Environmental Impact Statement (EIS) assessment report under the Environmental Protection Act 1994

for the Taroborah Coal Project

proposed by Shenhuo International Group Pty Ltd

Prepared by: Impact Assessment & Operational Support, Department of Environment and Heritage Protection

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Abbreviations and acronyms

AHD – Australian height datum

ALCAM – Australian level crossing assessment model

AMD – acid mine drainage

ANZECC (2000) – Australian and New Zealand Environment and Conservation Council, 2000

AS – Australian standard

BIBO – Bus-in-bus-out

CHMP – cultural heritage management plan

CHPP – coal handling and processing plant

CHRC – Central Highlands Regional Council

DATSIMA – Department of Aboriginal and Torres Strait Islander and Multicultural Affairs

dB(A) – A-weighted decibels

DIDO – drive-in-drive-out

DOTE – Australian Government Department of the Environment

DSDIP – Department of State Development, Infrastructure and Planning

DNRM – Department of Natural Resources and Mines

DTMR – Department of Transport and Main Roads

EA – environmental authority

e.g. – for example

EHP – Department of Environment and Heritage Protection

EIS – environmental impact statement

EP Act – *Environmental Protection Act 1994*

EPBC Act – *Environment Protection and Biodiversity Conservation Act 1999*

ERA – environmentally relevant activity (as defined in Schedule 2 of the EP Act)

etc. – et cetera

FIFO – fly-in-fly-out

GARID – Guidelines for Assessment of Road Impacts of Development

GDEs – groundwater dependant ecosystems

ha – hectares

HHMP – historic heritage management plan

i.e. – that is

IESC – Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development

IRMP – integrated risk management plan

kg – kilograms

km – kilometres

km/h – kilometres per hour

km^2 – kilometres squared

lcm – loose cubic metres

m – metres

MDL – Mineral development licence

mg/L – milligrams per litre

ML – megalitres or mining lease

ML/day – megalitres per day

mm – millimetres

mm/y – millimetres per year

MNES – matters of national environmental significance (as defined in the EPBC Act)

MR Act – *Mineral Resources Act 1989*

MSES – matters of State environmental significance

m/s – metres per second

Mt/y – million tonnes per year

NAF – non-acid forming

NC Act – *Nature Conservation Act 1994*

NPV – net present value

NTU – nephelometric turbidity units

PAA – priority agricultural area

PAF – potential acid forming

PAF–LC – potential acid forming–low capacity

$PM_{2.5}$ – particulate matter less than two point five micrometres in diameter

PM_{10} – particulate matter less than ten micrometres in diameter

QR – Queensland Rail

REMP – Receiving environment monitoring program

RIA – road infrastructure agreement

RIDA – regional interests development approval

RMP – road-use management plan

ROM – run-of-mine

RPI Act – *Regional Planning Interests Act 2014*

SCA – strategic cropping area

SCL – strategic cropping land

SIA – social impact assessment

SIMP – social impact management plan

SMU – soil management unit

t – tonnes

TEC – threatened ecological community

the proponent – Shenhuo International Group Pty Ltd

TI Act – *Transport Infrastructure Act 1994*

TOR – terms of reference

TSP – total suspended particulates

WICET – Wiggins Island Coal Export Terminal

WQO – water quality objective

$\mu g/m^3$ – micrograms per metre cubed

µS/cm – microSiemens per centimetre

°C – degrees Celsius

1 Introduction

This report provides an evaluation of the environmental impact statement (EIS) process pursuant to Chapter 3 of the *Environmental Protection Act 1994* (EP Act) for the Taroborah Coal Project proposed by Shenhuo International Group Pty Ltd (the proponent). The proponent is a Brisbane based coal exploration and development company, and is a subsidiary of the Henan Shenhuo Group Co Ltd.

On 12 December 2011, the proponent applied under sections 70 and 71 of the EP Act for approval to voluntarily prepare an EIS. The Department of Environment and Heritage Protection (EHP) approved the application under section 72 of the EP Act. The draft terms of reference (TOR) were publicly advertised in April/May 2012 for comment. Following this public consultation, the TOR were finalised on 2 August 2012.

EHP coordinated the EIS process as the administering authority of the EP Act. This EIS assessment report has been prepared pursuant to sections 58 (Criteria for preparing report) and 59 (Required content of report) of the EP Act.

