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ENVIRONMENTAL MANAGEMENT PLAN

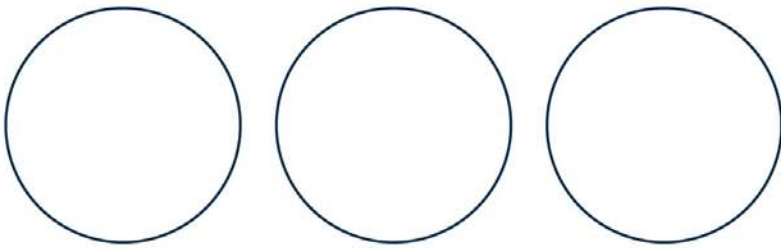


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21 EMP

This section describes the proposed Environmental Management Plan to be adopted for the Ensham Central Project. The Environmental Management Plan details measurable and auditable commitments to environmental management practices for the project.

21.1 INTRODUCTION

The *Environmental Protection Act 1994 (EP Act)* requires an Environmental Management Plan (EM Plan) to be submitted to the administering authority with any application for an Environmental Authority (EA) (mining activities). The proponent is seeking to amend the current Ensham Mine EA. The amended EA conditions are specified in this EM Plan. The application to amend the EA is supported by a voluntary Environmental Impact Statement (EIS), prepared in accordance with the Terms of Reference for the EIS. The EM Plan presents information in relation to the environmental impacts and proposed management measures for the project. The environmental impacts are discussed in greater detail in the EIS.

This EM Plan relates to the Ensham Central Project (the project) and extends to include the current approved Ensham mining operations only for environmental aspects where there will be cumulative impacts from the project and the approved Ensham mining operations (i.e. noise, dust, blasting and groundwater).

This EM Plan will be combined with the Environmental Management Overview Strategy (EMOS) for the approved Ensham mining operations prior to issuance of the amended Environmental Authority.

Sections 21.2 to 21.4 of this EM Plan provide background to the project, including a brief description of the project setting, mining tenure and project description.

The remainder of the EM Plan describes key environmental issues in terms of the following:

- Environmental values;
- Background to the issue;
- Potential impacts;
- Environmental protection objectives and control strategies; and
- Proposed EA conditions.

21.2 PROJECT BACKGROUND

The Ensham Mine is located in the Central Highlands region of Queensland, approximately 40 km east of Emerald and 200 km west of Rockhampton (Figure 21-1). The project involves gaining access to additional open cut coal reserves in the central area of the existing Ensham Mine and the development of a new underground longwall mine and associated infrastructure (Figure 21-1).

21.2.1 Mining Tenements

The project mining area includes areas within ML7459 and the adjoining Mineral Development Licence (MDL217). Project infrastructure will be located within ML7459, ML7460, a section of MDL217 to the west of ML7459, and an area to the north of ML7460 (Figure 21-2).

21.2.2 Land Ownership

The entire project site is located within freehold land owned by the proponent. Real property descriptions of the properties comprising the project site are as follows:

Lot No.	Registered Plan No.
33	CP864576
30	CP864574
32	RP908643
31	RP864573

There are no native title issues over the project site.

21.2.3 Land Use

The project site is largely cleared and used for grazing and cropping. The Nogoia River and its anabranch traverse the project site. The project site is surrounded by agricultural land used for grazing and cropping. There are a number of privately owned rural residences on neighbouring properties (Figure 21-1).

21.2.4 Project Stakeholders

An extensive stakeholder consultation program was undertaken as part of preparation of the EIS for the project. A list of stakeholders consulted for the project is included as an attachment at the end of this section.

21.3 PROJECT PROPONENT

The project proponent is the Ensham Joint Venture Parties (EJVP) which consists of: Bligh Coal Ltd (47.5%), Idemitsu Queensland Pty Ltd (37.5%), J Power Australia Pty Ltd (10%) and LG International (Australia) Pty Ltd (5.0%). Ensham Resources Pty Ltd (Ensham Resources) is the operator of the joint venture.

21.4 MINING ACTIVITIES

21.4.1 Project Description

The project involves an expansion of the existing Ensham Mine operations from a total production capacity of approximately 12 Mtpa to approximately 20 Mtpa. This will be achieved by gaining access to open cut and underground coal resources in the central area of the existing Ensham Mine (Figure 21-2). The expanded mining operations are anticipated to have a life of approximately 16 years, depending on the rate of production. The project includes the following main components:

- Extension of existing open cut mining operations into the central area. Open cut mining is conducted using draglines and truck and shovel for overburden removal. The project will extend the life of the current open cut operations, operating at 12 Mtpa, by approximately six years;

- Development of a new underground longwall mine in the central area to produce up to 8 Mtpa over a mine life of approximately 11 years; and
- Construction of new underground mine infrastructure, a wash plant and upgrading of existing open cut mine facilities (Figure 21-2).

The Ensham Mine is a 24 hr operation consisting of two 12 hr shifts.

21.4.2 Floodplain Mining Strategy

The project involves open cut and underground mining in the floodplain of the Nogoia River (Figure 21-2). The proposed open cut mining strategy involves the progressive extension of the existing mine flood protection levees to enable access to open cut mining areas in the floodplain. Mined areas are progressively backfilled to pre-mining surface levels, rehabilitated and recommissioned as floodplain. The mining strategy does not involve any disturbance of the main channel of the Nogoia River or mining within 100 m of the top of the high bank of the river channel. The underground mine has also been designed so that there is no surface subsidence within 100 m of the top of the high bank of the river channel.

21.4.3 Environmental Management

The project will involve various activities associated with the mining, processing and handling of coal. Many of these activities require specific management actions to reduce the risk of such activities causing environmental harm. The mitigation measures (as prescribed in this EM Plan) include best practice:

- vegetation clearing procedures;
- rehabilitation techniques;
- waste management practices;
- erosion and sedimentation control;
- weed and feral animal management; and
- noise, air and dust monitoring.

21.5 GENERAL

There are a number of general issues that do not relate to environmental values or control strategies, but are to be included in the EA. Conditions of the EA are proposed here for 'Schedule A – General Conditions'.

21.5.1 Proposed EA Conditions: Schedule A - General

Financial assurance

- (A1-1) Provide a financial assurance in the amount and form required by the administering authority prior to the commencement of activities proposed under this environmental authority.

NOTE: The calculation of financial assurance for condition (A1-1) must be in accordance with Guideline 17 and may include a performance discount. The amount is defined as the maximum total rehabilitation cost for complete rehabilitation of all disturbed areas, which may vary on an annual basis due to progressive rehabilitation. The amount required for the financial assurance must be the highest Total Rehabilitation Cost calculated for any year of the Plan of Operations and calculated using the formula:

(Financial Assurance = Highest Total Annual Rehabilitation Cost x Percentage Required).

(A1-2) The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely.

NOTE: Where progressive rehabilitation is completed and acceptable to the administering authority, progressive reductions to the amount of financial assurance will be applicable where rehabilitation has been completed in accordance with the acceptance criteria defined within this environmental authority.

Maintenance of measures, plant and equipment

(A2-1) The environmental authority holder must ensure:

- that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed; and
- that such measures, plant and equipment are maintained in a proper condition; and
- that such measures, plant and equipment are operated in a proper manner.

Monitoring

(A3-1) Record, compile and keep for a minimum of five years all monitoring results required by this environmental authority and make available for inspection all or any of these records upon request by the administering authority.

(A3-2) Where monitoring is a requirement of this environmental authority, ensure that a competent person(s) conducts all monitoring.

Storage and handling of flammable and combustible liquids

(A4-1) Spillage of all flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm (other than trivial harm) and maintained in accordance with AS 1940 - Storage and Handling of Flammable and Combustible Liquids.

Definitions

(A5-1) Words and phrases used throughout this environmental authority are defined in Attachment 1 – Definitions. Where a definition for a term used in this environmental authority is sought and the term is not defined within this environmental authority, the definitions in the *Environmental Protection Act 1994*, its Regulations and Environmental Protection Policies must be used.

21.6 AIR

21.6.1 Environmental Values

In accordance with the *Environmental Protection (Air) Policy 1997 (EPP Air)*, the environmental values of the air environment to be enhanced or protected are the qualities of the air environment that are conducive to suitability for the life, health and wellbeing of humans.

21.6.2 Background Air Quality

Existing dust levels in the vicinity of the project site have been quantified based on data from Ensham Mine's ongoing dust monitoring program and from a dust monitoring program undertaken specifically for the project EIS. Detailed monitoring results are provided in the EIS air quality assessment undertaken for the project (*Appendix F*).

Monitoring results indicated that the concentration of particles with aerodynamic diameters of less than 10 μm (PM_{10}) and dust deposition rates are low and are below ambient air quality goals at the nearest residence downwind of the existing Ensham Mine.

Based on monitoring, the following background dust levels were used in the air quality assessment undertaken for the project:

- 24-hr average PM_{10} concentration – 27 $\mu\text{g}/\text{m}^3$;
- annual average PM_{10} concentration – 14 $\mu\text{g}/\text{m}^3$;
- annual average concentration of Total Suspended Particulate matter (TSP) – 28 $\mu\text{g}/\text{m}^3$; and
- annual average dust deposition rate – 30-50 $\text{mg}/\text{m}^2/\text{day}$.

21.6.3 Potential Impacts

The emissions from the project that could potentially impact on the air environment are as follows:

- dust;
- odour; and
- Greenhouse Gas emissions.

Dust

Dust emissions associated with the project include dust from the following activities:

- Open Cut Mining – clearing of vegetation, extracting and transporting large quantities of overburden and coal, blasting, coal processing and stockpiles.
- Underground Mining – transport of coal from the underground mine via surface conveyor, stockpiling and coal handling.

A detailed modelling assessment was undertaken to predict dust levels likely to be experienced at the nearest residences to mining activities during the life of the project. The assessment concluded that predicted annual average levels were not expected to exceed the applicable air quality goals at the nearest residences for the following parameters, even with the inclusion of conservative background levels:

- ground-level concentrations of PM_{10} (goal of 50 $\mu\text{g}/\text{m}^3$)
- ground-level concentrations of TSP (goal of 90 $\mu\text{g}/\text{m}^3$); and
- dust deposition rates (goal of 120 $\text{mg}/\text{m}^2/\text{day}$).

The assessment also concluded that 24-hour average PM_{10} ground level concentrations are unlikely to exceed the applicable goal (150 $\mu\text{g}/\text{m}^3$) at the nearest residences.

Dust deposition rates were also found to be below thresholds that may cause adverse impacts on cotton growth.

Odour

Odour emissions from the ventilation shaft of the underground mine will be the main potential source of odour nuisance generated from the operation of the project. An odour assessment was undertaken for the project. It concluded that the project is not predicted to give rise to odour concentrations that would exceed the EPA's guideline of 2.5 odour units (ou).

Greenhouse Gas Emissions

An assessment of greenhouse gas emissions was undertaken in accordance with the Australian Greenhouse Office's (AGO's) recommendations. The major sources of greenhouse gas emissions from the project's activities are:

- Release of carbon dioxide and methane in coal seam gas;
- Combustion of diesel in mining equipment (e.g. haul trucks) and blasting; and
- Electricity consumption.

Over the life of the project, the Ensham Mine is estimated to emit 9.1 Mt of CO₂ equivalent.

21.6.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental protection objectives for air quality are to:

- comply with the relevant dust criteria for the project at sensitive receptors beyond the boundaries of the mining leases;
- minimise the impacts of odour derived from mine operations on sensitive receptors beyond the boundaries of the mining leases; and
- minimise emissions of greenhouse gases into the atmosphere.

Environmental Controls

Dust

The dust control measures outlined in Table 21-1 will be incorporated into the proponent's mining operations.

**Table 21-1
Dust Mitigation Measures**

Source	Control Procedures
Areas disturbed by mining	Disturb only the minimum area necessary for mining. Reshape, topsoil and rehabilitate completed overburden emplacement areas as soon as practicable.
Haul road dust	All roads and trafficked areas will be maintained and watered using water carts to minimise the generation of dust. All haul roads will have edges clearly defined with marker posts or equivalent to control their locations, especially when crossing large overburden emplacement areas. Obsolete roads will be ripped and revegetated.
Minor roads	Development of minor roads will be limited and the locations of these will be clearly defined. Minor roads which are used regularly will be watered. Obsolete roads will be ripped and revegetated.
Topsoil stripping	Access tracks used by topsoil stripping machinery will be watered.
Topsoil stockpiling	Long term topsoil stockpiles, not used for over six months, will be reshaped to promote pasture growth.
Drilling	Drills will be equipped with dust control technology as appropriate.
Blasting	Weather conditions will be considered, where necessary, to manage dust emissions associated with blasting.

Source	Control Procedures
Raw coal bins	Automatic sprays, or other dust control mechanisms, will be used when tipping raw coal that generates excessive dust quantities.
Washplant	Spillage of material will be cleaned up as soon as practical to prevent dust.

The proponent has an existing complaints handling protocol to respond to any complaints in relation to dust and conduct investigations, where necessary.

Odour

No mitigation measures are necessary with respect to the management of odour issues for the project.

Greenhouse Gas Emissions

The proponent will implement the following greenhouse gas minimisation strategies as part of its operations:

- Selection of fuel efficient motors;
- Adoption of a mining method which uses large equipment and economies of scale to significantly reduce greenhouse emissions. In particular, use of draglines, where possible, to minimise truck and shovel operations;
- Extracting and transporting coal and overburden efficiently minimising the number of trips and fuel consumption;
- Recycling of refrigerants in equipment and air conditioning;
- Segregation of waste into recycling materials and general waste;
- Minimising burning of vegetation;
- "Greenhouse awareness" training at induction;
- Development and maintenance of an inventory of emissions and sinks;
- Conduct energy conservation and greenhouse audits in accordance with the requirements of the National Greenhouse Challenge Plus annual progress reports; and
- Compilation of an annual National Pollutant Inventory (NPI) report.

Dust Monitoring

Ensham Mine has an established dust monitoring program, which will continue for the life of the project. The aim of the program is to monitor mine dust impacts and the compliance status of the mining operations in relation to the dust deposition limits contained in Ensham's EA.

The current location of dust deposition gauges is shown on Figure 21-3. Dust deposition gauges are sampled monthly in accordance with *Australian Standard AS3580.10.1-1991*. The program will be subject to periodic auditing, including a review of monitoring locations and a comparison of the monitoring results to the dust deposition limits contained in Ensham's EA.

The proponent will undertake additional dust monitoring in response to complaints and/or at the request of the EPA.

21.6.5 Proposed EA Conditions: Schedule B – Air

Dust nuisance

- (B1-1) Subject to Conditions (B1-2) and (B1-3) the release of dust or particulate matter or both resulting from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.
- (B1-2) When requested by the administering authority, dust and particulate monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.
- (B1-3) If the environmental authority holder can provide evidence through monitoring that the following limits are not being exceeded then the holder is not in breach of (B1-1):

Dust deposition of 120 milligrams per square metre per day, averaged over one year, when monitored in accordance with AS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991; and

A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM_{10}) suspended in the atmosphere of 150 micrograms per cubic metre over a 24 hour averaging time, at a sensitive or commercial place downwind of the operational land, when monitored in accordance with:

- Particulate matter - Determination of suspended particulate PM_{10} high-volume sampler with size-selective inlet - Gravimetric method, when monitored in accordance with AS 3580.9.6 Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM (sub) 10 high volume sampler with size-selective inlet - Gravimetric method of 1990; or
- Any alternative method of sampling PM_{10} , which may be permitted by the 'Air Quality Sampling Manual' as published from time to time by the administering authority.

