conveyed waste (beneficiation waste and oversize) to the waste dump. This formed part of a beneficiation circuit which is no longer active and mostly removed.

The crushing and screening plant has been performing well over the last 5 - 6 years, and opportunities to improve plant availability with small modifications that will reduce plant downtime, spillage and dust suppression will be maximised as part of the project.

## **Grinding**

The grinding circuit consists of two primary ball mills and one secondary ball mill. Discharge from all mills reports to a common sump from where it is pumped to a cyclone cluster consisting of seven 26 inch diameter Krebs cyclones. Normally, the circuit operates with two cyclones on-line and a cyclone feed pressure of approximately 100 kPa. Cyclone underflow reports to both the secondary mill ML02 and the primary mill ML03.

Scats (trommel oversize) from the two primary mills are typically very low grade and are discarded. Scats generation is equivalent to 7-10% of incoming primary mill feed.

## **Leaching**

The leach-adsorption circuit is a hybrid carbon-in-leach arrangement. It consists of one leach tank followed by eight adsorption tanks, providing five adsorption stages.

The first leach tank and adsorption tank each have a live volume of 2,500 m<sup>3</sup> (installed in the last upgrade) with the following seven adsorption tanks each having a live volume of 1,480 m<sup>3</sup>. The last six adsorption tanks are arranged in two parallel lines of three tanks each.

The progressive increase in plant throughput has had the effect of reducing leach residence time, which has impacted gold recoveries. This issue will be alleviated with the commissioning of a gravity circuit in late 2011. Two new leach tanks of 2,500 m<sup>3</sup> will be installed as part of the project, potentially increasing residence time to 21.1 hours under a 5.2 Mtpa operating scenario.

### Elution and Gold Room

The elution circuit is currently stripping at a rate of 1.5 strips per day (6 t of carbon). The stripping circuit follows an AARL process with two 4 t carbon columns, (acid wash is carried out in a purpose 4 t column prior to stripping) with six electrowinning cells and two vertical carbon regeneration kilns.

### Tailings Disposal

The current tailings thickener (22 metres diameter) was commissioned in March 2001. It has treated tailings generated from the operations at annualised milling rates of 5.2 Mtpa. The current pumping is handled by 12/10s pumps (these pumps are currently at capacity and will be upgraded to two stage pumping via the installation of additional 12/10 pumps in a two stage pumping arrangement), with an emergency 12/10 available to send unthickened tails to the dam in the event the thickener needs to be bypassed. The target tailings density for pumping to the dam is 62% to 66% solids.

### Recovery Projections for Ore

The existing and historical recoveries of the ore indicate that recoveries in the range of 85 - 87% were achieved over the life of the open pit. The recoveries for the expansion will be in the same value range. Indications are that given the introduction of the gravity circuit and a potential two additional leach tanks, recoveries may increase by 3 - 5% (up to 90%).

### Reagent Consumptions

The major reagents and consumables used at Ravenswood are detailed below in Table 2.

**Table 2 Nolans Mill Reagent Consumptions**

Material	Average Annual Consumption per tonne processed
Cyanide	0.42 kg/t
Lime	0.46 kg/t
Caustic	0.09 kg/t
HCl	0.04 kg/t
Lead Nitrate	0.18 kg/t
Oxygen	0.27 m <sup>3</sup> /t
Grinding Media	0.46 kg/t
Carbon	0.01 kg
Flocculant	0.007 kg/t

### **3.3 Waste Rock**

The mining area will require the construction of a new waste dump to accommodate the extra waste material, new low grade stockpiles, abandonment bund walls, topsoil stockpile areas and new lay-down areas. The existing run – of - mine pad will require possible extensions and re-organisation to accommodate the ore and the Mt Wright's ore separately to ensure any blending requirements of the mill.

All waste dump designs and stockpile placement will consider the nature of the material being dumped, the site conditions and natural topography. Surface waste dump designs will be constructed based on the following parameters:

- Each lift is a maximum of 10 metres. The first lift, to compensate for an undulating natural surface, may be extended higher.
- All final outer slopes are battered off to 15°.
- A 10 metre safety berm is provided between each lift.
- Access ramps are double lane width, with a gradient of 10 %.
- The top of the waste dumps are concaved towards the centre of the dump.
- A windrow around the outer edge of the dump is constructed to prevent runoff occurring over the waste dump sides, thereby minimising the erosion of batter face topsoil and vegetation.
- A swell factor of 1.20 will be assumed in the estimation of dump volumes from bank cubic metres taking into account the compaction during dump construction.