1.1 Criteria considered when preparing this report

Section 58 of the EP Act lists the criteria that EHP must consider when preparing an EIS assessment report. The criteria are:

a) the final terms of reference (TOR) for the EIS

   The final TOR were issued to the proponent on 2 August 2012, and have been considered when preparing this EIS assessment report (Refer to section 5).

b) the submitted EIS

   The submitted EIS comprises:

   - the EIS (Volumes 1 to 4) that was available for public comment from 15 May to 26 June 2014
   - the response to submissions and the amended EIS received by EHP on 24 November 2014
   - amended section 3.7, Rehabilitation and decommissioning, and section 6.1, Environmental commitments received by EHP on 21 January 2015.

   All the components of the submitted EIS has been considered when preparing this EIS assessment report.

c) all properly made submissions and any submissions accepted by the chief executive

   EHP received 24 properly made submissions on the submitted EIS within the submission period. Two additional (not properly made) submissions were received after the submission period had ended. All submissions (including the two submissions that were not properly made) were accepted under section 55 of the EP Act. Those submissions were received from the following stakeholders:

   - Aurizon
   - Australian Government Department of the Environment (DOTE)
   - Central Highlands Regional Council (CHRC)
   - Department of Agriculture, Fisheries and Forestry
   - Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA)
   - Department of Energy and Water Supply
   - Department of Housing and Public Works
   - Department of Justice and Attorney General
   - Department of Natural Resources and Mines (DNRM)
   - Department of State Development, Infrastructure and Planning (DSDIP)
   - Department of Tourism, Major Events, Small Business and the Commonwealth Games
   - Department of Transport and Main Roads (DTMR)
   - Ergon Energy
   - Fitzroy Basin Association
   - Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)
   - Queensland Ambulance Service
   - Queensland Fire and Emergency Services (QFES)
   - Queensland Police Service (QPS)
   - SunWater.

Another seven submissions were received from members of the public. EHP provided its own submission to the proponent on the EIS.

In addition, there has been additional correspondence from stakeholders regarding the proponent's response to submissions on the EIS and amendments to the EIS as a result of the submissions. All submissions and other comments made by stakeholders on the EIS documents were considered when preparing this EIS assessment report.

d) the standard criteria

The standard criteria are listed in Schedule 4 of the EP Act, and have been considered when preparing this EIS assessment report.

e) another matter prescribed under a regulation

There are no other matters prescribed under a regulation that must be considered when preparing an EIS assessment report.

1.2 Required content of report

Section 59 of the EP Act outlines the required content of the report, which must:

a) address the adequacy of the EIS in addressing the final TOR
   - The adequacy of the EIS in addressing the final TOR is addressed in section 5 of this report.

b) address the adequacy of any environmental management plan (EM plan)
   - the final TOR required the proponent to prepare an EM plan for the project. However, amendments to the EP Act came into force on 31 March 2013 and included, amongst other things, removal of the requirement for a project to include an EM plan if an environmental authority (EA) application had not been received by 31 March 2013. Because the proponent had not submitted an EA application to EHP by 31 March 2013 an EM plan was no longer required to be prepared for the project.

c) make recommendations about the suitability of the project
   - Recommendations about the suitability of the project are outlined in section 6 of this report.

d) recommend any conditions on which any approval required for the project may be given
   - The recommended conditions for the environmental authority (EA) for the project are included in Appendix 1 of this report.

e) contain another matter prescribed under a regulation
   - Section 9 of the Environmental Protection Regulation 2008 (EP Reg) requires this EIS assessment report to contain the following matters:
     1. a description of the following:
        a) the project
        b) the places affected by the project
        c) any matters of national environmental significance (MNES) likely to be affected by the project
     2. a summary of the project's relevant impacts
     3. a summary of feasible mitigation measures or changes to the project or procedures to prevent or minimise the project's relevant impacts, proposed by the proponent or suggested in a relevant submission
     4. to the extent practicable, a summary of feasible alternatives to the project identified in the assessment process and the likely impact of the alternatives on MNES
     5. to the extent practicable, a recommendation for any conditions of approval for the project that may be imposed to address impacts identified in the assessment process on MNES.

Section 2 of this report summarises a description of the project. Section 5.2.1 of this report summarises the places affected by the project. Appendix 2 outlines the MNES likely to be affected by the project. A summary of the project's relevant impacts and feasible mitigation measures or changes to the project are discussed throughout sections 5 of this report. Appendix 2 of this report contains a summary of feasible alternatives and the likely impact of the alternatives on MNES. The Australian Government Department of the Environment (DOTE) will develop conditions of approval to address impacts on MNES after the completion of the EIS process for the project.

1.3 Completion of EIS process for the project

The giving of this assessment report to the proponent completes the EIS process for the Taroborah Coal Project under section 60 the EP Act.