NOTE: You must propose which monitoring method is appropriate in accordance with condition (B1-3) (a) or (b) or both.

- (B1-4) If monitoring indicates exceedance of the relevant limits in Condition (B1-3), then the environmental authority holder must investigate whether the exceedance is due to emissions of dust from the activity. If the mining activity is found to be the cause of the exceedance then the environmental authority holder must:
- address the complaint including the use of appropriate dispute resolution if required; or
 - immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental nuisance.

21.7 GROUNDWATER

21.7.1 Environmental Values

The environmental values associated with groundwater resources which may potentially be affected by the project include the water level and water quality of the Nogoia River alluvial aquifer and the coal seam aquifer.

21.7.2 Groundwater Setting

Groundwater in the vicinity of the project occurs within the following two main aquifers:

- the shallow Quaternary alluvial aquifer, which is associated with the Nogoia River floodplain; and
- the underlying Permian coal seam aquifers.

The alluvial aquifer consists generally of fine to coarse grained sand and gravel varying in thickness from 1 to 25 metres. The alluvial aquifer has limited groundwater occurrence which is generally restricted to sections where the basement Permian sequence has been more deeply eroded. The permeability is highly variable but generally high and in the order of 100 m/day, and groundwater levels range from RL 141 m at the upstream western limits of the proposed open cut area, to about RL 135 m near the current limit of B pit. These levels are generally between 1 and 6 metres below the Nogoia River water level and field investigation has confirmed that there is effectively no hydraulic connection between the Nogoia River and the alluvial aquifer.

The groundwater quality of the alluvial aquifer is generally poor to very poor. Monitored salinity levels varied significantly with concentrations of total dissolved solids (TDS) ranging from 1,110 mg/L to 28,200 mg/L, indicating slightly brackish to moderately saline water quality. Many samples exceeded the recommended ANZECC (2000) *"Australian and New Zealand Guidelines for Fresh and Marine Water Quality"* which specify 5,000 mg/L TDS for beef cattle watering. The pH is in the neutral range between 7 to 8.

The coal seams are confined aquifers which generally exhibit relatively low transmissivity and recharge rates. Yields in the coal seam are in the range of 0.1 to 2.6 L/s. Standing water level analysis from exploration bore logs indicate that the coal seam groundwater flow is toward the Nogoia River from an elevation of about RL 170 m to RL 180 m in the north to about RL 135 m in the south-east.

Water quality in the coal seam is variable but generally very poor. It is alkaline and highly saline with pH ranging from 7.8 to 8.35, and TDS ranging from 4,000 to 16,000 mg/L, with the majority of samples exceeding 9,400 mg/L. The TDS levels exceed the ANZECC (2000) guidelines for domestic consumption and irrigation and the water quality is also generally unsuitable for stock watering.

All registered bores located within the floodplain alluvial aquifer in the vicinity of the project area were found to have been established by either the Department of Natural Resources, Mines and Water (NRMW) or the proponent. There are an additional eight identified private bores, within a 15 km radius of the project area, which are not associated with Ensham Mine. Of these, only two are registered bores and all except one inactive unregistered bore are sourced from the coal seam.

Only one of the six unregistered private bores within the 15 km mine radius was in active use at the time of inspection in November 2005. This bore is located on Property No. 75 and is equipped with a pump. The water quality is suitable for stock watering purposes (TDS 2,380 mg/L). The five other known private bores within the 15km mine radius were inspected in November 2005 and found to be inactive and not equipped with pumps.

21.7.3 Potential Impacts

The potential impacts of the project on groundwater resources include the following:

- Lowering of groundwater levels in the coal seam and alluvial aquifer due to mine dewatering and mine subsidence, and consequent impacts on bore yields;
- Groundwater contamination due to seepage from tailings emplacements; and
- Groundwater and/or surface water contamination due to the formation of a spoil aquifer in the long term, post-mining.

Groundwater impacts were assessed using a detailed groundwater model. The results of detailed geochemical characterisation of overburden material were also used to assess the potential for the development of poor quality spoil aquifer water in the long term.

Privately Owned Groundwater Bores

All private bores within a 15 km radius of the project were found to be drilled to coal seam depths when investigated in November 2005, with the exception of one private bore which is sourced in the alluvial aquifer but was inactive. Due to the limited and patchy nature of the alluvial aquifer, mine dewatering has virtually no effect on groundwater in this aquifer, other than where alluvium is removed by open cut mining. Any bores which draw from the alluvium will therefore not be impacted.

There are seven private bores located in coal formations within a 15 km radius of the mine site which could potentially be impacted by lowered groundwater levels due to mine dewatering. Of these, only two are in active use. It is proposed that water level and quality monitoring of these bores be undertaken prior to commencement of the project and at four-monthly intervals thereafter so as to identify any impacts.

The groundwater investigation also considered the potential impact of underground mine subsidence on the overlying alluvial aquifer. Cracking due to mine subsidence may intersect the base of the alluvial aquifer in a limited area at the eastern end of the underground mine where the depth of cover from the coal seam to the base of the alluvium is less than 105 m. The groundwater study concluded that, whilst this vertical cracking may intersect the base of the alluvium, the thin saturated thickness of the alluvium will have already drained during adjacent open cut mining and there will be minimal impact on pit and alluvium groundwater levels due to mine subsidence.

Contamination from Tailings Dams

The proposed tailings dam sites are located beyond the alluvial aquifer on low permeability, clay rich strata. The tailings dams are therefore unlikely to impact on the groundwater regime.

Spoil Aquifer Impacts

Long term groundwater recovery, post-mining, will be very slow relying on inflow from the coal seams and from rainfall recharge of the elevated overburden emplacements. Groundwater modelling indicates that it will take in excess of 200 years for equilibrium post-mining groundwater levels to establish. The final open cut voids will act as sinks for groundwater flow with worst case long term equilibrium water levels in the spoil aquifer predicted to be below the Nogoia River level. It is therefore assessed that the equilibrium water table that develops in the spoil aquifer will not discharge to the river. Similarly, long term final void water levels are not predicted to overtop the final voids and will not impact on surface water quality.

Geochemical characterisation of the spoil has shown it to be benign and any leachate produced in the spoil aquifer should be of reasonable quality and higher quality than the groundwater in the existing alluvial aquifer and coal seam aquifer. This predicted leachate water quality will not pose a significant contamination risk.

21.7.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental protection objectives for groundwater management are as follows:

- to prevent the contamination of groundwater due to mining; and
- to monitor and remedy any adverse effects on operational, privately owned groundwater bores, due to mining operations.

Control Strategies

A detailed groundwater monitoring program is proposed and is specified below in proposed EA condition C6-1. The proponent will address any impacts on privately owned groundwater bores due to mining in consultation with affected landowners.

Detailed geotechnical assessment of the proposed tailings dam sites will include confirmation of the surface permeability and potential for groundwater impacts due to tailings water seepage.

21.7.5 Proposed EA Conditions Schedule C - Water

Groundwater

- (C6-1) Groundwater, affected by the mining activities must be monitored at the locations and frequencies defined in Schedule C - Table 12. The monitoring locations are shown on Figure 21-4.

Schedule C – Table 12 (Groundwater monitoring locations and frequency)

Location	Monitoring Point	Parameters	Frequency
Nogoa River channel	Bores EC01- EC23, GW1 & GW2	pH, EC, water level	Every 4 months
Nogoa River channel	4 selected "EC" bores	pH, EC, Na, Mg, Ca, Cl, HCO ₃ , SO ₄ , Total Fe	Every 4 months
Nogoa River floodplain	NRMW bores 1302176 to 13020181	pH, EC, water level	Every 4 months
Private Property	Bore RN 38845 Bore RN 62511 Unregistered Bore A	pH, EC, water level	Every 4 months, if required by property owner

- (C6-2) Subject to Condition (C6-1), if the groundwater contaminant trigger levels defined in Schedule C - Table 13 are exceeded then the environmental authority holder must complete an investigation into the potential for environmental harm caused by groundwater contamination from the mining activity and notify the administering authority within 3 months of receiving the analysis results.

Schedule C – Table 13 (Groundwater contaminant trigger levels)

Parameter	Units	Limit	Limit Type
pH	-	6.0, or background levels - whichever is lower	Minimum
pH	-	9.0, or background levels - whichever is higher	Maximum
Electrical Conductivity	µS/cm	Within 20% of the background levels	Maximum
Suspended Solids	mg/L	Within 20% of the background levels	Maximum

- (C6-3) Subject to Condition (C6-1), groundwater levels must be monitored and groundwater draw down fluctuations from EIS predictions in excess of 2 m per year, not resulting from the pumping of licensed bores, must be notified within 14 days to the administering authority following completion of monitoring.
- (C6-4) The method of water sampling required by this environmental authority must comply with that set out in the latest edition of the Environmental Protection Agency’s Water Quality Sampling Manual.

21.8 SURFACE WATER

21.8.1 Environmental Values

The surface water environmental values which may potentially be affected by the project include the following:

- Surface water quality, including the Nogoia River and tributary streams;
- The Nogoia Mackenzie Water Supply Scheme, which includes conveyance of allocated water supply flows via the reach of the Nogoia River traversing the mine site; and
- The stability of the Nogoia River and its floodplain.

21.8.2 Surface Water Setting

The Ensham Central Project mining areas are located within the floodplain of the Nogoia River. The river at the project site has a total catchment area of approximately 27,000 km². Fairbairn Dam is located on the Nogoia River approximately 50 km upstream of the site. Approximately 60% of the total upstream catchment is within the Fairbairn Dam sub-catchment. The majority of the remaining upstream catchment area lies in the Theresa Creek sub-catchment.

The Nogoia River crosses the central area of the mine site flowing in a south-easterly direction. In the vicinity of the site, the river has an extensive floodplain and ephemeral tributary system. The floodplain is up to 5 km wide and includes a secondary anabranch channel in addition to the main river channel. Winton Creek flows from the west and joins the main channel of the Nogoia River within the Ensham mining lease (ML7459). Boggy Creek flows from the north and joins the Nogoia River downstream of the anabranch within the Ensham mining lease.

The terrain of the site is flat or very gently sloping in the south and gentle to moderately undulating with some isolated irregular steep areas in the north. The existing approved Ensham open cut mining operations in B and C pits encroach on the floodplain from the south and north respectively and are contained within existing flood protection levees.

Approximately 6 km downstream of the site the Nogoia River and the Comet River meet and together become the Mackenzie River. The Mackenzie River flows into the Fitzroy River which flows to the Coral Sea.

The Nogoia River in the vicinity of the site forms part of the Nogoia Mackenzie Water Supply Scheme which supplies agriculture, industry and towns in Central Queensland. Fairbairn Dam is the major water storage in the scheme, the operation of which involves controlled release of water from the dam, via the Nogoia River, to downstream water users and weirs on the Mackenzie River.

Nogoia River water quality at the project site is within the ANZECC (2000) guidelines for drinking water (subject to coarse screening), irrigation and stock watering. The median water pH of 8.0 is in the neutral range and the salinity level, measured by the median electrical conductivity of 260 $\mu\text{S}/\text{cm}$, is low.

The proponent has an existing site water management system that involves the following key water management strategies:

- diversion of clean runoff away from areas disturbed by mining activities;
- collection of runoff from areas disturbed by mining activities in catch drains and direction to sediment traps and settling dams for control of suspended sediment prior to discharge from site;
- collection of runoff from infrastructure areas in catch drains and direction to storage dams for re-use as mine water supply;
- transfer of open cut pit water to storage dams for re-use as mine water supply; and
- discharge of any excess mine water to the Nogoia River in accordance with the conditions of the Ensham Mine Environmental Authority (EA).

21.8.3 Potential Impacts

Potential impacts of the project on surface water environmental values include the following:

- contamination of surface water, including the Nogoia River, due to:
 - runoff from disturbed areas and industrial areas
 - discharge of tailings water, mine water or sewage effluent
- loss of water from the Nogoia Mackenzie Water Supply Scheme due to seepage from the river to the mine;
- flood impacts on privately owned properties upstream of the site due to restriction of the floodplain width with mine flood protection levees; and
- instability and erosion of the Nogoia River and floodplain due to closure of the anabranch and restriction of the floodplain width.

Surface Water Contamination

Water management strategies designed to prevent surface water contamination are presented in Table 21-2.

Loss of Water from the Nogoia River

The bed and banks of the Nogoia River consist of low permeability clay and clay-bound sand and there is effectively no hydraulic connection between the river and the alluvial aquifer. This conclusion has been confirmed by extensive field investigations conducted during preparation of the EIS. This conclusion is also supported by the findings of a previous investigation by the NRMW and operational experience at Ensham Mine.

The project open cut mine will not disturb the main channel of the Nogoia River and there is no mining within a minimum distance of 100 m from the high bank the river. The underground mine has also been designed so that there is no subsidence of the river channel or an area within 100 m of the high bank of the river.

The project mining operations will therefore not result in any loss of water from the Nogoia River and will not impact on the Nogoia Mackenzie Water Supply Scheme.

Upstream Flood Impacts

Upstream flood impacts were assessed using a two-dimensional flood model of a 27 km reach of the Nogoia River including the project site. The key findings of the flood impact assessment are as follows:

- The majority of flood level impacts are contained within land owned by the proponent.
- The maximum upstream afflux is 1.1 m for the 20 year Average Recurrence Interval (ARI) flood event. This afflux occurs at the upstream Ensham land boundary in the vicinity of the main river channel and the adjoining floodplain.
- On the majority of the floodplain upstream of the Ensham property boundary, the afflux is generally small (less than 0.1 m).
- There is no change in flood levels downstream of the Ensham property boundary.

Stability Impacts on the Nogoia River and Floodplain

A comprehensive assessment of the impact of the project on the stability of the Nogoia River and its floodplain was conducted as part of the EIS. The assessment was based on a detailed assessment of flow velocity increases, a detailed audit of the current condition of the river and an assessment of long term geomorphologic impacts due to the closure of the anabranh and restriction of the width of the floodplain.

The assessment of river and floodplain stability concluded that:

- The Nogoia River main channel is stable and well vegetated and has significant inherent erosion resistance.
- The current erosion regime in the Nogoia River is mild and there are no problem erosion areas and no erosion that has affected river morphology in recent history.
- The impacts of the project on floodplain and river channel flow velocities are moderate and there is no significant increase in scour risk.
- There is a negligible net effect on flows in the main channel of the Nogoia River due to closure of the anabranh channel compared to the natural situation (prior to the construction of Fairbairn Dam and other flood protection works on the floodplain), as the impact is balanced by the flood attenuation effect of Fairbairn Dam.
- The project is not expected to have a significant impact on the morphology of the Nogoia River in the long term.

21.8.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental protection objectives for surface water are as follows:

- Prevent contamination of surface water resources including the Nogoia River;
- Ensure that the Nogoia Mackenzie Water Supply Scheme is not impacted by the project;
- Address any adverse impacts due to increased flood levels on upstream properties in consultation with affected landowners; and
- Ensure that the stability of the river and floodplain are not adversely impacted.

Control Strategies

Surface Water Contamination

The additional water types generated by the project are listed in Table 21-2. The table also lists the characteristics and proposed management strategy for each water type. Project water management will be integrated with the existing site water management system and the proposed management strategies are similar to the existing operations. These management strategies are designed to prevent surface water contamination.