The waste generated from the expansion operations will be placed on the existing Sarsfield waste dump and the dump will be extended to the east to join with the Nolans dump and then fill in the area between. This will allow for both the encapsulation of the scats stored on the Nolans dump and also allow for any potential acid forming waste to also be encapsulated within the dumps.

The waste dump will not be positioned to optimise the haulage distances but located to account for environmental issues, such as the location of waterways, limiting the disturbance of flora and minimising the project's visual impacts.

### **3.4 Tailings Storage Facility**

Tailings generated during the processing of the ore from surface mining projects will be disposed in new cells, adjacent to the existing TSF. The construction, operation and closure of these facilities will be performed in accordance with the site's Tailings Operating Strategy.

The new TSF cells are proposed to the north-east and south of the existing TSF. They will utilise the existing walls to minimise waste material and will be limited to

the same height as the existing TSF cells. The proposed cell locations will also limit the visual impact of the expanded TSF.

The TSF cells will cover an area of approximately 206 hectares. The tailings dry density will be equivalent to 1.5 t/m<sup>3</sup>. The preliminary design for the proposed TSF embankment is intended to be raised to existing embankment crest level of RL 330 m.

The quantity of tailings to be dredged from the Sarsfield Pit is estimated to be 8 Mt, with tailings produced from 2012 - 2023 of 54.3 Mt. The total quantity of tailings to be stored is 62.3 Mt, with the proposed total cell capacity to be 68 Mt.

### **3.5 Infrastructure Requirements**

#### **3.5.1 Water**

##### **Water Supply Infrastructure**

Water is supplied to the mine via a pipeline, owned by Carpentaria Gold, from the nearby Burdekin River. The pipeline also supplies the Ravenswood township. The water supply system consists of approximately 20 kilometres of buried pipeline with a number of strategically located surge tanks and variable speed pipeline pumps to provide surge protection. A majority of the pipeline has a diameter of 375 mm with some sections at 450 mm to limit line loss. Surge protection for the pipeline consists of a number of surge tanks strategically located along the length of the line and variable speed pipeline pumps. Two storage dams have been built to provide the site with a theoretical 100% reliability of supply of 9.2 mega litres per day for expected flow patterns in the river. The first dam (Burdekin Turkey's Nest) is located adjacent to the river and has a capacity of about 1,046 mega litres. The second dam (Suhr's Creek Dam) is adjacent to the mine site and has a capacity of approximately 1,380 mega litres.

The site extracts water from the Burdekin River under the two water extraction licences. Licence 4003888 is held by Charters Towers Regional Council and operated by Carpentaria Gold, Licences 57293A is held and operated by Carpentaria Gold. There is no specific expiry dates on either of these licences.

In previous years water extraction from the Burdekin River has been allowed by the Department of Environment and Resource Management (formerly Department of Natural Resources and Water) during times of low flows over the dry season. Regulatory changes to the Burdekin River Water Management Plan have resulted in a reduction of extraction during dry periods of low flow.

##### **Water Demand**

Potable water requirements will be provided on site using the existing water supply sources and infrastructure. Potable water will be treated by filtration and chlorination and stored in potable water tanks, from where it will be pumped to the various buildings.

Fire hydrant water will be stored in a dedicated fresh water tank. This water supply will be used only during fire drills and actual fires. Water requirements for dust suppression and road maintenance during mining activities, will be supplied from existing water sources at Sarsfield. Water extracted during mine dewatering will be stored in specially constructed dams for use in the dust suppression around the mill and surface facilities and in the mine operations.

A significant component of water is recycled through the operation and a water balance will be undertaken for the project.

### **Pit Dewatering**

Due to the disposal of tailings within the Sarsfield Pit the water within the pit has minor levels of total dissolved solids, metals and cyanide. The water within the pit does not meet the water quality requirements to discharge water off site.

The groundwater aquifer system covering the mine area consists of a relatively shallow and permeable aquifer contained in the weathered tonalite or decomposed granite and a deeper fractured rock aquifer. The pits may require some ongoing dewatering but it is expected to be similar to the previous operation where dewatering is limited to sumps which collect seepage and rainwater. This dewatering will be mainly due to evaporation from the walls and floor of the pit.

This water will be used for dust suppression and to supplement the process water requirement for the project.

## **3.5.2 Energy**

### **Power Supply**

Electrical energy is supplied to the site by Ergon and is part of the Queensland state grid consisting of a 66 KV line supplied from two geographically separate substations. This system also supplies the Ravenswood township. The maximum capacity of the supply is currently 28 MW. The site demand is approximately 17 MW.