1.4 Accredited process for the controlled action under Commonwealth legislation

On 20 February 2012 the project was declared a controlled action under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), including that it be assessed through the EP Act EIS process under the agreement between the Commonwealth of Australia and the State of Queensland (the bilateral agreement) relating to environmental impact assessment. The controlling provisions are sections 18 and 18A (listed threatened species and communities), sections 20 & 20A (listed migratory species) and sections 24D and 24E (water resources). An assessment of the significance of impacts of the action on the controlling provisions is contained in Appendix 2 of this report. A copy of this report will be given to the Commonwealth Environment Minister, who will decide whether to approve or refuse the controlled action under Part 9 of the EPBC Act.

1.4.1 Independent Expert Scientific Committee

The Australian Government established an Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) in late 2012 through amendment to the EPBC Act. The IESC provides advice to the Commonwealth Environment Minister on research priorities to improve the understanding of potential impacts of coal seam gas and large mining developments on water resources. The committee can be requested by federal, state and territory governments to provide advice on water resource related aspects of environmental impact assessments.

DOTE and EHP referred the EIS for the project to the IESC on 7 May 2014. The committee's advice to the departments dated 12 June 2014 has been considered in the preparation of this assessment report (see Appendix 2 of this report).

2 Description of the project

The proposed Taroborah Coal Project would include the construction and operation of an open-cut and underground coal mine on a greenfield site. The project site lies in the Denison Trough of the Bowen Basin approximately 22 kilometres (km) west of Emerald within the Central Highlands Regional Council local government area in Central Queensland (Figure 2-1). The open-cut mining area lies to the south of the Central West rail system and the Capricorn Highway. The underground mining area lies to the north of the Central West rail system and the Capricorn Highway. An indicative project layout is shown in Figure 2-2.

The proposed project would be carried out on mineral development licence (MDL) 467, covering approximately 7,966 hectares (ha). The disturbance footprint associated with the open-cut and underground operations is estimated to cover 2,568ha. A breakdown of disturbance is provided in Table 2-1.

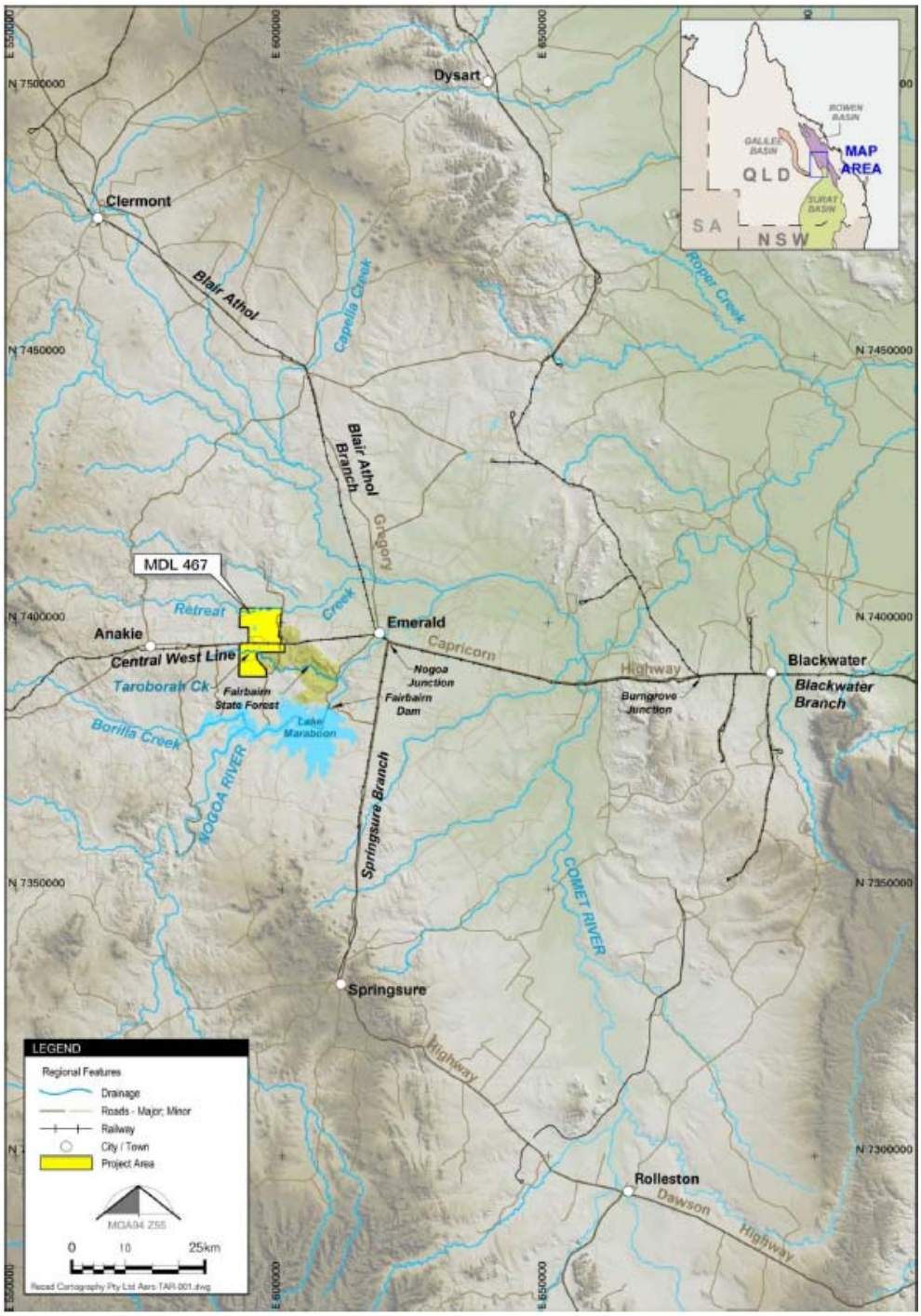
Table 2-1 A breakdown of the disturbance footprint