**Table 21-2
Water Management Strategies**

Water Type	Characteristics	Management Strategies
Pit water (underground and open cut)	Elevated salinity and suspended sediment load.	Stored on site in mine water dams for re-use as mine water supply. Excess mine water can be discharged to the Nogoia River in accordance with the existing EA discharge conditions.
Runoff from areas disturbed by active open cut mining and infrastructure construction	Elevated suspended sediment load.	Collection of runoff in catch drains and direction to sediment traps and settling dams for control of suspended sediment prior to discharge from site.
Runoff from mine infrastructure areas.	Elevated suspended sediment and potentially hydrocarbons and other chemicals from spills.	Isolation of mine infrastructure area catchments with diversion drains. Use of sediment traps and oil separators to control suspended sediment and any oil spills, prior to collection in dams. Collection of runoff in catch dams located immediately downstream of infrastructure area. Re-use of dam water as mine water supply.
Tailings Water	Elevated salinity and suspended sediment load.	Operation of the tailings dams as nil discharge systems. Isolation of tailings dam catchment areas with diversion drains. Operation of the decant water pond with sufficient freeboard above maximum storage levels to ensure nil overflow. Recycling of tailings decant water in the washplant process water circuit.
Sewage Effluent	Faecal Coliforms	New sewage treatment facilities will be constructed in accordance with relevant Australian Standards and legislative requirements.

Surface Water Monitoring

The current surface water monitoring program will continue. The monitoring program involves daily monitoring of pH and Electrical Conductivity at river locations upstream and downstream of the mine site (Compliance Points 1 and 2 specified in the current Mine EA). It is proposed that Compliance Point 2 will be relocated further upstream to a location in the vicinity of the upstream boundary of the proponent's land as part of the project. This will ensure that the monitoring location remains upstream of the project mining operations and monitoring data is representative of river water quality upstream of the mine.

Monthly monitoring of Total Suspended Solids and Total Dissolved Solids is also conducted at these monitoring sites. The monitoring program will detect any adverse impacts on Nogoia River water quality due to the mining operations.

The groundwater monitoring program specified in Section 21.7.5 of the EM Plan and visual monitoring of groundwater inflow from alluvium to pits adjacent to the river will detect any unanticipated leakage of river water.

Landowner Consultation

The proponent has consulted with riverfront landowners potentially affected by flood level impacts throughout the preparation of the EIS. This has included presentation of the results of the surface water study and flood level impact predictions. The proponent will address any material impacts caused by increased flood levels in consultation with affected landowners. This consultation has commenced and is ongoing.

River Management Plan

The proponent proposes to develop and implement a River Management Plan to maintain, enhance and monitor river stability.

21.8.5 Proposed EA Conditions Schedule C – Water (Continued)

Release to waters

(C1-1) Receiving waters affected by the release of process water or storm water contaminated by the mining activities or both must be monitored at the locations and frequencies defined in Schedule C – Table 21-2.

**Table 21-2
Water Monitoring Locations and Frequency**

Monitoring point	Latitude (GDA 94)	Longitude (GDA 94)	Sampling Point	Monitoring frequency
Release point	Any location within the mixing zones defined in Condition C1-3 and C1-4		Release point at outlet	Daily during water release
Within mixing zone upstream of release point	As per C1-3 and C1-4		Mixing zone 1	Daily during water release
Within mixing zone downstream of release point	As per C1-3 and C1-4		Mixing zone 2	Daily during water release
Downstream lease boundary (Nogoia River)	654470	7400670	Compliance point 1	Daily before, during and after water release
Upstream Ensham land boundary (Nogoia River)	648650	7406550	Compliance point 2	Daily

Note: This does not apply to dams containing hazardous waste and is not a release point.

(C1-2) Receiving waters at compliance point 1 affected by the release of process water or storm water contaminated by the mining activities or both must comply with the contaminant limits defined in Schedule C – Table 21-3.

**Table 21-3
Receiving Water Contaminant Limits**

Parameter	Units	Minimum	Maximum
pH	-	6.5	8.5
EC	$\mu\text{S/cm}$ (micro Semens per centimetre)	Not Applicable	1000
TSS	mg/L	Not Applicable	1150

Note: This does not apply to dams containing hazardous waste. Background is considered to be hydrographical data taken from NRMW gauging station, Duckponds.

- (C1-3) The Nogoia River mixing zone is considered to be from the Ensham mine Haul road crossing downstream to the eastern boundary of mining lease ML7459.
- (C1-4) The Boggy Creek mixing zone is considered to be the northern limit of mining lease ML70049 to the confluence of the Nogoia River.
- (C1-5) Water release to Boggy Creek shall be only during periods of natural flow events. The duration of a natural creek flow event shall not be extended as a consequence of the mine water release.
- (C1-6) The Authority holder within 20 working days of a water release provide a report to the administering authority detailing:
 - The reason for the release;
 - The location of the release;
 - All water quality monitoring results;
 - All other monitoring results;
 - Any general observations;
 - All calculations; and
 - Any other matters pertinent to the water release event.

Sediment contaminant levels

- (C2-1) All reasonable and practicable erosion protection measures and sediment control measures must be implemented and maintained to minimise erosion and the movement of sediment. Including:
 - All clean drainage waters, from undisturbed areas, kept separate from dirty waters from disturbed areas;
 - Water from disturbed catchments diverted into the mine water management system and sedimentation dams;
 - Sedimentation dams designed to contain a 6 hour 10 year average recurrence interval rainfall; and
 - Sediment shall be excavated from sediment dams as required to maintain design capacity.

Sewage effluent

- (C3-1) Sewage effluent used for dust suppression or irrigation must not exceed sewage release limits defined in Schedule C Table 21-4.

**Table 21-4
Sewage Effluent Quality Standards**

Quality	Release Limit	Units	Limit Type	Monitoring Frequency
5 day BOD	50	mg/L	Max	On release
pH	6 – 9	-	Range	On release
Free chlorine residuals	1.0	mg/L	Max	On release
Faecal coliforms (based on average of a min. of 5 samples)	5 000	Colonies per 100 ml	Max	On release

River Management Plan

- (C4-1) At least 28 days prior to commencement of the project the holder of the environmental authority will develop a River Management Plan for the reach of the Nogoia River within Ensham land. The River Management Plan should address the following matters:
- a) Control of grazing in the river channel;
 - b) Management of woody debris in the river channel;
 - c) A program to monitor and remediate identified localised erosion areas;
 - d) A program to monitor the river condition following any significant flow events and every two years.

Flood Protection Levees

- (C5-1) The flood protection levees shall be designed and inspected by a suitably qualified and experienced person. The final design level of the levee crest shall be 1 m above the predicted 1,000 year ARI event flood level. If the construction of the levee is staged, such that the effective life of parts of the levee is reduced, the design level of the crest within those parts of the levee may be reduced to maintain a constant probability of overtopping. The risk of overtopping must not be greater than 2.5% during the life of the levee.
- (C5-2) Any section of the outside face of the levees shall be treated with cover material and grass seeded (unless rock armored) within three months of completion of the earthworks for that section of the outside face of the levee.
- (C5-3) The Holder shall upon submission of each annual return provide the administering authority with 'as-built' plans of the constructed works completed during the return period.
- (C5-4) The condition of the levee must at a minimum be assessed by a suitably qualified and competent person at least once per year between the months of May and October inclusive (i.e. during the 'dry' season and before the onset of the 'wet' season).
- (C5-5) Remedial works identified during assessments conducted under condition [C5-4] must be commenced within 60 days unless delayed by inclement weather.

21.9 NOISE

21.9.1 Environmental Values

In accordance with the *Environmental Protection (Noise) Policy 1997*, the environmental values to be enhanced or protected are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; and
- the wellbeing of an individual, including the individual's opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

21.9.2 Background

Noise monitoring was undertaken during preparation of the EIS at residences in the vicinity of the project site. The noise monitoring was used to determine the Rating Background Level (RBL) at neighbouring residences. The RBLs were then used to develop specific noise level goals for the project. The criteria range of 30 to 40 dB(A) is applicable to the project.

A low frequency noise criterion of 50 dB(Linear) is applicable to the project.

Road traffic and rail noise criteria were determined for the project based using the *Environmental Protection (Noise) Policy 1997*.

21.9.3 Potential Impacts

The noise assessment concluded the following:

- Noise levels resulting from open cut mining operations are predicted to comply with the noise goal for the project at all of the private residences in the vicinity of the mine.
- Low frequency noise emissions are predicted to comply with the low frequency noise criterion [50 dB(Linear)] at all private residences in the vicinity of the mine.
- The ventilation shaft can be designed to comply with the applicable noise criteria through the use of simple treatments such as commercially available noise attenuators and suitable setback distances from sensitive receptors. These treatments will be applied where necessary in the design of the ventilation shaft.
- Road traffic noise on Duckponds Road and the Capricorn Highway is forecast to comply with the relevant criteria at setback distances of 50 m and beyond.
- Predicted rail noise impacts from the project comply with the 65 dB(A) Leq (24 hour) rail noise criterion at the nearest residence.

Construction activities for the project will comprise the construction of a new washplant, conveyor, ancillary buildings and new underground mine surface facilities. The construction of these facilities will be no louder than the operation of these facilities and consequently a separate assessment of construction noise was not undertaken.

The impact of intermittent high frequency noise from items such as horns and reversing alarms is not reflected in the noise prediction results as noise predictions are based on the dominant noise emission sources. The proponent will monitor any adverse impact from reversing alarm noise through ongoing consultation with neighbouring residents.

21.9.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental protection objective for noise is to minimise the impacts of mine-derived noise on sensitive receptors.

Environmental Controls

The following noise management measures will be implemented for the project:

- The proponent will maintain all plant and equipment in good working order to ensure compliance with the noise criteria;
- The proponent will maintain its existing complaints handling protocol to respond to any complaints in relation to noise and investigate these, where necessary; and
- The proponent will site and design the ventilation shaft/s to comply with the applicable noise criteria.

The proponent will monitor any adverse impact from reversing alarm noise through ongoing consultation with neighbouring residents. In the event of reversing alarm noise adversely impacting neighbouring residents, opportunities to reduce the impact through volume/pitch changes or substitution of another system which provides the same level of warning will be investigated and implemented.

21.9.5 Proposed EA Conditions Schedule D – Noise and Vibration

Noise Nuisance

- (D1-1) Subject to Conditions (D1-2) and (D1-3) noise from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.
- (D1-2) When requested by the administering authority, noise or airblast overpressure monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.
- (D1-3) Noise Monitoring must include the following descriptors, characteristics and conditions:
- a) $L_{A, eq, adj, T}$;
 - b) the level and frequency of occurrence and adjustments for impulsive or tonal noise;
 - c) atmospheric conditions including wind speed and direction; rain;
 - d) effects due to extraneous factors such as traffic noise; and
 - e) location, date and time of monitoring.

21.10 GROUND VIBRATION & AIRBLAST FROM BLASTING

21.10.1 Environmental Values

The environmental values to be enhanced or protected in relation to airblast overpressure impacts from blasting are the qualities of the acoustic environment that are conducive to:

- the wellbeing of the community or a part of the community, including its social and economic amenity; and
- the wellbeing of an individual, including the individual's opportunity to have sleep, relaxation and conversation without unreasonable interference from intrusive noise.

21.10.2 Background

The proponent has an established ground vibration and airblast overpressure monitoring program. This monitoring program indicated that there have been some past exceedances of the air blast overpressure criteria in the EPA Guideline *Noise and Vibration from Blasting – EPA, 2004* at neighbouring residences. A number of changes have been made to blasting procedures to manage these elevated ground vibration and airblast levels. Recent monitoring has shown that ground vibration and airblast levels at neighbouring residences are below the criteria in the EPA Guideline *Noise and Vibration from Blasting – EPA, 2004*.

21.10.3 Potential Impacts

Project ground vibration and airblast overpressure levels were predicted based on a regression analysis of blast monitoring data from the current Ensham mining operations, adjusted to account for differences between the current operations and the project.

Ground vibration and airblast overpressure levels are predicted to be generally below the relevant criteria. However, additional controls on the blast design may be necessary toward the end of the mine life to ensure compliance with the criteria at the closest residence to the mining operations (Residence No. 94 on Figure 21-5). Monitoring will be undertaken at this residence to confirm ground vibration and airblast levels. If necessary, additional blast controls will be implemented to ensure blast ground vibration and airblast levels are within the criteria.

21.10.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental protection objective for ground vibration and airblast overpressure is to comply with the relevant ground vibration and airblast overpressure criteria for the project at sensitive receptors beyond the boundaries of the mining leases.

Environmental Controls

The blast management measures outlined below will be implemented for the project:

- Blast impacts will be monitored through ongoing consultation with neighbouring residents and through the existing complaints handling protocol.
- Blast monitoring will be conducted in response to any complaints from neighbouring residents and/or at the request of the EPA. Blast design and procedures will be revised to reduce blast impacts, in the event that monitoring indicates that the limits outlined in the EA are being exceeded.
- Monitoring will be undertaken at Residence No. 94 for any blasting within the north-west limit of the project open cut operations. This area is shown in Figure 21-5. Section 15.6.1 provides additional detail on this issue.

Risks associated with flyrock will be managed through adoption of the following controls for the project:

- selection of a blast design appropriate for the hole diameter and charge mass;
- accurate implementation of the blast design by the shotfiring crew;

- establishment of an appropriate exclusion zone incorporating a proven safety margin;
- use of sentries to enforce exclusion zone; and
- clearance of the exclusion zone prior to firing.

21.10.5 Proposed EA Conditions Schedule D – Noise and Vibration (continued)

Noise (Airblast Overpressure) Nuisance

- (D1-4) Subject to conditions (D1-2) and (D1-5), the airblast overpressure level from blasting operations on the premises must not exceed the limits defined in Schedule D - Table 1 at any sensitive place.
- (D1-5) Airblast overpressure monitoring must include the following descriptors, characteristics and conditions:
- location of the blast(s) within the mining area (including which bench level); and
 - atmospheric conditions including temperature, relative humidity and wind speed and direction; and
 - location, date and time of recording.
- (D1-6) If monitoring indicates exceedence of the relevant limits in Schedule D - Table 1, then the environmental authority holder must:
- address the complaint including the use of appropriate dispute resolution if required; or
 - immediately implement airblast overpressure abatement measures so that airblast overpressure from the activity does not result in further environmental nuisance.
- (D1-7) The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual.

Schedule D - Table 1 (Airblast Overpressure Level)

Location	Airblast Overpressure Measured
Sensitive or commercial place	Air blast overpressure level of 115 db (Linear peak) for nine (9) out of ten (10) consecutive blasts initiated and not greater than 120 db (Linear peak) at any time.

Note: The method of measurement and reporting of over pressure levels must comply with the latest edition of the Environmental Protection Agency's vibration and air blast overpressure monitoring guideline.

Vibration nuisance

- (D2-1) Subject to Conditions (D2-2) and (D2-3) vibration from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.
- (D2-2) When requested by the administering authority, vibration monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within 14 days to the administering authority following completion of monitoring.

- (D2-3) If the environmental authority holder can provide evidence through monitoring that the limits defined in Schedule D - Table 3 are not being exceeded then the holder is not in breach of (D2-1). Monitoring must include:
- a) location of the blast(s) within the mining area (including which bench level); and
 - b) atmospheric conditions including temperature, relative humidity and wind speed and direction; and
 - c) location, date and time of recording.
- (D2-4) If monitoring indicates exceedence of the relevant limits in Schedule D - Table 3, then the environmental authority holder must:
- a) address the complaint including the use of appropriate dispute resolution if required; or
 - b) immediately implement vibration abatement measures so that vibration from the activity does not result in further environmental nuisance.