Electricity is generated off-site and supplies all power requirements within the vicinity of the camp, processing plant and Mt Wright Underground Operations. Additional open pit operations at the required electrical power will also be supplied from the off-site grid. During mining operations the existing 11 KV power lines connecting the Mt Wright operations to the Nolans Mill will require relocation.

For some dewatering bores and pumps stand-alone diesel gensets will be utilised owing to the multiple relocations required during operations (to reduce capital costs of relocating power lines).

### **Fuel Supply**

The existing surface refuelling facility will be utilised for the additional owner light vehicle requirements at the Nolans' Mill in the interim.

The project will require the establishment of new diesel fuel procurement and storage requirements and facilities for the open pit mining operations.

Fuel for mobile equipment will be transported to the site from Townsville by tanker trucks as required. The fuel will be pumped into storage tanks which will be constructed in a bunded tank farm. Tanks will also be provided to store waste oil, lube oil and hydraulic fluid. A fuelling pump station will be located adjacent the main fuel storage farm.

The storage and dispensing facilities will be provided and maintained by the oil companies providing the fuel.

### **3.5.3 Telecommunications**

Telephone communications are provided by Telstra, whilst data communication is provided by Optus via a frame relay data system.

The existing site communication network of telephones and licensed UHF radio repeaters will be utilised within the pit mining areas and village facilities. Outside these areas, communication is by means of UHF CB radio or mobile telephone only.

Upgrades to the existing telephone switchboard may be required as part of the project. Additional site frequencies for use in the surface operations may also need to be acquired.

### **3.5.4 Sewerage**

Sewage disposal will be via septic tanks and leach drains at the toilet facilities located adjacent to the office and crib facilities established at each open pit location.

The camp sewage treatment plant will be upgraded to Class A recycled water tertiary treatment standard, with continuation of reclaimed water spray irrigated on the existing 9 hole golf course in Ravenswood under existing environmental authority conditions.

### **3.5.5 Other Mine Infrastructure**

#### **Buildings and Facilities**

Mining operations will require the usual support facilities to sustain operations, and these are briefly described below. The mine site will contain the following new facilities:

- Truck workshop and warehouse.
- Additional administration offices.
- Fuel and lube oil storage and dispensing.
- ANFO plant (explosives contractor owned, operated and maintained).
- Explosive magazine.
- Truck wash bay.
- Equipment ready line.

### **Administration Building**

The main administration building is planned to contain the offices for senior management, mining, and technical personnel as well as meeting rooms and support services. It is expected to locate the buildings in close proximity to the existing mine operations buildings.

### **Mine Rescue and Training Building**

Existing facilities and services will be utilised.

### **Assay Laboratory Building**

Existing facilities will be utilised at the on-site laboratory and at outside services in Charters Towers and Townsville.

### **Mine Truck Workshop/Warehouse Building**

The existing building is proposed to be used for routine servicing and repair of mine trucks and other heavy mobile equipment. An overhead 25-tonne travelling crane services the repair bays. A light vehicle repair shop, welding bays, service bays, and a warehouse will also require construction or refurbishment as will offices for maintenance personnel and contractor personnel.

New workshop, warehouse and refuelling facilities will be established in close proximity to the existing open pit operations area to reduce the costs of service provisions to the area.

### **Explosive Manufacture and Storage**

Due to the expected volume of explosives required it is expected that as part of a supply contract a manufacturing and storage facility will be established on-site.

Explosives will be stored in an approved explosive magazine facility, located in a safe and secure location to be confirmed. Explosives and blasting agents will be transported to the pits as required.

### **Transport Infrastructure**

Site supplies including diesel, oils, lubricants, domestic provisions, explosives and industrial supplies will be transported to site from either Townsville or Brisbane. All hazardous materials will be transported, stored, handled and used in accordance with the relevant legislative requirements.

## **3.6 Workforce Requirements**

### **3.6.1 Construction**

The estimated peak construction crew is 40 persons. The bulk of the personnel will be employed directly by the engineering contractor and will work a 4 weeks on/ 1 week off roster, being accommodated in the mine village whilst on site and travelling back to their home towns in the off period. Given that the scope of works is refurbishment rather than new construction, apart from the two new leach tanks (if required) that works will be complete over an approximate 26 week

period. Of the peak labour force, approximately 32 persons will be skilled (trades persons), semi skilled (trades assistants) and labourers plus a small group of supervisors and clerical staff.

### **3.6.2 Commissioning**

Of the 160 operations staff, at project start up an extra twenty six technical staff will be required. It is anticipated that a commissioning crew of 3 personnel (1 off process, 1 off mechanical, 1 off electrical) plus vendor reps (2 off) for no longer than 2 weeks for the new crusher installation. These individuals will be the only additional personnel on site above the normal levels of owner's operations staff and mining contractor staff.