Disturbance	Area (ha)
Open-cut mining, including dumps and haul roads	336
Underground (longwall) mining	2,071
Coal handling and preparation plant (CHPP), mine infrastructure and site offices	58
Rail balloon loop, sediment dams, CHPP water recycle dam and mine waste water dam	50
Visual amenity bunds	16
Total:	**2,568**

Source: Table 3.3 of the EIS

The life of the project would be approximately 22 years, including an initial twelve month construction phase, 20 year production period and a 15 month decommissioning and rehabilitation phase. An additional six month construction phase, in preparation for underground mining, would occur in parallel with open-cut mining, and would begin in the fifth year of the project.

Figure 2-1 Local project location



Source: Figure 1.2 of the EIS

Mining would target the A and B seams, which are thought to be equivalent to the Cetus and Cygnus seams of the Freitag Formation. The A and B seams range from 0.1 to 1.9 metres (m) thick and 2.3 to 3.0m thick respectively, and lie at depths of 30m to 200m. The project would recover approximately 11.5 million tonnes (Mt) of run-of-mine (ROM) thermal coal from the open-cut pit and 64.3Mt of ROM thermal coal from the underground operation. Initially, 0.5Mt of ROM coal would be mined in the first year. The rate would progressively increase up to 5.75Mt a year (Mt/y) of ROM coal in year 8. Open-cut mining would overlap with underground mining between years 5 to 7 and would cease after the seventh year. Between years 8 to 20, underground mining would continue to produce up to 5.75Mt/y of ROM coal.