Schedule D - Table 2 (Vibration limits)

Location	Vibration measured
Sensitive or commercial place	5 mm/s peak particle velocity for nine (9) out of ten (10) consecutive blasts and not greater than 10 mm/s peak particle velocity at any time

Note: The method of measurement and reporting of vibration levels must comply with the latest edition of the Environmental Protection Agency's vibration and air blast overpressure monitoring guideline.

21.11 WASTE

21.11.1 Environmental Values

In accordance with the *Environmental Protection (Waste Management) Policy 2000 (EPP Waste)*, the environmental values to be protected throughout the project are:

- the life, health and well being of people;
- the diversity of ecological processes and associated ecosystems; and
- the land use capability.

21.11.2 Potential Impacts

The main types of waste generated by the project will be green waste, overburden, rejects, sediments, scrap metals, general waste, cardboard, regulated waste (e.g. batteries, tyres, hydrocarbon waste, and miscellaneous chemicals), sewage and sewage sludge. The management of overburden, rejects and tailings is addressed in Section 21.12 – Land.

The estimated volume of each waste type and its management and disposal strategy is summarised in Table 8-1 – Estimated Annual Mine Construction and Operational Wastes.

Ensham has an existing Waste Management Program which provides for the identification of waste types, the use of licensed waste transport contractors and relevant tracking of regulated

wastes. This program has been specifically designed to manage any potential environmental impacts associated with the management of solid waste.

21.11.3 Environmental Protection Objectives and Control Strategies

Environmental Protection Strategies

The existing Ensham Waste Management Program will be extended to include additional waste expected to be generated by the project. Objectives of the program are to:

- Reduce the quantity and hazardous nature of wastes through application of the waste management hierarchy.
- Ensure that wastes are handled, stored and disposed of in a manner which minimises impacts on air, water and land resources and protects the health of people working at the Ensham Mine and the surrounding community.
- Minimise land disturbances associated with on site disposal areas.

Control Strategies

Waste will be managed in accordance with the Ensham Waste Management Program, revised to include waste streams and quantities generated by the project. Key features of the program include:

- Strategies to avoid the generation of waste, where possible;
- Strategies to reuse waste streams, where possible;
- Strategies to recycle waste, where possible;
- Strategies to manage the disposal of waste, including:
 - engagement of professional, licensed waste management contractors;
 - provision of covered general refuse bins to contain odour, reduce leachate and exclude vermin;
 - use of mosquito and vermin control;
 - removal of general refuse from site on a weekly basis;
- Regular environmental auditing; and
- Biennial (every two years) hazardous substance auditing.

21.11.4 Proposed EA Conditions Schedule E - Waste

Storage of tyres

(E1-1) Tyres stored awaiting disposal or transport for take-back and, recycling, or waste-to-energy options - should be stockpiled in volumes less than 3 m in height and 200 m² in area and at least 10 m from any other tyre storage area.

(E1-2) All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a 10 m radius of the scrap tyre storage area.

Disposal of tyres

(E2-2) Disposing of scrap tyres resulting from the mining activities in spoil emplacements is acceptable, provided tyres are placed as deep in the spoil as reasonably practicable.

- (E2-3) Scrap tyres resulting from the mining activities disposed within the operational land must not impede saturated aquifers or compromise the stability of the consolidated landform.

Waste Management

- (E3-1) The holder must revise its existing Waste Management Program to incorporate all waste generating activities associated with the Ensham Central Project. The revised Plan is required to include:
- a) a program for safe recycling or disposal of all wastes – re-using and recycling where possible;
 - b) a disposal procedure for hazardous wastes; and
 - c) a staff awareness and induction program that encourages re-use and recycling.

21.12 LAND

21.12.1 Environmental Values

The environmental values to be protected or enhanced are the:

- stability of the Nogoia River floodplain;
- the suitability of the project site for agricultural activities; and
- the aesthetic qualities of the landscape.

21.12.2 Background

Current Land Use

The project site is used for rainfed and irrigated cropping (wheat, sorghum, cotton, corn and legumes) and cattle grazing. The majority of the site has been cleared of vegetation but there are some areas of remnant vegetation remaining on the site, predominantly associated with riparian areas and drainage lines.

Pre-Mine Land Suitability

The project site consists predominantly of a combination of Class A land (approximately 40% of the project site) and Class C land (approximately 50% of the project site). The Class A land is associated with the floodplain of the Nogoia River and is suitable for cropping, with nil to moderate limitations. The undulating plains beyond the Nogoia River floodplain are classified as Class C land and are considered suitable as pasture land.

Good Quality Agricultural Land

Within the project area, the land classified as Class A land is regarded as good quality agricultural lands (GQAL) with only minor limitations. Approximately 40% of the project site is classified as Class A land and is therefore considered to be GQAL. The GQAL on the project site is located on the floodplain of the Nogoia River.

Existing Land Contamination

The properties on which the project is located are not listed on the Contaminated Land Register and there are no known historical or existing contaminated sites within the project area. Notifiable Activities (Petroleum Product Storage, Disposal of Mine Wastes and Landfilling) are

conducted on the proponent’s properties, adjacent to the project area, as part of the existing approved Ensham mining operations. These properties are listed on the Environmental Management Register. These activities will continue to be managed to prevent contamination.

21.12.3 Potential Impacts

Potential impacts on land resources from the project include the following:

- changes to existing landforms;
- changes to land suitability, including loss of GQAL;
- changes to land use; and
- land contamination.

These impacts should be considered in terms of the land disturbance types that will be created by the project and the rehabilitation strategy proposed for each disturbance type. These are summarised in Table 21-5. The disturbance areas are shown on Figure 21-6. Detailed rehabilitation and decommissioning strategies for these areas are provided in Section 21.12.4.

**Table 21-5
Summary of Rehabilitation Strategy**

Disturbance Area	Summary of Rehabilitation Strategy	Post-Mining Land Suitability	Potential Post-Mining Land Use
Elevated overburden emplacements within the project area	<ul style="list-style-type: none"> • Reshaped slopes at a grade of 10% with a maximum effective slope length of 100 m • Installation of erosion and drainage controls • Establishment of pasture grass cover on outer slopes and native trees and shrubs on plateau areas 	Class C	<ul style="list-style-type: none"> • Grazing on 10% overburden emplacement slopes • Native habitat for berm and plateau areas.
Reinstated floodplain areas	<ul style="list-style-type: none"> • Backfilling to approximately pre-mining surface levels • Backfilling strategy designed to control settlement of backfilled overburden • Establishment of pasture grass cover 	Class B	<ul style="list-style-type: none"> • Grazing and rainfed cropping
Surface subsidence areas due to underground longwall mining	<ul style="list-style-type: none"> • Monitoring of subsided areas • Rehabilitation of surface cracks, where necessary • Remedial drainage works, where necessary 	<ul style="list-style-type: none"> • Class B (land that was Class A pre-mining) • Class D (land that was Class D pre-mining) 	<ul style="list-style-type: none"> • Grazing and rainfed cropping (Class B land) • Native habitat (Class D land)
Tailings dams	<ul style="list-style-type: none"> • Capping the surface of tailings dams with benign overburden material and topsoil • Minor drainage works • Establishment of pasture grasses and legumes 	Class D	<ul style="list-style-type: none"> • Native habitat
Final voids and ramps within the project area	<ul style="list-style-type: none"> • Regrading ramps, where necessary, to blend in with rehabilitated overburden emplacements • Bunding and/or fencing around the high walls and end walls of the final void to prevent access to the area 	Class D	<ul style="list-style-type: none"> • Native habitat

Disturbance Area	Summary of Rehabilitation Strategy	Post-Mining Land Suitability	Potential Post-Mining Land Use
Project mine infrastructure areas	<ul style="list-style-type: none"> Removal of infrastructure Remediation of any land contamination Ripping, topsoiling and revegetation 	Class C	<ul style="list-style-type: none"> Grazing

Post-Mining Land Suitability and Good Quality Agricultural Land

Table 21-5 lists the proposed post-mining land suitability for the various disturbance areas associated with the project and are based on the application of the rehabilitation strategies summarised in Table 21-5. These strategies have been developed to achieve the overall rehabilitation objective of creating a stable, self-sustaining landform.

**Table 21-6
Analysis of the Impact of Mining on Pre-Mine Agricultural Land Suitability**

Agricultural Land Class	Pre-Mining				Post-Mining			
	Open-Cut Footprint	Subsided Areas	Tailings Dams	TOTAL	Open-Cut Footprint	Subsided Areas	Tailings Dams	TOTAL
A	592	1,154	0	1,746	0	0	0	0
B	32	0	53	85	540	1,154	0	1,694
C	294	235	147	676	370	235	0	605
D	89	32	0	121	97	32	200	329
TOTAL	1,007	1,421	200	2,628	1,007	1,421	200	2,628

In total, the project will lead to a loss of 1,746 ha of Class A land, which is considered to be GOAL. Much of this land will be converted to Class B land resulting in a net increase of 1,609 ha of Class B land.

State Planning Policy 1/92: *Development and the Conservation of Good Quality Agricultural Land* provides a framework for the consideration of the GOAL in development assessment. The policy acknowledges that there will be developments that can legitimately impact on GOAL because they represent an overriding benefit to the community.

The project is considered to provide the following overriding community benefits:

- It allows the utilisation of the coal resources of the state;
- It will provide substantial employment opportunities and economic benefits;
- It will allow the continuation and expansion of a locally significant industry that provides substantial export income to the State;
- it allows the continued utilisation of infrastructure associated with Ensham Mine; and
- There is no alternative location on land of lesser agricultural quality as the project location is dictated by the position of the coal resources.

Land Use

As indicated in Table 21-5, cattle grazing will be a suitable post-mining land use for the majority of the site. Rainfed cropping is a suitable post-mining land use in any reinstated floodplain areas

where cropping would not compromise the stability of the final landform. Rainfed cropping is a suitable post-mining land use in surface subsidence areas classified as Land Class B. Plateau areas of elevated overburden emplacements and rehabilitated tailings dams are proposed to be used as areas of native habitat.

Land Contamination

Geochemical characterisation of overburden and rejects within the project area has concluded that overburden is likely to be relatively benign and will generate slightly alkaline and fresh (non-saline) runoff and seepage following surface exposure. This conclusion is consistent with current operational experience at Ensham Mine.

Based on the conclusions of the geochemical study, and the management measures proposed to prevent land contamination (Section 21.12.4), the project is not expected to give rise to land contamination issues.

21.12.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental protection objectives relevant to land resources are as follows:

- To return land disturbed by the project to post-mining landforms that are stable, self-sustaining and safe and require minimal maintenance; and
- To ensure that post-mining landforms are non-polluting.

Environmental Controls

Rehabilitation

Progressive rehabilitation of the existing approved Ensham mining operations is conducted in accordance with the mine's Plan of Operations and Rehabilitation Management Plan (RMP). The RMP was prepared in accordance with the conditions of the Ensham Mine EA. The RMP addresses the following aspects related to rehabilitation of the current approved operations:

- landform design criteria including a conceptual end of mine landform;
- rehabilitation methods;
- spoil characterisation, topsoil analysis and topsoil management;
- revegetation, establishment of native vegetation and corridors; and
- rehabilitation monitoring and success criteria.

The RMP addresses the rehabilitation of the slopes and plateaus of elevated overburden emplacements, reinstated floodplain areas, final voids and ramps, mine industrial areas and roads.

The RMP will be revised to include the rehabilitation of project areas and integration with the existing mine rehabilitation program. An overview of the proposed rehabilitation techniques for each disturbance type is provided below.

Elevated Overburden Emplacement Areas

Elevated overburden emplacements within the project area will be contiguous with the overburden emplacements of the existing approved open cut mining operations. Progressive rehabilitation of these areas will therefore be integrated with the existing open cut mine rehabilitation program.

The nature of the project's elevated overburden emplacements will be similar to the adjacent existing approved mine emplacements. The same rehabilitation strategy, as specified in the RMP, will be applied to the project area emplacements. This "conventional" rehabilitation strategy has

proven very successful on site rehabilitation to date. The components of the strategy are as follows:

- Outer slopes of the emplacement are reshaped at a grade of 10% with a maximum effective slope length of 100 m;
- Drainage berms, typically 25 m wide, are installed to limit effective slope lengths. The drainage berms will be constructed with gentle cross fall for drainage control and located at maximum slope length intervals of 100 m;
- Completed slopes are covered with 300 mm of topsoil and deep contour ripped;
- Pasture seed (typically Rhodes, Buffel and Urochloa) are applied to outer slopes with fertiliser and hay mulch to establish a thick pasture cover for slope erosion control;
- Planting of native trees and shrubs on the slopes is considered only after initial erosion control has been achieved by the establishment of pasture grasses;
- Upper drainage berms are planted with native trees and shrubs. No topsoil is placed on these berms to reduce grass competition and facilitate tree establishment;
- Emplacement plateau areas are constructed with grades of less than 1% and generally less than 0.5%;
- Native trees and shrubs are planted on the plateau areas to establish native bushland for fauna habitat; and
- Drains and ponds are constructed on the plateau areas to collect runoff water. The drains/ponds are constructed with flat bases and typically 20 m wide by 5 m deep.

Reinstated Floodplain Areas

The proposed progressive floodplain mining, reinstatement and recommissioning process is as follows:

- Construction of levees to provide flood protection for active open cut mining areas;
- Backfilling of the open cut mining void within the levee area to approximately pre-mining surface levels. Backfilling will include construction of a low permeability compacted surface layer (achieving a maximum permeability of 1×10^{-5} m/sec);
- Placement of a 1.5 m surface layer of topsoil and growth medium;
- Seeding with pasture grasses and establishment of pasture grass cover;
- Establishment of trees in selected areas; and
- Removal of flood protection levees and recommissioning of the rehabilitated floodplain.

A key consideration in the development of the rehabilitation strategy for reinstated floodplain areas is the control of settlement in backfilled overburden and any consequent effects on the reinstated floodplain surface. The proponent is currently preparing to commence floodplain rehabilitation works for a 100 ha area at the northern end of B Pit, in accordance with the RMP. A detailed monitoring program will be implemented for the B Pit floodplain rehabilitation area to obtain confirmation of the level of overburden settlement control. The results from this monitoring program will be used to refine the design of future floodplain rehabilitation areas to ensure appropriate levels of settlement control.

The proponent will prepare a Backfilling Management Plan prior to backfilling the floodplain areas. This plan will specify the proposed backfilling and compaction methods, materials to be used, monitoring program, performance criteria and quality control. The monitoring program will include:

- compaction and permeability testing of the compacted surface spoil layer;
- settlement monitoring in each layer of backfill using extensometers;

- surface settlement monitoring by survey of monument points installed at the surface of the compacted spoil layer; and
- piezometers to monitor groundwater levels in the backfill.

Surface Subsidence Areas

The potential effects of surface subsidence include:

- initiation of localised erosion;
- localised alteration of surface drainage paths;
- formation of localised surface depressions; and
- initiation of creek line erosion due to local steepening of bed grades.

Monitoring for these effects will be conducted periodically during active subsidence. Remedial drainage and erosion and sediment control works will be undertaken, where necessary, to mitigate these effects. Remedial works may include the following:

- rehabilitation of surface cracks by ripping/ploughing and reseeding where necessary;
- minor remedial drainage earthworks to redirect drainage paths;
- minor cut and/or fill earthworks to re-establish free drainage in depression/ponding areas; and
- minor creek line drainage works or stabilisation works to remediate any areas prone to erosion.

The progressive re-establishment of free drainage in the subsidence area can be achieved by relatively minor earthworks. This will predominantly include the construction of excavated trapezoidal drainage channels. These will be designed with sufficient capacity to cater for contributing catchments and with stable batter slopes. These channels will enable drainage of subsidence troughs along pre-existing drainage lines. Excavated material from the channels will be used for filling in any nearby ponding areas.