### **3.6.3 Operations**

The project will be a continuous mining operation, 365 days per year and 24 hours per day on a 2 x 12 hour shift basis. Most staff will commute from outside Ravenswood and utilise the Ravenswood village while on site.

Operators and maintenance personnel will work on a three panel, two shift roster, with 8 days on then 6 days off followed by 7 days on and 7 days off and will work a 12 hour shift alternating between dayshift and nightshift. Blast crews are expected to work a similar roster on day shift only.

Labour requirements are based upon the equipment required to achieve the production schedule at the equipment's productivity and performance levels. Staffing has been estimated at 160 personnel.

The majority of technical and supervision staff will work 5 days on then 2 days off and a 12-hour dayshift giving continuous coverage, excluding pit and maintenance operators who will be on 8 days on 6 days off – 7 days on 7 days off schedule.

#### **Supervision**

Overall management of the operation will be the responsibility of an open pit mining manager. Overall supervision of the pit operations will be the responsibility of a mine superintendent.

The contract operations will be managed by a project manager and pit/shift supervisors will be responsible for the pit production, drill and blasting and the operators. A maintenance manager and shift supervisors will manage the equipment maintenance and stocking requirements.

#### **Pit Operators**

Cross training is likely to occur for all operators, ensuring that each shift panel is multi-skilled enough to relieve for sickness, annual leave and general absenteeism. Dewatering personnel are assumed at one person per day shift only. Blasting personnel are planned at a single shot firer and two labourers per day shift.

## **Technical**

The technical section will consist of two groupings: mine engineering and mine geology, with both sections reporting to a Technical Services Manager. Staff numbers in the engineering/geology/ geotechnical groups will reflect the need for personnel to be self-sufficient and multi-skilled in geotechnical, geological modelling, open pit design, scheduling and the application of computers for engineering purposes.

To achieve this, the following staff will work under the overall direction of a Technical Services Manager:

- Senior Mining Engineer.
- Planning Engineer/Mining Engineer.
- Geotechnical Engineers.
- Chief Geologist.
- Senior Geologist.
- Geologists.
- Senior Surveyor.
- Surveyors.
- Grade Control Geologists.

The mining engineering section will provide all necessary technical services to the open pit mining operations, such as survey control, mining plans and schedules, and any other technical services required. The mine geology section will be responsible for all grade control, control of ore mining, grade reconciliation and reporting. Pit technicians will be responsible for sample collection, data handling, floor mark-outs and associated grade control activities.

Surveying for the entire property (open pit) will be the responsibility of the Senior Surveyor.

## **Maintenance**

Overall management of the maintenance operation will be the responsibility of a Contractor employed Mine Maintenance Manager. Workshop supervision will be the responsibility of a Superintendent. Shift Supervisors will be responsible for the workshop floor personnel and the maintenance and servicing of the equipment. The number of maintenance personnel to equipment operators' averages 0.40. Maintenance personnel have also been estimated based on machine hours and site location.

## **Recruitment and Training**

Recruitment for the project will be in accordance with Resolute Mining's Corporate hiring policies. Presently, Carpentaria Gold advertises all its field positions through the Resolute Mining website. Carpentaria Gold prefers to recruit its workforce from the local area.

### **3.6.4 Decommissioning**

Following the cessation of mining and processing operations it is envisaged only a small number of permanent Carpentaria Gold staff will remain onsite, who will direct the services of varying number of contractor personnel engaged in rehabilitation works.

### **3.6.5 Workforce Accommodation**

Carpentaria Gold operates an accommodation village for the existing site workforce located in Ravenswood. The current accommodation village has capacity for permanent and contractor personnel required for the Mt Wright project.

It is proposed to construct a 100-bed ensuite roomed worker camp extension adjacent to the existing camp to accommodate an additional 160 people.

Some personnel may elect to reside in Ravenswood on a full time basis and Carpentaria Gold will provide assistance to achieve this.

## **3.7 Rehabilitation and Closure Planning**

The nature of the final land use will change as a result of mining. The Carpentaria Gold mine closure plan envisages the post mine land use as native bushland, with revegetated leach pads and rock dumps, and open void (i.e., the pit).

Due to the use of topsoil and implementation of erosion control measures combined with the establishment of grass, shrub and tree species, the area of Category VIII land on the Carpentaria Gold leases will be decreased, increasing the area of Category VII land. The downgrading of some mine land from Class VII to Class VIII will result from the need to better protect some rehabilitation (eg., tailings dams) from grazing due to potential increases in erosion. Some areas will be downgraded to Class VIII.

The objectives of the rehabilitation program are to:

- Carry out the rehabilitation in a progressive manner, commensurate with the nature of the operations and rate of disturbance.
- Establish a stable landform and drainage system that can minimise soil erosion and ensure minimum impact off the lease.
- Produce a vegetative cover of native trees, shrubs and local grasses on the postmining landform that can develop into a self-sustaining ecosystem.
- Maintain or enhance the existing landscape character of Ravenswood and ensure that the rehabilitation undertaken is not out of character with the surrounds.
- Leave pits in a stable condition and inaccessible to people and stock.

- Retain infrastructure (e.g., access roads) that is recognised as being of value for residents or tourist uses.

There is no practical rehabilitation backlog, although there are minor areas that are not available as they maybe required for future mining; being actively explored or are budgeted for rehabilitation in the next budget year. The time between classification as available and revegetation may take at least two years. To assist in the identification of available areas for rehabilitation, areas of disturbance, completed rehabilitation, reserved for mining and infrastructure areas, will be classified and documented annually in the Plan of Operations.

All areas significantly disturbed by mining activities will be rehabilitated to the landform design criteria outlined in Table 3.

**Table 3 Post Mining Activity Landform Design Criteria**

Landform/Criteria	Limit
Tailings Dam outer batter maximum slope (Nolans and Sandy Creek)	Maximum of 22°, if topsoiled and grassed, or angle of repose if rock armoured.
Waste rock dump maximum outer face slope	Angle of repose.
Heap Leach Pads	Heap leach dump batters rehabilitation design will be as agreed with local landholder. Surface will be dome-shaped and revegetated directly subject to research trials.
Other bunds or dumps	Maximum of 22°, if topsoiled and grassed, or angle of repose if rock armoured.
Diversion Design Storm (permanent or process catchments)	1 in 50 year event.
Diversion Design Storm (temporary diversions)	1 in 5 year event.

### 3.7.1 Waste Rock Dumps

Waste rock dumps will be capped with benign material, topsoiled and revegetated. There will be ongoing research into the best ways to rehabilitate waste dumps. At present research is looking at angle of repose batters that may offer more stability and lower erosion potential.

### 3.7.2 Tailings Dams

Tailings dams will be capped and revegetated as per the method employed on the Sandy Creek Tailings Dam, being capped to a minimum depth of 0.75 metres, seeded and fertilised.

### 3.7.3 Voids

After the expansion project is complete, open cut mining voids will be left as water storages or used to contain disposed tailings and waste material. Pits used for disposal of waste material or tailings will be capped with at least 1m of inert material and rehabilitated to open woodland where applicable. The voids intended for use as permanent water storages will be documented in the Plan of Operations. As the water quality in these pits is likely to be of good quality, the

final pit use will be determined by the community and DERM. Final voids will be bunded (2 metres in height and 4 metres wide as per current DERM guidelines) and fenced off from stock and threatened fauna. The bunding dimensions may vary in areas where the existing noise bund is located, as it is proposed to incorporate the noise bund as a part of the abandonment bunding.

The use of the Nolans and Sarsfield pits for tailings disposal was assessed with a trial permitted by DERM of depositing and storing tailings into the Nolans Pit. The use of the pits would present a more long-term environmental storage, particularly for the Mt Wright tailings. In-pit disposal of tailings would also enable the existing tailings dam to be decommissioned earlier and resolve the ongoing seepage issue.

#### **3.7.4 Infrastructure Rehabilitation**

All buildings and structures not required for any purpose (except concrete slabs) will be removed. Concrete slabs will be removed or covered with at least 1 metre of inert material. Rehabilitation of infrastructure areas will be undertaken to the same rehabilitation criteria as the mined area rehabilitation. The requirements for inert material, topsoiling, ripping or revegetation is largely dependent on the nature of redundant activity.

Ponds will be pumped dry or left to evaporate and an assessment of the floor conditions will be carried out. The assessment will include a soil evaluation to determine if the soil surface is contaminated and if so, it will be removed and disposed of in accordance with the EA guidelines. The pond walls will be removed and the area will be ripped and seeded.

The Sandy Creek run of mine ponds will contain freshwater in the future. The most appropriate final land use for this dam will be determined with the local community and the DERM. Redundant roads will be removed. Roads will be classified as redundant when no further access is required by the operation, landholder or community. Road surfaces will be ripped and seeded once redundant.