Particular attention will be paid to subsidence effects on Winton Creek. The creek will be monitored monthly during active subsidence and, if necessary, remedial drainage earthworks/rehabilitation will be designed and implemented to ensure that the stability of the creek is not adversely impacted due to changes in the grade of the creek bed. These works may include regrading of sections of the creek bed and/or creek stabilisation works including revegetation and/or installation of scour protection in sections of steep bed grades.

Tailings Dams

Tailings will be pumped as a slurry from the washplant to two out of pit tailings emplacement areas (Figure 21-6). These emplacement areas will be designed to enable progressive beaching and drying of tailings solids and collection of supernatant water for return to the washplant process water circuit.

Conventional coal tailings dam rehabilitation will be completed after filling and drying of the dams. Rehabilitation will include covering the final surface with 1 m of benign overburden material and 300 mm of topsoil. Tailings beaching and design of the cover layer will be conducted to create relatively flat final rehabilitation surface levels. Minor drainage works will be installed as necessary. The cover layer will provide a growth medium for deep rooted grasses.

The finished surface will be ripped, seeded and fertilised. The area will be ripped on the contour to a depth of 600 mm. Seeding will include a mixture of pasture grasses and legumes. Fertiliser will be spread to encourage establishment of a dense pasture cover.

Rehabilitation Monitoring and Maintenance

The RMP includes monitoring and maintenance programs for current site rehabilitation. These include monitoring of rehabilitation ground cover, species frequency and erosion rates.

Maintenance works are triggered on the basis of monitoring results. Maintenance works include:

- ripping and reseeding areas of poor germination;
- maintenance of rehabilitation drainage and sediment control works; and
- installation of additional drainage and controls for erosion areas.

The RMP also includes the establishment of analogue sites and rehabilitation monitoring reference sites to enable the development of site rehabilitation success criteria.

The current site rehabilitation monitoring and maintenance programs specified in the RMP will be extended to apply to all project rehabilitation areas to ensure that rehabilitation is established to appropriate standards.

The geochemical characterisation of overburden and reject material completed for the project (*Appendix A*) did not identify any materials with adverse geochemical characteristics that pose a significant contamination risk. However, the report recommends periodic monitoring of runoff water from overburden and tailings emplacement areas in order to confirm the benign geochemistry of the materials.

Proposed water quality monitoring includes:

- Monthly monitoring of tailings dam water for pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS);
- Opportunistic monitoring of overburden runoff at representative locations, during runoff events; and
- Bi-annual testing of the full suite of dissolved metals (listed in Table 21-7) for tailings dam water and overburden emplacement runoff.

Table 21-7
Dissolved Metals to be Monitored Bi-annually

Major Element	Detection Limit (mg/L)	Minor Element	Detection Limit (mg/L)
Ca	2	Al	0.2
Mg	2	As	0.02
Na	2	B	0.2
K	2	Cd	0.02
Cl	2	Co	0.02
SO ₂	10	Cr	0.02
		Cu	0.02
		Fe	0.2
		Mn	0.02
		Mo	0.02
		Pb	0.02
		Se	0.02
		Zn	0.02

(Detection Limit is the lowest concentration of a chemical that can reliably be distinguished from a zero concentration)

If the pH of runoff from overburden or tailings water drops below pH 6.0 or the EC value increases by more than 50%, then a more comprehensive range of water quality analysis would be triggered and, if necessary, a detailed geochemical investigation conducted to determine the cause.

Topsoil Management

Detailed topsoil management measures for the project area are provided below.

Planning

Topsoil resource assessments, carried out in advance of mining, will enable detailed volume calculations and preparation of stripping plans prior to clearing. The stripping plans will also include designated respreading areas or stockpile locations.

Variability occurs within the soil types of each of the terrain units. Consequently, monitoring of soil type variability will be undertaken during the ongoing operational phases of the project to ensure that the maximum quantity and quality of useable topsoil resources is recovered.

A site topsoil register that includes recorded locations and volumes of all topsoil stockpiles will be maintained.

Stripping

The proponent has developed a "Permit to Disturb" procedure to ensure that usable topsoil is salvaged prior to disturbance.

Prior to the commencement of stripping, areas will be cleared of any timber. Earthmoving plant operators will be trained and/or supervised to ensure that stripping operations are conducted in accordance with stripping plans and in situ soil conditions. This will ensure that all suitable topsoil material resources are salvaged and that the quality of the stripped topsoil is not reduced through contamination with unsuitable soils.

Care will be taken during stripping, stockpiling, and respreading to ensure that excessive compaction does not occur during stockpiling.

The volume of topsoil stripped and the stockpile location will be recorded.

Stockpiling

Where possible, topsoil will be respread directly from stripped areas onto prepared rehabilitation areas. Where this is not possible, topsoil will be stored in designated stockpile areas.

Topsoil stockpiles will be located in areas that are outside the mining disturbance area and away from drainage lines. The stockpiles are limited to 5 m in height to preserve topsoil quality. The side slopes of stockpiles will be reduced to a stable gradient. Erosion and sediment controls will be installed at stockpile areas, as necessary. Establishment of any declared weeds on the stockpiles will also be monitored and controlled. Topsoil stockpiles will be clearly sign-posted for easy identification and to avoid any inadvertent losses.

Respreading

Mine rehabilitation planning will include topsoil respreading considerations including:

- Balancing required rehabilitation topsoil quantities against stored stockpile inventories; and
- Planning the source of topsoil to maximise direct respreading from stripping areas and to minimise the length of time that material is stored in stockpiles.

During the removal of soils from the stockpiles, care will be taken to minimise structural degradation of the soils. The respreading process will result in some mixing of the upper and lower sections of the stockpiles, promoting the spread of seed stock and micro-fauna through the lower sections of the stockpile.

Topsoil material will be respread in even layers at a thickness appropriate for the intended land use of the area to be rehabilitated.

The mine rehabilitation strategy will include the following measures that are designed to minimise the loss of topsoil material respread on rehabilitated areas:

- Contour ripping to encourage rainfall infiltration and minimise runoff;
- Reseeding soon after respreading to establish vegetation cover as early as possible;
- Installation of slope drainage control to limit slope lengths and runoff velocities; and
- Installation of collection drains and sediment dams to collect runoff and remove suspended sediment.

Erosion and Sedimentation Controls

In addition to the topsoil management and rehabilitation methods described above, the following erosion and sediment control measures will be employed as part of the surface water management system for the project:

- diversion of clean runoff away from areas disturbed by mining activities;
- collection of runoff from areas disturbed by mining activities in catch drains and direction to sediment traps and settling dams for control of suspended sediment prior to discharge from site;
- collection of runoff from infrastructure areas in catch drains and direction to storage dams for re-use as mine water supply;
- transfer of open cut pit water to storage dams for re-use as mine water supply; and
- discharge of any excess mine water to the Nogoia River in accordance with the conditions of the Ensham Mine Environmental Authority (EA).

Land Contamination

The following management measures will be implemented to prevent land contamination:

- Petroleum and chemical storage areas will be designed and bunded in accordance with AS1940: *The storage of flammable and combustible liquids* to contain and recover spills. Bunding will also allow for collection of stormwater for treatment or appropriate disposal.
- Waste hydrocarbons and miscellaneous chemicals will be handled in accordance with standard operating procedures to minimise potential for spillage and leakage.
- Key staff will be trained in spills prevention and clean up.
- Oil spill clean up kits will be provided at strategic locations as part of site emergency planning.
- Workshop and truck wash down area contaminants will be directed to sumps for containment and subsequent treatment or appropriate disposal.
- Leachate or surface runoff from the tailings area will be controlled.

Details of new areas with notifiable activities will be provided to the EPA. These will include the tailings dams and petroleum storage associated with underground mining and the washplant.

Decommissioning

The RMP addresses site decommissioning for the current approved operations. Decommissioning strategies include:

- Demonstration of acceptable overburden rehabilitation standards through the achievement of site rehabilitation success criteria;
- Bunding and/or fencing of the high walls and end walls of final voids for public safety;
- Regrading of ramps, where necessary, to blend in with the rehabilitated overburden emplacements; and

- Decommissioning of mine infrastructure areas. This involves removal of infrastructure, remediation of any land contamination, ripping, topsoiling (if necessary) and seeding. Infrastructure useful for subsequent landowners, such as roads, may be left in place.

The current site decommissioning strategies specified in the RMP will be extended to apply to project open cut mining areas and infrastructure areas.

Underground mine entries will be permanently sealed at mine closure in accordance with the Department of Natural Resources, Mines and Water (NRMW) requirements.

21.12.5 Proposed EA Conditions Schedule F - Land

Rehabilitation landform criteria

- (F1-1) All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover
- (F1-2) Progressive rehabilitation must commence when areas become available within the operational land.
- (F1-3) The holder must revise its existing Rehabilitation Management Plan to incorporate rehabilitation for all mining areas associated with the Ensham Central Project. The revised Rehabilitation Management Plan must be submitted to the Administering Authority for approval at least twenty eight (28) days prior to the commencement of the project. The revised Rehabilitation Management Plan is deemed to be accepted if the administering authority has not rejected the revised Rehabilitation Management Plan within 28 days of its submission. The Rehabilitation Management Plan must:
- a) map existing areas of rehabilitation;
 - b) detail rehabilitation methods applied to areas in F1-3 (a);
 - c) identify success factors from areas in F1-3 (a);
 - d) detail future rehabilitation actions to be completed on areas in F1-3 (a);
 - e) identify any rehabilitation and analogue sites to be used to develop rehabilitation success criteria;
 - f) detail landform design criteria;
 - g) detail future planned rehabilitation methods for disturbed areas;
 - h) detail planned native vegetation rehabilitation areas and corridors;
 - i) detail rehabilitation monitoring and maintenance requirements to be applied to all areas of disturbance;
 - j) detail end of mine landform design plan;
 - k) detail spoil characteristics, soil analysis, soil separation of or use on rehabilitation; and
 - l) detail potential problems and how they will be addressed.

Reinstated Floodplain Backfilling

- (F2-1) Backfilling of the reinstated floodplain will include construction of a low permeability compacted surface layer (achieving a maximum permeability of 1×10^{-5} m/sec).

- (F2-2) The holder must develop a Backfilling Management Plan for reinstated floodplain areas prior to the commencement of the Ensham Central Project. The Backfilling Management Plan must:
- a) map the areas of the floodplain that will be reinstated as part of the Ensham Central Project;
 - b) detail backfilling methods and quality control procedures to be applied to areas in F2-2 (a);
 - c) detail the construction method, materials and quality control procedures for construction of the compacted surface layer in F2-1;
 - d) detail an ongoing monitoring program for reinstated floodplain areas including:
 - compaction and permeability testing of the compacted surface spoil layer;
 - settlement monitoring in each layer of backfill using extensometers;
 - surface settlement monitoring by survey of monument points installed at the surface of the compacted spoil layer;
 - piezometers to monitor groundwater levels in the backfill; and
 - e) detail landform performance criteria for the areas in F2-2 (a).

Final Voids

- (F3-1) All reasonable and practicable measures must be taken to minimise or prevent serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority.
- (F3-2) If final voids are to be left, an investigation into void options must be prepared and a report submitted to the administering authority. The investigation must at a minimum include the following:
- a) A study of options available for minimizing final void area and volume;
 - b) A void hydrology study, addressing the long-term area water balance in the voids, connections to groundwater resources and water quality parameters in the long term;
 - c) A pit wall stability study, considering the effects of long-term erosion and weathering of the pit wall and the effects of significant hydrological events;
 - d) A hydrological study into the long-term risk of the Nogoia River, Boggy Creek / final void interaction, including erosion of the levee and extreme hydrological events, and the consequences of such interaction to the long-term stability of the final voids;
 - e) A study of void capability to support native flora and fauna;
 - f) A proposal/s for end of mine void rehabilitation success criteria and final void areas and volumes.

These studies will be undertaken during the life of the mine, and will include detailed research and modeling. All studies must be complete prior to 5 years before end of open cut mining.

Dams containing hazardous waste

- (F4-1) The holder of the environmental authority must design, construct and operate all high-hazard dams containing hazardous waste in accordance with the Code of Environmental Compliance for High Hazard Dams Containing Hazardous Waste.
- (F4-2) The holder of the environmental authority must design, construct and operate all low-hazard dams containing hazardous waste and non-hazardous dams in accordance with the criteria outlined in Appendix B of the Code of Environmental Compliance for Mining Activities.

Topsoil Management

- (F5-1) Topsoil resources, that are suitable for use in rehabilitation, must be salvaged ahead of mining disturbance, (or additional spoil placement) for strategic use in rehabilitation of the mine/spoil dump area. This topsoil removal and relocation must be documented in a Topsoil Stockpile Register.

Infrastructure

- (F6-1) All infrastructure, constructed by or for the environmental authority holder during the mining activities including water storage structures, must be removed from the site prior to mining lease surrender, except where agreed in writing by the post mining land owner / holder.

NOTE: This is not applicable where the landowner / holder is also the environmental authority holder.

21.13 NATURE CONSERVATION

21.13.1 Environmental Values

The environmental values to be enhanced or protected are the life, health and wellbeing of the terrestrial and aquatic flora and fauna, and the diversity of ecological processes and associated ecosystems within the project area.

21.13.2 Background

An ecological assessment was undertaken for the project, including comprehensive field surveys over two seasons. The assessment concluded:

- The majority of the project site is cleared and dominated by cultivated land and native or improved pasture.
- There are small patches of remnant and non-remnant vegetation, generally associated with riparian areas and drainage lines.
- A total of six different Regional Ecosystems (REs) were recorded on site. Of these, RE 11.3.1 and RE 11.4.8 are listed as Endangered under the Queensland *Vegetation Management Act 1999 (VM Act)* and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. RE 11.4.8 is beyond the disturbance area of the project.
- No threatened flora species were recorded on the site.
- The majority of the site's fauna is listed under the *Queensland Nature Conservation Act (NC Act)* as being 'Common Wildlife'. Six fauna species of conservation significance under the *NC Act* were recorded on the site or are listed from records of the region and may occur on the site.

- No fauna species listed as threatened under the *EPBC Act* were found on site, despite targeted searches. A total of 11 migratory birds listed under the *EPBC Act* were recorded on the site or may occur on the site.
- The Nogoia River, anabranh and Winton Creek provide habitat and movement corridors within the site.
- The Nogoia River, anabranh and Duckponds, together with numerous artificial dams, are the key aquatic habitats. They are highly disturbed systems and have been impacted by agricultural clearing in the catchment, high sediment loads, and altered flows due to the Nogoia McKenzie regulated water supply system.
- No aquatic species of conservation significance were recorded.
- Five declared plant (weed) species under the *Land Protection (Pest and Stock Route Management) Act* were recorded in the site. None of the declared species were present in significant numbers.

21.13.3 Potential Impacts

Potential impacts on ecological values of the proposed mining activities were assessed in terms of direct and indirect effects.

Direct Impacts

A total of 163 ha of remnant vegetation will be cleared comprising:

- 113 ha of RE 11.3.25 ('Not of Concern' under the *VM Act* and not listed under the *EPBC Act*).
- 9 ha of Brigalow (RE 11.3.1) ('Endangered' under the *VM Act* and *EPBC Act*).
- 41 ha of RE 11.7.1 ('Not of Concern' under the *VM Act* and not listed under the *EPBC Act*).

This represents approximately 19% of the remnant vegetation within the study area.