#### **3.7.5 Vegetation Establishment**

Rehabilitation establishment will incorporate strategies to obtain the best outcome for the designated land use. Ripping will be undertaken to a depth range of 200 to 400 mm to increase water infiltration and root penetration. Areas will be ripped along the contour to reduce erosion. Fertiliser will be applied in a one off application during the revegetation program to supplement the nutrient deficiencies in the soil and improve initial growth.

#### **3.7.6 Rehabilitation Assessment**

Assessment and monitoring of the rehabilitation is necessary to demonstrate compliance with the rehabilitation and proposed land capability objectives commitment with the ultimate aim being lease relinquishment. Rehabilitation

background sites have been established and further sites are to be selected as required to assess revegetation progress.

Monitoring of sites is being undertaken by both photographic records and Landscape Functional Analysis (LFA) method developed by the CSIRO to assess the ecosystem by scoring a series of processes (indicators). These individual indicators are used to formulate indices, which allow for comparisons to be made between sample sites. The following indicators are scored:

- Soil Cover.
- Perennial Basal Plant Cover.
- Litter Cover.
- Cryptogram Cover.
- Crust Broken-ness.
- Erosion Features.
- Deposited Materials.
- Soil Microtopography.
- Surface Nature.
- The Slake Test.

These indicators are scored numerically and used to formulate indices for stability, infiltration/runoff, and nutrient cycling status. By using these indices, comparisons can be made between rehabilitation sites of differing development and analogue sites. The values scored for rehabilitated areas will be used for determining the rate of development of the rehabilitation and allow determination of progress towards the natural variation of the region.

### **3.8 Environmentally Relevant Activities**

The project triggers the following Environmental Relevant Activities under the Environmental Protection Regulation 2008:

- Schedule 1 Chapter 4 activities, being:
  - 8 Chemical storage.
  - 30 Metal smelting and refining.
  - 31 Mineral processing.
  - 33 Crushing, milling, grinding or screening.
  - 50 Bulk material handling.
  - 56 Regulated waste storage.
  - 58 Regulated waste treatment.
  - 60 Waste disposal.
  - 63 Sewage treatment.
  - 64 Water treatment.

- Schedule 6 Level 1 mining project, being:
  - 1 drilling, costeaning, pitting or carrying out geological surveys causing significant disturbance.
  - 2 investigating the potential development of a mineral resource by large bulk sampling or constructing an exploratory shaft, adit or open pit.
  - 8 mining gold ore.

### **3.9 Carpentaria Gold Environmental Management System**

All mining activities will be conducted in accordance with Carpentaria Gold's existing Environmental Management System. All site personnel and contractors will be obligated to conform to this standard.

Specific site safe operating procedures have been developed at Carpentaria Gold and been fully utilised throughout previous surface mining at the project. These procedures will be updated to meet current Resolute Mining Environmental, Health and Safety operating standards.

All employees working on the project will be educated on Carpentaria Gold's Safety and Environmental Policies during the site inductions. This will include Resolute Mining's safety vision and commitment to environmental excellence with competency based induction.

The project will be undertaken in accordance with the Carpentaria Gold Environment, Community and Heritage Policy (refer Attachment A).

## **4. COMMUNITY CONSULTATION**

### **4.1 Interested Persons**

The following definition of interested persons has been taken from the QEPA *Guideline 12 – The EIS Process for Non-standard Mining Projects*.

Interested persons are defined as persons nominated by the proponent that have an interest in the project. Interested persons may include a local community progress association, a local/state/national environmental action group, and affected land users other than land holders, any person who might have a substantial interest in the project or its impact.

Interested persons for the project may include, but not limited to, the following groups as stated in Table 4 below.

## 4.2 Affected Persons

The definition of an affected person is provided in QEPA *Guideline 12 – The EIS Process for Non-standard Mining Projects*, and is shown below:

A person is an ‘affected person’ for a project (s38) if the person is:

- 1 Any of the following under the *Native Title Act 1993 (Commonwealth)* for the operational land or for an area that includes any of the land:
  - a) A registered native title body corporate;
  - b) A registered native title claimant;
  - c) A representative Aboriginal/ Torres Strait Islander body; or
- 2 A relevant local government for the operational land;
- 3 A person mentioned below for the operational land or any land joining it:
  - a) A registered proprietor – for freehold land;
  - b) A person recorded in the register as the registered holder of the interest – for land that is held from the State for an estate or interest less than fee simple and for which the interest is recorded in a register mentioned in the Land Act 1994 (Land Act), section 276;
  - c) A holder of, or an applicant for, the tenement – for land subject to a mining claim, mineral development licence or mining lease;
  - d) A holder of the authority, or a lessee under the lease; or a licensee under the licence – for land subject to an authority to prospect or a lease or licence under the *Petroleum Act 1923*;
  - e) A trustee of the land – for land under the *Land Act* or the *Nature Conservation Act 1992 (NCA)* for which there are trustees;
  - f) A grantee of the land – for Aboriginal land under the *Aboriginal Land Act 1991 (ALA)* that is taken to be a reserve because of section 87(2) or 87(4)(b) of that Act;
  - g) A trustee for the land – for DOGIT land under the ALA or the *Torres Strait Islander Land Act 1991*;