Removal of the anabranh and its associated vegetation will lead to a loss of habitat and habitat corridors for fauna species. However, remnant vegetation associated with the Nogoia River will not be disturbed and will continue to provide a habitat corridor for fauna species. Section 21.13.4 describes the offsets that will be implemented as mitigation for this impact.

The main channel of the Nogoia River will not be disturbed by the project. However, the project will result in the loss of the anabranh and Duckponds. The loss of the anabranh and Duckponds is unlikely to be of local or regional significance for aquatic species because of the poor condition of these systems.

Indirect Impacts

Indirect impacts associated with the project include:

- Surface subsidence from underground mining. The majority of the area to be subsided is cultivated land or cleared pasture. A total of 50 ha of 'not of concern' remnant vegetation (RE 11.3.25/11.3.25e) will be subsided. Subsidence itself would not cause the loss of vegetation. Subsidence may, however, cause surface cracking, ponding, or erosion which could potentially affect flora and fauna.
- Vegetation removal, soil disturbance and altered flow patterns resulting from open cut mining operations have the potential to increase erosion and sedimentation within the mine site. Sediment and erosion controls will be installed to prevent any impacts on water quality in the Nogoia River.
- If not controlled, weed species may increase in areas where disturbance has occurred.

21.13.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The key environmental protection objective is to minimise and mitigate any adverse impacts on terrestrial and aquatic flora and fauna.

Mitigation Measures

Vegetation Clearing

The proponent will implement a Vegetation Management Plan which will address the long-term protection and management of vegetation associated with the Nogoia River. Implementation of this plan is designed to compensate for the loss of remnant vegetation associated with the anabranche. Protection and management of vegetation associated with the Nogoia River will also maintain habitat linkages for flora and fauna species and provide for recolonisation of rehabilitated areas by local native species.

The area subject to this Vegetation Management Plan is shown on Figure 21-7. This area includes the following vegetation:

- 212 ha of RE 11.3.25e;
- 29 ha of RE 11.3.25e/3.3; and
- 100 ha of non-remnant vegetation with Brigalow (11.3.1) elements. These areas formerly supported Brigalow vegetation, but currently do not meet the *VM Act's* criteria for remnant vegetation because of their poor condition. Management and enhancement of this vegetation will facilitate the recovery of these areas over time.

Implementation of the Vegetation Management Plan will thus offset the loss of 9 ha of Brigalow (RE 11.3.1) with the management of 100 ha of vegetation that formerly supported the same Brigalow community and enhancement of additional areas of remnant vegetation.

The Vegetation Management Plan will include measures to control weeds, grazing, site access, erosion and sedimentation and fire.

In addition to the protection and management of vegetation associated with the Nogoia River, the Vegetation Management Plan will address the management of approximately 31 ha of regrowth vegetation in an area on the north-west boundary of the proponent's land (Figure 21-7). This will provide further habitat linkages, particularly between remnant vegetation on the proponent's land and on adjoining properties. Regeneration will be achieved by controlling and/or excluding stock from the area and relocating felled trees/stags to the regeneration site to encourage colonisation of the area by native flora and fauna.

The impact of clearing of remnant vegetation will further be mitigated by progressive rehabilitation and revegetation of mined areas. The re-establishment of native habitat will be considered in the development of the mine rehabilitation strategy.

Finally, the following vegetation clearing procedures will be adopted for clearing of remnant vegetation associated with the project to minimise impacts on flora and fauna:

1. The area to be disturbed will be limited to the minimum area necessary;
2. The clearance area will be clearly delineated to ensure that no disturbance occurs outside the area;
3. Prior to clearing commencing, all trees to be removed will be subjected to a pre-clearing survey, conducted by the Ensham Environmental Officer. Specific tasks will include:

- inspect trees for the presence of bats and other mammals;
 - inspect trees for nesting birds; and
 - inspect trees for den/roost/nest hollows.
4. If threatened species are detected nesting in the trees, an ecologist will be consulted to develop management plans or mitigation procedures for the species and to determine whether nests can be relocated;
 5. Any trees which are to be retained within the area will be flagged;
 6. Trees and stags with roost/den/nest hollows will be identified and flagged so that these can be salvaged after felling;
 7. Once felled, hollows within trees/stags (especially those greater than 20cm diameter) will be inspected for fauna. Hollows containing fauna will be flagged. In the event of any identified injured native fauna being found, appropriate specialist advice will be sought and appropriate actions taken;
 8. Felled trees will be allowed to stand for at least 24 hours to allow fauna within hollows to vacate;
 9. Prior to salvage, flagged hollows will be inspected and if fauna is still present it will be relocated, in consultation with a native fauna specialist. Hollows will be relocated along with all denning, roosting or nesting material; and
 10. Remaining tree sections will be relocated to remnant habitat areas to substitute for the absence of ground structures in these areas (i.e. fallen dead timber), where practicable.

Underground Mine Subsidence

Monitoring of surface subsidence is to be conducted for the duration of underground mining. Any areas of significant subsidence related surface cracking will be rehabilitated and remedial drainage works will be completed, where necessary, to prevent ponding and erosion. These works are described further in Section 21.12.4 of the EM Plan. Where possible, subsidence remediation work will be designed to avoid any clearing of vegetation areas. Where subsidence remediation work requires clearing of remnant vegetation, the vegetation clearing procedure described above will be followed.

Weed Management and Feral Animal Control

Ensham Mine has an existing weed and feral animal control program. This program will be applied to the Ensham Central Project area. Specific elements of the program include:

- A formal induction process for all staff and contractors to detail weed identification, distribution and prevention strategies (i.e. washdown procedures);
- Active monitoring and control of weeds on the project site in co-ordination with surrounding landholders in accordance with best practice guidelines;
- Use of vehicle washdown facilities; and
- All programs will be conducted in accordance with any local government pest or weed management plans.

Fauna Mortality on Roads

The proponent will implement measures to reduce fauna mortality on roads within the project site. These measures will be implemented for roads that traverse areas of significant fauna habitat, including the haul road crossing of the Nogoia River. Measures to be implemented include the provision of fauna crossing signs to warn drivers.

21.13.5 Proposed EA Conditions Schedule F – Land (Continued)

Vegetation Management

- (F7-1) Prior to any clearing of remnant vegetation associated with the Ensham Central Project, the holder must submit to the Administering Authority a Vegetation Management Plan. When developing the plan the holder should address the following matters:
- a) measures for the long-term protection and management of existing area(s) of remnant vegetation and regrowth with a Brigalow component adjacent to the Nogoia River (refer Figure 21-7 of the Ensham Central Project Environmental Management Plan);
 - b) state environmental objectives, performance criteria, monitoring, reporting, corrective action, responsibility and timing for long term protection and management; and
 - c) measures to control weeds, grazing, site access, erosion and sediment control and fire management.
- (F7-2) The Vegetation Management Plan referred to in condition (F7-1) must also address the management of regrowth of an area on the north-west boundary of mining lease (refer Figure 21-7 of the Ensham Central Project Environmental Management Plan) to mitigate for impacts on north-south habitat corridor connectivity.

21.14 COMMUNITY

21.14.1 Environmental Values

The environmental values to be enhanced or protected are those that relate to the existing lifestyle of the surrounding community, including the general wealth, health, safety and wellbeing of the community.

21.14.2 Setting

The project is located approximately 40 km east of Emerald. Comet is the nearest township and is located approximately 10 km south of the project site. The project site is surrounded by agricultural land used for grazing and cropping. There are a number of privately owned rural residences in the vicinity of the project site.

21.14.3 Potential Impacts

The potential community impacts of the project include:

- Reduced residential amenity due to (dust, odour, noise, airblast overpressure and ground vibration due to blasting, and changes to the visual environment);
- impacts on private groundwater bores;
- traffic;
- impacts on housing demand and supply, and community infrastructure and services; and
- social implications of the project workforce accommodation arrangements.

21.14.4 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental objectives are to minimise any environmental nuisance on neighbouring residents and the local community.

Environmental Controls

The proponent will implement the following strategies to minimise the potential impacts listed above:

- To manage dust, odour, noise, airblast overpressure, ground vibration and impacts on private groundwater bores in accordance with mitigation strategies described in other sections of this EM Plan.
- Rehabilitate mine disturbances in accordance with mitigation strategies described in Section 21.12. These measures will serve to reduce any impact of the project on the existing visual environment.
- House the majority of the workforce in on site camp accommodation.
- Participate in the Central Highlands Development Corporation (CHDC) Mining Forum, which addresses issues related to accommodation and skills.
- Participate in the CHDC Skills Development Study Program, which considers skills development in the Central Highlands region.
- Provide timely workforce data and planning updates to forums and agencies involved in planning related to accommodation provision, social infrastructure and skills development. These include the Emerald Shire Council, Peak Downs Shire Council, CHDC Mining Forum, CHDC Skills Development Study and any relevant social infrastructure providers.
- Continue to provide an independent counselling service to the project workforce to provide professional guidance on personal matters.
- Maintain the existing Ensham Mine community complaints handling protocol to respond to any complaints related to the project.

21.14.5 Proposed EA Conditions Schedule G - Community

Complaint response

(G1-1) All complaints received must be recorded including details of complainant, reasons for the complaint, investigations undertaken, conclusions formed and actions taken. This information must be made available for inspection by the administering authority on request.

21.15 CULTURAL HERITAGE

21.15.1 Environmental Values

The environmental values of the cultural environment to be enhanced or protected are those qualities that are of particular aesthetic, archaeological, architectural, historical, social or scientific significance with respect to:

- Aboriginal occupation of the mining tenement; and
- Non-Aboriginal occupation of the mining tenement.

Aboriginal Cultural Heritage

The following Aboriginal parties have been identified in accordance with the *Aboriginal Cultural Heritage Act 2003*:

- Garingbal and Kara Kara (project area south of the Nogoa River); and
- Kangoulu People (project area north of the Nogoa River).

A Cultural Heritage Management Plan (CHMP) for the area south of the Nogoa River has been developed with the Garingbal and Kara Kara endorsed parties and approved by the NRMW, and a separate CHMP for the area north of the Nogoa River is being developed with the Kangoulu endorsed parties. Development of the CHMPs included detailed surveys of the project area. The results of the surveys are contained in the CHMP documents, which are confidential documents.

Non-Aboriginal Cultural Heritage

A non-Aboriginal heritage assessment was undertaken for the project. This assessment, in conjunction with previous heritage assessments undertaken for Ensham Mine, includes the full extent of the project area.

No sites or places of significance have been recorded on the Queensland Heritage Register, the Register of the National Estate, the National Trust, the Commonwealth Heritage List or the National Heritage List for the project area. The non-Aboriginal heritage assessment identified a single site of local historical significance within the project area, namely the *Duckponds* homestead and associated stockyards. This site has been heavily modified from its original form and is of local significance only. It does not meet any of the criteria for entry into the Queensland Heritage Register. There are no other sites of historical significance within the project area.

21.15.2 Potential Impacts

Aboriginal Cultural Heritage

The survey reports used to develop the CHMPs describe the impacts of the project on Aboriginal cultural heritage.

Non-Aboriginal Cultural Heritage

The *Duckponds* homestead and its associated stockyards are within the footprint of proposed open cut mining operations will be removed in advance of mining. There are no other impacts on non-Aboriginal heritage.

21.15.3 Environmental Protection Objectives and Control Strategies

Environmental Protection Objectives

The environmental protection objectives for cultural heritage are to:

- ensure the protection, enhancement, or appropriate management of all things of particular aesthetic, archaeological, architectural, historical, social or scientific significance with respect to Aboriginal and non-Aboriginal occupation in the mining tenements; and
- manage all Aboriginal cultural heritage in accordance with an approved CHMP.

Aboriginal Heritage Mitigation Measures

The proponent will manage all matters with respect to Aboriginal heritage in accordance with approved CHMPs developed in consultation with the Garingbal and Kara Kara and Kangoulu People.

Non-Aboriginal Cultural Heritage Mitigation Measures

A record of the Duckponds Homestead and its associated stockyards will be compiled prior to its removal. This record will comprise a scaled plan of the house (floor and profile) and stockyards and a comprehensive photographic record. This record will be provided to the local historical society.

21.15.4 Proposed EA Conditions Schedule H – Cultural Heritage

No environmental authority conditions are proposed.

21.16 DEFINITIONS

Definitions

“**acceptance criteria**” means the measures by which the actions implemented to rehabilitate the land are deemed to be complete. The acceptance criteria indicate the success of the rehabilitation outcome or remediation of areas which have been significantly been disturbed by the mining activities. Acceptance criteria may include information regarding:

- vegetation establishment, survival and succession;
- vegetation productivity, sustained growth and structure development;
- fauna colonisation and habitat development;
- ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;
- microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- resilience of vegetation to disease, insect attack, drought and fire;
- vegetation water use and effects on ground water levels and catchment yields.

“**airblast overpressure**” means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dB).

“**authority**” means environmental authority (mining activities) under the *Environmental Protection Act 1994*.

“**blasting**” means the use of explosive materials to fracture-

- rock, coal and other minerals for later recovery; or
- structural components or other items to facilitate removal from a site or for reuse.

“**commercial place**” means a work place used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees accommodation or public roads.

“**competent person**” means a person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for the reliance upon collected data or protection of the environment.

“**dam**” means a containment or proposed containment whether permanent or temporary, which is designed to contain, divert or control flowable substances. However this does not include a fabricated or manufactured tank or container designed to a recognised standard.

“**Ensham Central Project**” means the construction, development and operation of:

- an underground mine;
- underground mine infrastructure and a washplant; and/or
- open cut mining operations in the areas shown in Figure 21-1 of the EM Plan.

“**environmental authority holder**” means the holder of this environmental authority.

“**hazardous waste**” means any substance, whether liquid, solid or gaseous, derived by or resulting from, the processing of minerals that tends to destroy life or impair or endanger health.

“**LA**, eqadj, T means

“**mineral**” means a substance which normally occurs naturally as part of the earth’s crust or is dissolved or suspended in water within or upon the earth’s crust and includes a substance which may be extracted from such a substance, and includes:

- a) clay if mined for use for its ceramic properties, kaolin and bentonite;
- b) foundry sand;
- c) hydrocarbons and other substances or matter occurring in association with shale or coal and necessarily mined, extracted, produced or released by or in connection with mining for shale or coal or for the purpose of enhancing the safety of current or future mining operations for coal or the extraction or production of mineral oil therefrom;
- d) limestone if mined for use for its chemical properties;
- e) marble;
- f) mineral oil or gas extracted or produced from shale or coal by in situ processes;
- g) peat;
- h) salt including brine;
- i) shale from which mineral oil may be extracted or produced;
- j) silica, including silica sand, if mined for use for its chemical properties;
- k) rock mined in block or slab form for building or monumental purposes;

but does not include:

- l) living matter;
- m) petroleum within the meaning of the Petroleum Act 1923;
- n) soil, sand, gravel or rock (other than rock mined in block or slab form for building or monumental purposes) to be used or to be supplied for use as such, whether intact or in broken form;
- o) water.

“**peak particle velocity (ppv)**” means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mms^{-1}).

“**progressive rehabilitation**” means rehabilitation (defined below) undertaken progressively or a staged approach to rehabilitation as mining operations are ongoing.

“protected area” means:

- a protected area under the *Nature Conservation Act 1992*; or
- a marine park under the *Marine Parks Act 1992*; or
- a World Heritage Area.

“rehabilitation” the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

“residual void” means an open pit resulting from the removal of ore and/or waste rock which will remain following the cessation of all mining activities and completion of rehabilitation processes.