- h) A relevant local government – for land held under a lease under the *Local Government (Aboriginal Lands) Act 1978*, section 6;
- i) A grantee of the land – for Torres Strait Islander land under the *Torres Strait Islander Land Act 1991* that is taken to be a reserve because of section 84(2) or 84(4)(b) of that Act;
- j) A trustee of the land – for land under a lease from the State under the *Aborigines and Torres Strait Islanders (Land Holding) Act 1985* that has been excised from land granted in trust for Aboriginal or Torres Strait Islander purposes under the *Land Act*;
- k) The State – for land that is any of the following:
  - Unallocated State land.
  - A reserve under the Land Act for which there is no trustee.
  - A national park, national park (Aboriginal land), national park (scientific), national park (Torres Strait Islander land), national park (Recovery) or forest reserve under the NCA.
  - A conservation park under the NCA for which there are no trustees.
  - A State forest or timber reserve under the *Forestry Act 1959*.
  - A State-controlled road under the *Transport Infrastructure Act 1994*.
  - A fish habitat area under the *Fisheries Act 1994*.
  - Another person prescribed under a regulation to the EP Act.

A list of affected persons for the project are available for internal and government use only.

### 4.3 Consultation Process

Interested and affected persons will be included in the community consultation program for the project and will be provided with a copy of the Terms of Reference (TOR) Notice and EIS for public comment. The community consultation program will include meetings with interested and affected persons as required. All correspondence with interested and affected persons will be recorded in the Consultation Report as part of the overall report and the EIS.

The draft TOR will be released for public comment, and to interested and affected persons, and advisory bodies for at least 30 business days. Anyone can make comments on the draft TOR to DERM. At the end of the comment period, copies of all comments received by DERM will be given to the proponent. Carpentaria Gold will then prepare the following:

- A written summary of the comments.
- A response to the comments.
- Proposed amendments to the TOR as a result of the comments received.

The above information must be provided by Carpentaria Gold to DERM within 20 business days of receiving copies of the documents. However, a longer period of time can be agreed between Carpentaria Gold and DERM. DERM will then

prepare and publish the final TOR based on the responses from RML within 20 business days.

Carpentaria Gold will then undertake the necessary assessments, research and consultation to prepare the EIS, in accordance with the TOR. The EIS will support an application for project approvals, in particular and Environmental Authority (EA).

Carpentaria Gold will submit the completed EIS to DERM. DERM will then assess the EIS and decide whether or not it adequately addresses the published TOR. If it does, Carpentaria Gold must then publish an EIS Notice and give a copy of the EIS Notice to each interested and affected person. The submission period for public comment will be set by DERM and must be at least 20 business days. Copies of the EIS will be made available to all interested and affected persons and Advisory Bodies. DERM will accept all correctly completed submissions received during the period. DERM will provide Carpentaria Gold with a copy of all the submissions received on the EIS. Carpentaria Gold must then prepare a response to the submissions and make any necessary amendments to the submitted EIS.

DERM will prepare and give an EIS Assessment Report to Carpentaria Gold. This Assessment Report will consider the final TOR, the submitted EIS, all correctly completed submissions, Carpentaria Gold responses to submission and the standard criteria in preparing the EIS Assessment Report. The Assessment Report will, among other things, recommend any relevant conditions that will be necessary for the project to proceed.

Community consultation and stakeholder engagement forms an integral component of the assessment process for the project. Carpentaria Gold has and is likely to wish to continue to build strong, lasting relationships with the community and key stakeholder groups, with the objective of providing accurate and timely environmental, social and economic project information.

Accordingly, a community and stakeholder engagement plan will be prepared and delivered that is flexible in order to take full account of stakeholder input and importantly, to respond to feedback. The objectives of the plan will be to:

- Initiate and maintain open and honest communication with all interested and affected stakeholders on all aspects of the project and the EIS.
- Identify stakeholder issues and concerns in the relation to the project via 'one on one' meetings and community feedback.
- Provide a range of communication methods to engage and inform stakeholders about the project such as newsletters and a page on the Carpentaria Gold website.
- Address stakeholder issues and concerns through the EIS and process and communications.

- Provide feedback to stakeholders on their issues or concerns and how their comments have been used via newsletters and the Carpentaria Gold website.

To achieve the above mentioned objectives, a detailed community and stakeholder engagement plan will be designed to:

- Identify key stakeholders and determine their level of interest in the project.
- Determine stakeholder level of impact on the project.
- Develop a communication and consultation plan.
- Select appropriate stakeholder communication and consultation tools such as 'one on one' meetings, newsletters, static displays, articles in local press, as required.
- Develop a schedule of activities.
- Provide ongoing documentation of community and stakeholder comments and issues of concern.

Carpentaria Gold is committed to liaising and discussing the project with all directly affected landowners and stakeholders to ensure that all concerns are taken in to consideration during the EIS phase. The list of stakeholders will be an evolving document over the life of the project.

## 5. EIS TRIGGER CRITERIA

DERM Guideline 4 (DERM, 2000) is the deciding criteria on the level of impact assessment required for the mining industry and sets out criteria for standard mining activities. Based on a review of the criteria for mining leases, the proposed project would, as a minimum, trigger a non-standard application on the following grounds:

- No more than 10 ha of the tenement land is at any one time significantly disturbed land because of mining activities carried out under all relevant mining tenements in the mining project.

*It is noted the Sarsfield TSF alone is approximately 100+ hectares.*

- No more than 5 hectares of the tenement land is at any one time covered by mine workings resulting from mining activities carried out under all relevant mining tenements in the mining project.

*The Sarsfield waste rock dump and scats heaps alone are greater in area than the trigger.*

- No Level 1 environmentally relevant activity (ERA) is carried out under the environmental authority.

*The Sarsfield TSF is a Level 1 ERA.*

- No more than 20 persons are employed on the tenement land at any one time.

*Over 240 Full Time Employees (FTEs) are employed across the MLs.*

The DERM Guideline 4 further indicates an EIS will be required if a non-standard application for a mining project meets any of the nominated EIS trigger criteria. In this case, based on the EIS trigger criteria the mine extension project would, as a minimum, trigger an EIS on the following grounds:

- Include an activity that would otherwise be a Level 1 ERA with an annual fee greater than \$4,000.

*RML/CG currently pay a Level 1 ERA annual fee of \$56,000 for an activity.*

- Involve the mining of more than 2 Mt of mineral or run of mine ore per year.

*The proposed extension is upto 5 Mtpa.*

- Result in more than 25 hectares remaining post mining in a non-beneficial land capability where an acceptable alternative may be feasible.

*The Sarsfield Pit would likely trigger this criterion.*

- Involve any non-standard mining activity less than 2 km from a town.

*The majority of sensitive land uses associated with Ravenswood township are located within 2 km of the non-standard mining activity.*

- Contains a dam which requires a dam failure assessment under the Water Act 2000.

*The Suhrs Creek raw water dam would be part of the project, which has been the subject of a dam failure assessment.*

It is proposed to apply for approval to prepare a voluntary EIS under sections 70 and 71 of the *Environmental Protection Act 1994* (Qld). The voluntary EIS will assess the potential adverse and beneficial impacts (i.e., environmental, economic and social impacts) of the project, propose measures to manage the potential impacts, identify feasible alternatives to the project and inform the community and decision makers.

# Attachment A

## **Carpentaria Gold Environment, Community and Heritage Policy**



## **ENVIRONMENT, COMMUNITY & HERITAGE POLICY**

Carpentaria Gold and its contractors will adopt the Resolute “Environmental Policy” and “Community Policy”. We are committed to sustainable development and protection of the natural and historic environment throughout our operations. This policy statement emphasises the site specific commitments.

Carpentaria Gold and its contractors will ensure:

- Commitment to meeting EA conditions and compliance with all applicable environmental laws, regulations, and statutory obligations.
- Life of mine environmental, rehabilitation and decommissioning plans are maintained.
- All chemicals, hydrocarbons and other materials are stored, used and disposed of in accordance with appropriate standards.
- Natural resources, particularly water, are managed in a responsible manner.
- No natural land surface is disturbed without the appropriate approval.
- Progressive rehabilitation of areas no longer required by the operations.
- All reasonable measures are taken to avoid damage to historic sites and buildings.
- Community consultation meetings are held on a regular basis or as required prior to changes to the operation that may impact on the community.
- All individuals are made aware of their responsibility for the environment, heritage and community.
- The promotion of a pro-active environmental culture across site.
- A commitment to minimising greenhouse gas emissions and improving energy efficiency.

We aim to achieve best practice in environmental performance by responding to all environmental challenges in all areas of our business.

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Joel Ray  
Operations Manager