“self sustaining” means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

“sensitive place” means:

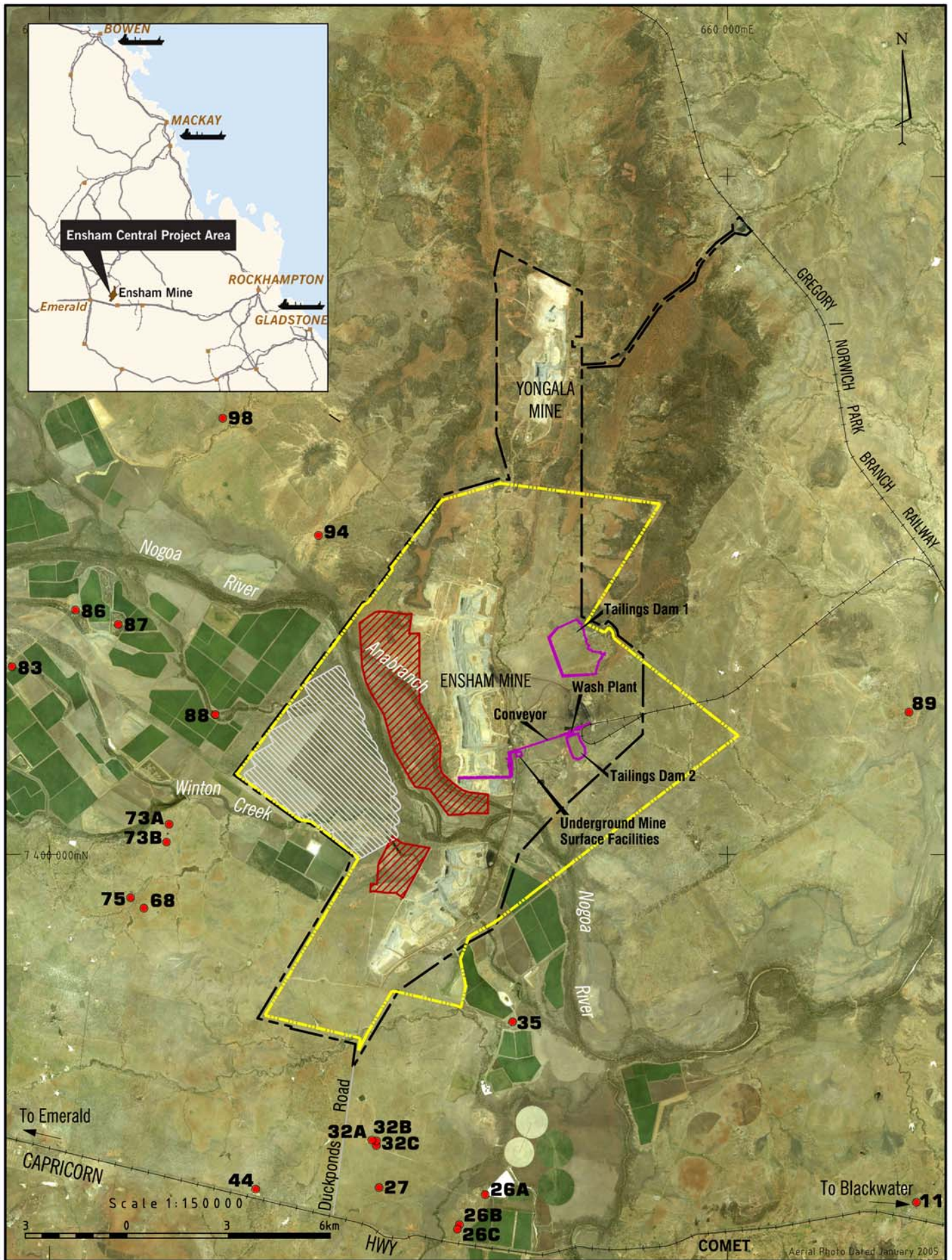
- a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- a motel, hotel or hostel; or
- an educational institution; or
- a medical center or hospital; or
- a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area; or
- a public park or gardens.

“stable” means geotechnical stability of the rehabilitated landform where instability related to the excessive settlement and subsidence caused by consolidation / settlement of the wastes deposited, and sliding / slumping instability has ceased.

“trivial harm” means environmental harm which is not material or serious environmental harm and will not cause actual or potential loss or damage to property of an amount of, or amounts totalling more than \$5,000.

“waters” includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea) or any part thereof.

FIGURES



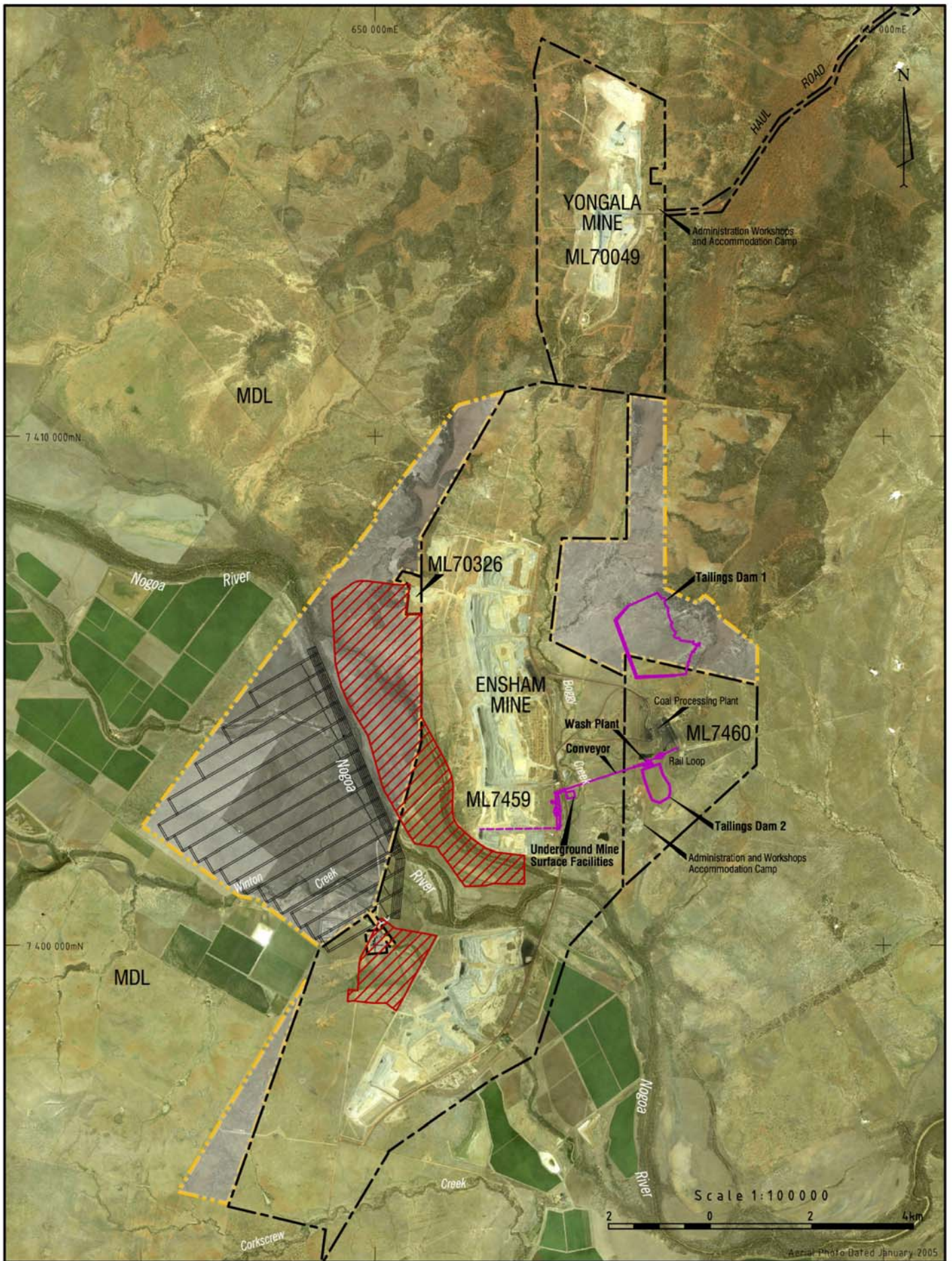
- Mining Lease and Mining Lease Application Area
- Ensham Owned Land
- Neighbouring Private Residence
- ▨ Project Open Cut Mining Area
- ▨ Project Underground Mining Area
- Project Infrastructure

ENSHAM CENTRAL PROJECT

Site and Surrounds



FIGURE 21-1



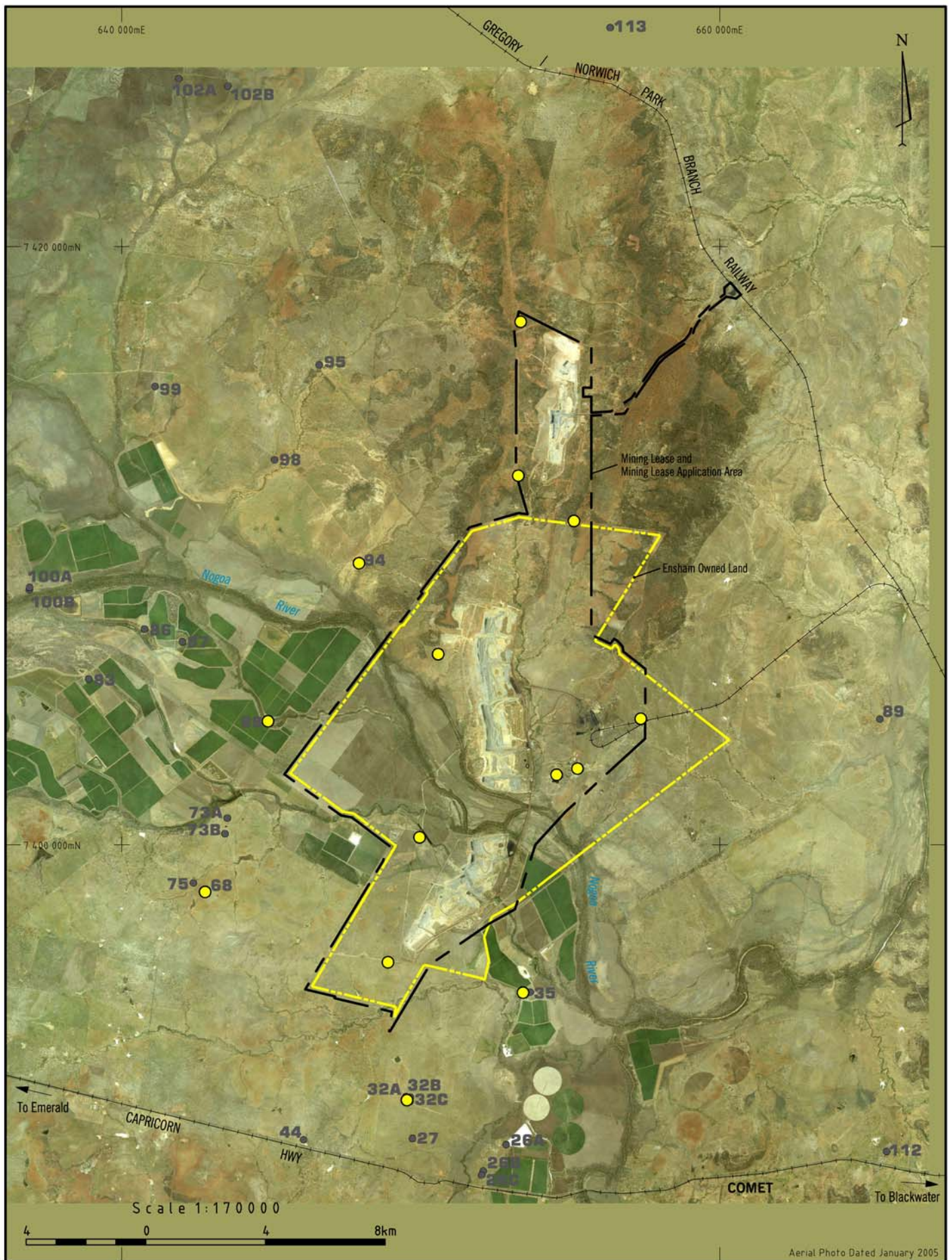
-  Existing Mining Lease Area
-  Project Mining Lease Application Areas
-  Project Open Cut Mining Area
-  Underground Mine Workings
-  Project Infrastructure

ENSHAM CENTRAL PROJECT

Project Layout and Mining Lease Application Areas



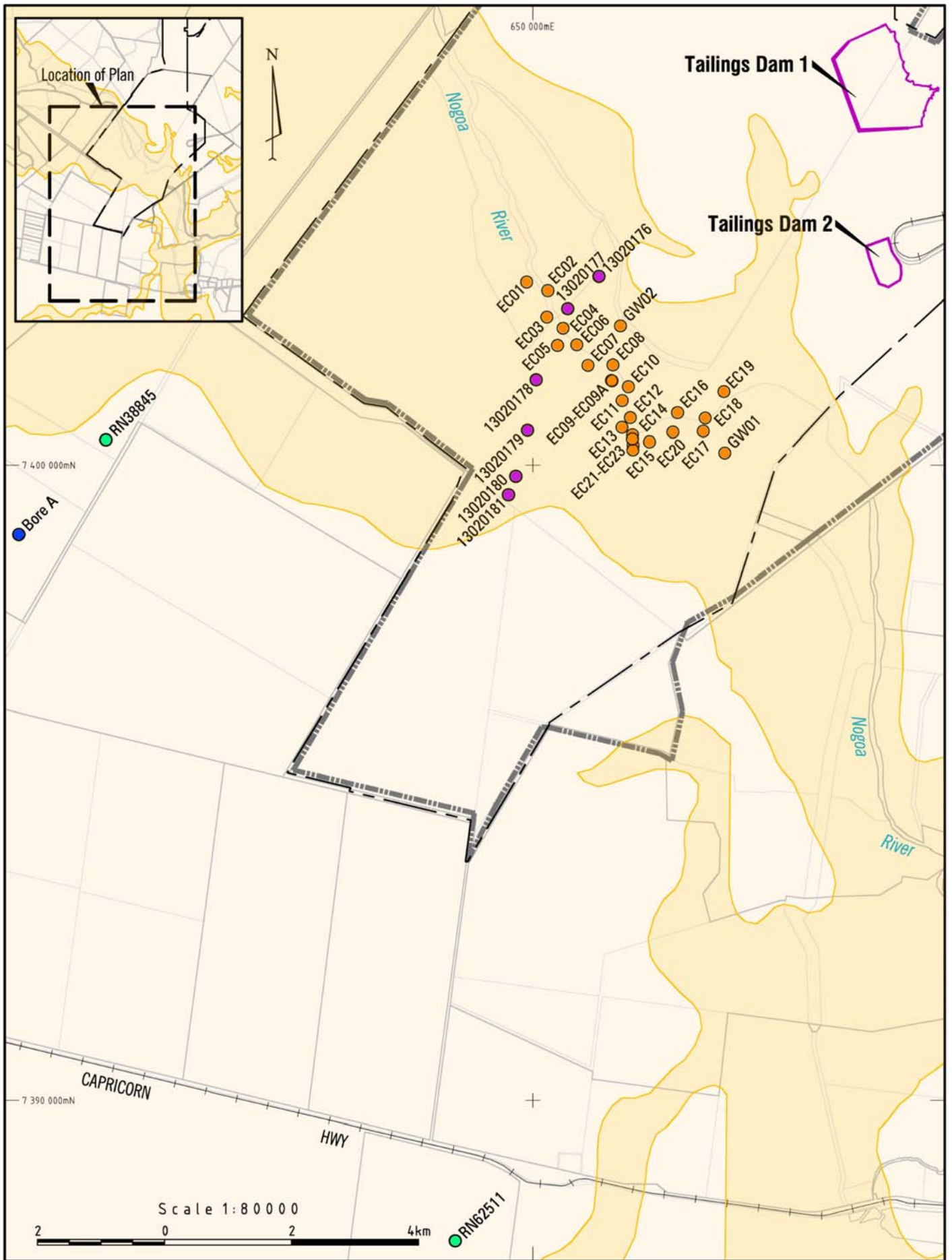
FIGURE 21-2



- Privately Owned Residence
- Dust Monitoring Location (Dust Deposition)
- Ensham Owned Land
- Mining Lease and Mining Lease Application Area

ENSHAM CENTRAL PROJECT

Dust Monitoring Locations

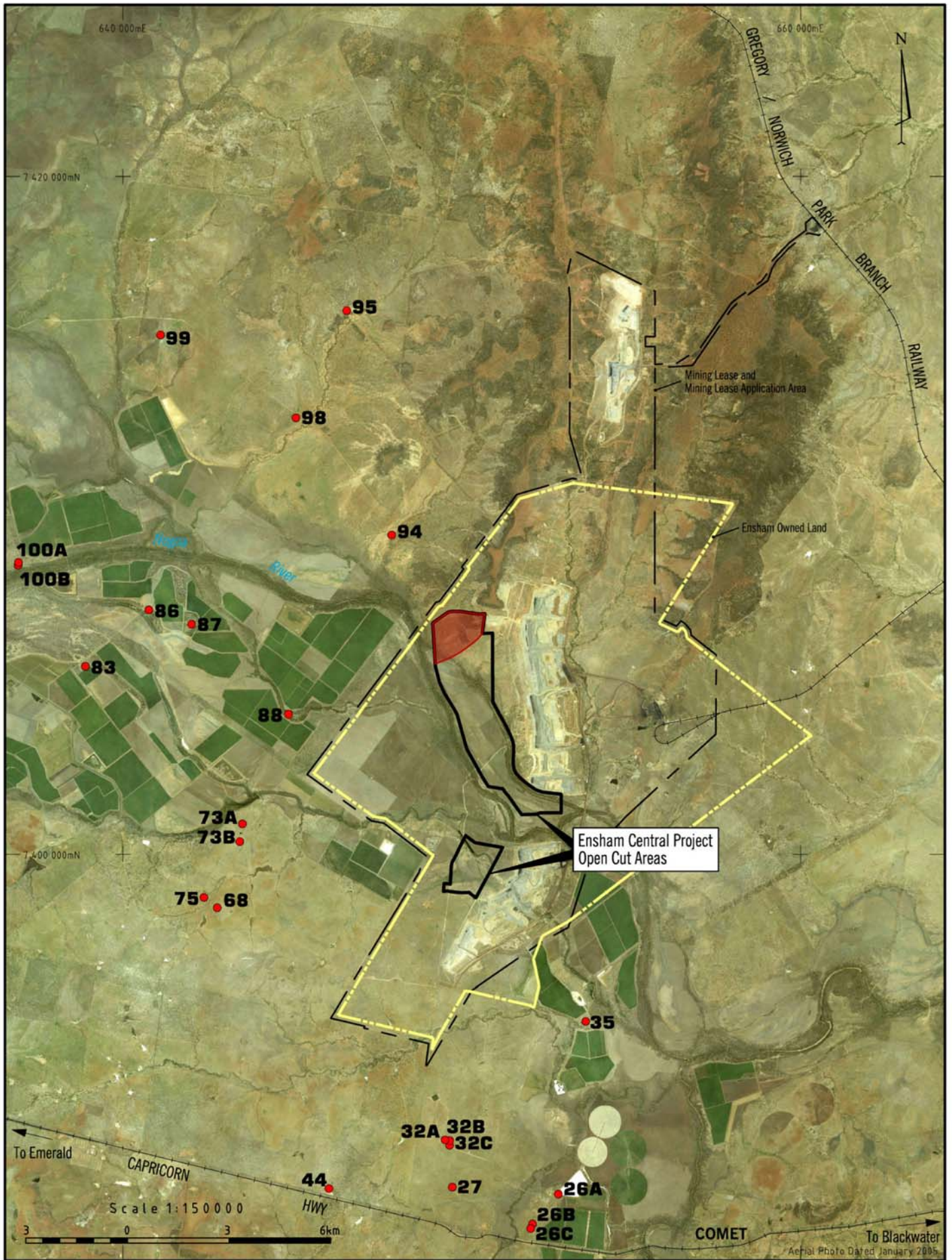


- Ensham Owned Land
- ... Mining Lease and Mining Lease Application Area
- Alluvial Aquifer

- Bores**
- Ensham Groundwater Monitoring Bore
 - NRMW Bore
 - Registered private bore
 - Unregistered inactive private bore

ENSHAM CENTRAL PROJECT

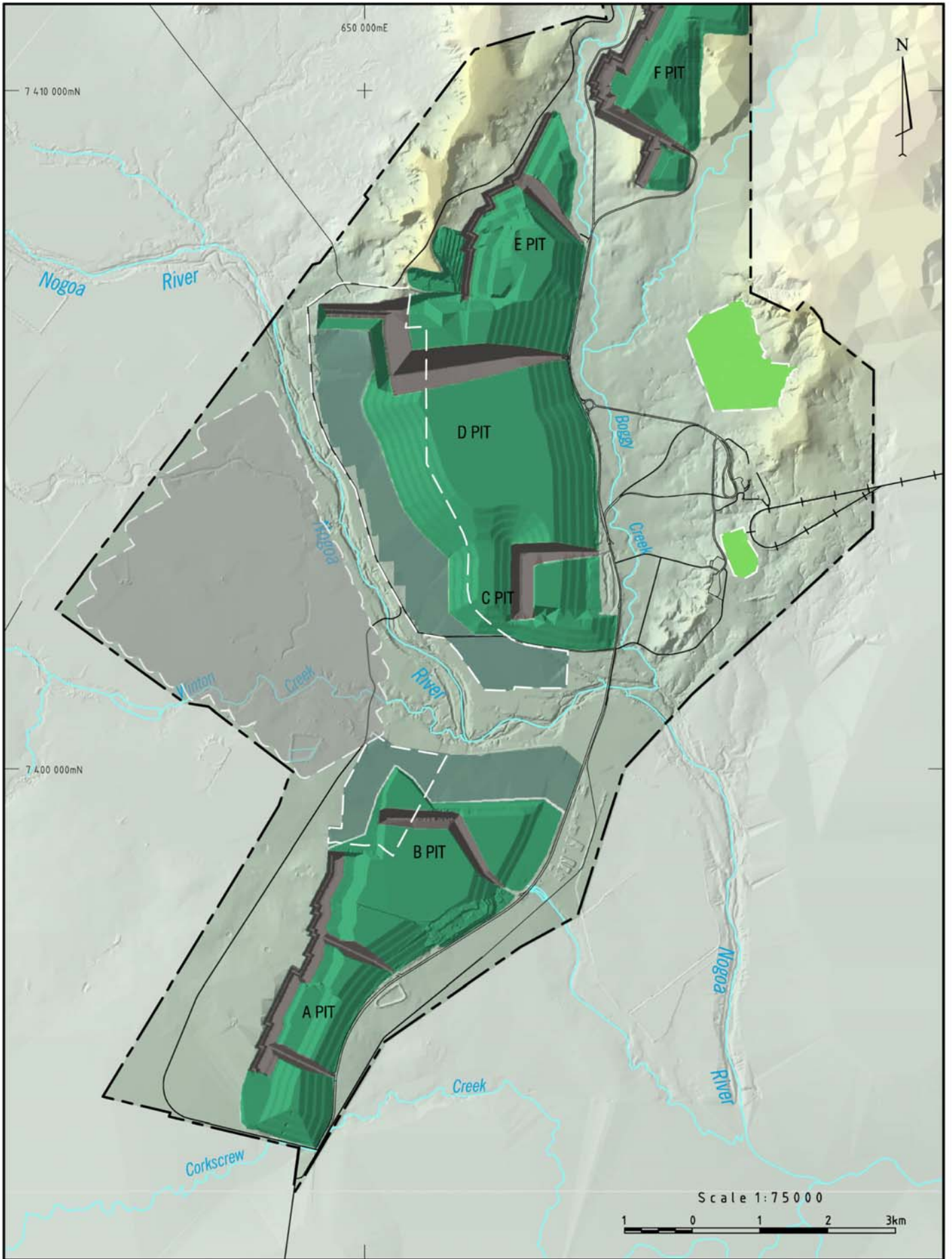
Groundwater Monitoring Plan



ENSHAM CENTRAL PROJECT

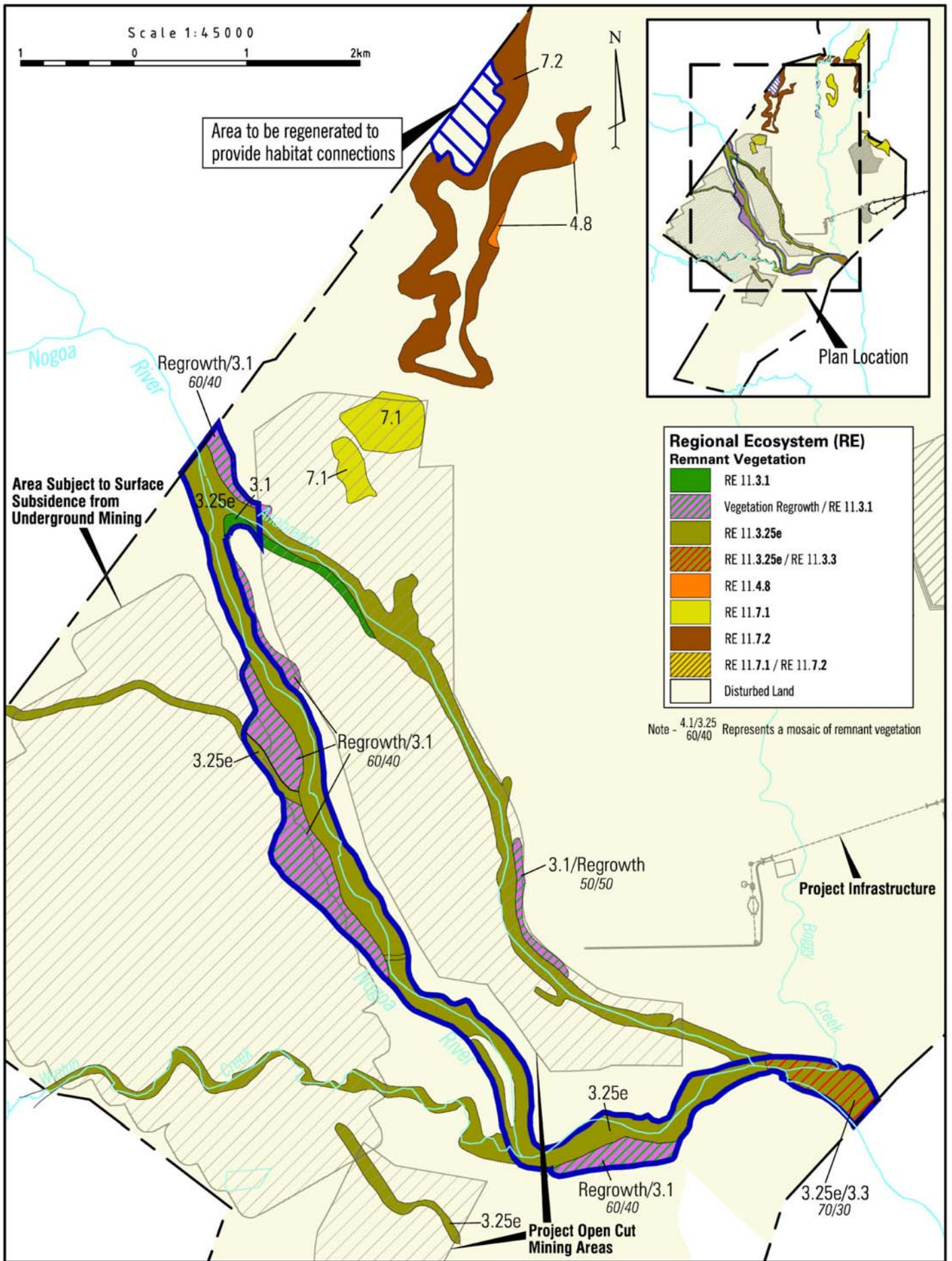
- Neighbouring Private Residence
- Ensham Owned Land
- Mining Lease and Mining Lease Application Area
- Area of Potential Blast Design Controls

Blast Mitigation Area



- Rehabilitated Elevated Overburden Emplacement
- Reinstated Floodplain
- Rehabilitated Tailings Dams
- Surface Subsidence Area
- Final Voids/Ramps
- Mining Lease and Mining Lease Application Area
- Road
- Project Disturbance Area

ENSHAM CENTRAL PROJECT
Project Rehabilitation Areas



- Mining Lease and Mining Lease Application Area
- ▨ Project Disturbance Areas
- Project Infrastructure
- ▭ Nogoia River Vegetation Subject to Vegetation Management Plan

ENSHAM CENTRAL PROJECT

Vegetation Mitigation Strategies

ATTACHMENT 21-1
LIST OF ENSHAM
CENTRAL PROJECT
STAKEHOLDERS

Table 1
List of Ensham Central Project Stakeholders

Category	Stakeholder
Neighbouring Landowners	18 landowners with properties adjacent to the Ensham Mine or properties with river frontage to the Nogoia River (5 km upstream or downstream of the Ensham Mine).
Federal Government	Department of Environment & Heritage (DEH)
State Government and Government Owned Corporations	Environmental Protection Agency (EPA) Representatives of the Environmental Operations Division (Brisbane) and the Regional Office (Emerald) were consulted.
	Department of Natural Resources, Mines and Water (NRMW) Representatives of Integrated Resource Management, Natural Resource Services and Bureau of Mining and Petroleum were consulted.
	Department of Communities
	Department of Housing
	Department of Main Roads
	Department of Primary Industries and Fisheries
	Department of State Development, Trade and Innovation
	Education Queensland
	Queensland Health
	Queensland Transport
	SunWater
Local Government	<ul style="list-style-type: none"> • Emerald Shire Council • Peak Downs Shire Council • Broadsound Shire Council • Nogoia River Flood Plain Board
Industry Bodies	<ul style="list-style-type: none"> • AgForce • Cotton Australia • Central Highlands Cotton Growers & Irrigators Association • Central Highlands Development Corporation • Fitzroy Basin Food & Fibres • Sunwater Customer Council
Environmental Groups	<ul style="list-style-type: none"> • Central Highlands Regional Resource Use Planning • Fitzroy Basin Association/Waterwatch • Integrated Area-Wide Management • Lake Maraboon Landcare Group
Community	<ul style="list-style-type: none"> • Anglicare • Centacare • Central Highlands Human Services Group • Central QLD TAFE - Central Highlands Campus • Central QLD University, Institute for Sustainable Regional Development • Emerald Chamber of Commerce • Domestic Violence Service of Central Queensland • Emerald Agriculture College

Category	Stakeholder
	<ul style="list-style-type: none">• Lions Club of Emerald Inc.• Emerald Neighbourhood Centre• Rotary Club of Emerald• Rotary Club of Emerald Sunrise• Comet Public School• Denison State School• Emerald North State School• Emerald State High school• Emerald State Primary school• St Patricks School
Endorsed Aboriginal Parties	<ul style="list-style-type: none">• Garingbal and Kara Kara People• Kangoulu People