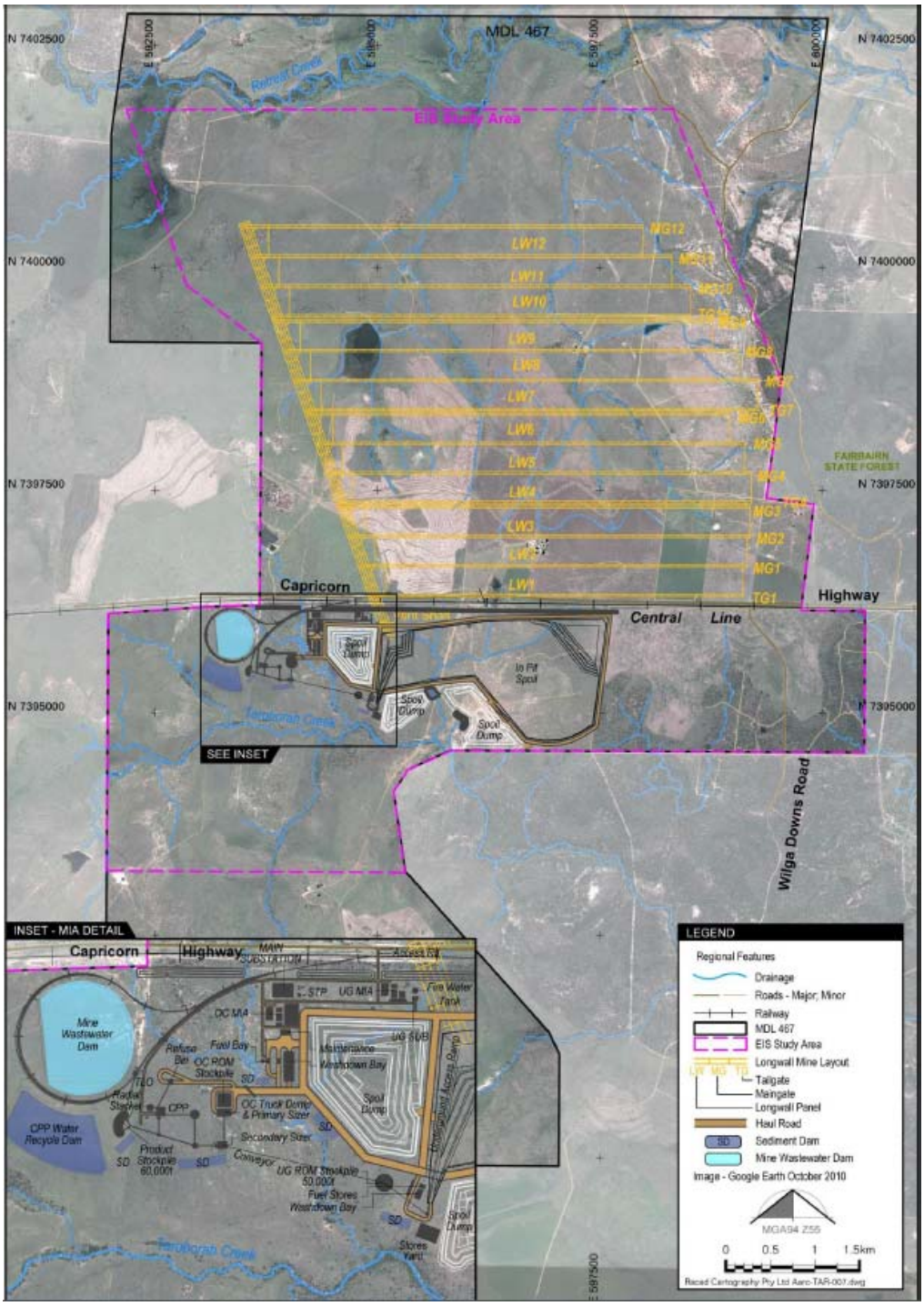
Open-cut mining would be carried out using conventional hydraulic excavators and a fleet of dump trucks to remove overburden and extract the coal resource. ROM coal from the open-cut pit would be loaded onto trucks and hauled to an on-site coal handling and processing plant (CHPP). Overburden would be hauled by truck, initially to out-of-pit spoil dumps adjacent to the open-cut pit. Once mining of the pit has progressed sufficiently, spoil would be progressively backfilled in the advancing pit.

Underground mining would be carried out by longwall extraction techniques. ROM coal from the underground operations would be transported by conveyors via the open-cut highwall to the CHPP for processing.

Processing at the CHPP would involve crushing, screening and washing of ROM coal in order to separate product coal from coarse and fine reject materials. Fine rejects from the CHPP would be partially dewatered and mixed with coarse rejects, prior to being hauled and buried in the spoil dumps.

Up to 5.73Mt/y of product coal would be transported from the project site via the Queensland Rail (QR) Central West rail system and the Aurizon Blackwater rail system to the Wiggins Island Coal Export Terminal (WICET) at the Port of Gladstone for export. The coal transport option would require the construction of a new on-site train load-out facility and rail loop to connect the mine to the Central West rail system, as well as an upgrade of the Central West rail line.

Figure 2-2 Proposed project layout



Source: Figure 3.5 of the EIS

Site access by road would be via the Capricorn Highway, which passes east-west through the middle of MDL467.

The construction and operation phases of the project would employ up to 150 and 375 full-time staff respectively. Construction and operational workforces would use a bus-in, bus-out (BIBO) transportation system from Emerald to the project site. All staff would live in Emerald or the surrounding townships in either permanent or temporary accommodation while on roster.

The annual raw water demand during the proposed 22 year life of the project is estimated to range from 330 megalitres (ML) per year during initial construction up to 2,680ML per year during peak open-cut and underground operations. Water would be sourced from coal seam dewatering and the collection of rainfall run-off in surface water storages. No surface water allocations are proposed for the project.

Flood protection bunds would be constructed to a nominal height of 0.5m, and would be designed to protect the open-cut pit and mine infrastructure area (MIA) from local flooding up to a 1-in-1000 year peak flow event.

A 66 kilovolt (kV) overhead feeder line running parallel to the Capricorn Highway is proposed to be connected to the Emerald substation located 22km to the east of the project site. It would supply 25 megawatts (MW) of electricity per year during peak project operations.

Key features of the conceptual rehabilitated final landform design for the project include:

- two final voids covering approximately 292ha on the southern side of the Capricorn Highway on MDL467
- elevated landforms associated with out-of-pit spoil dumps covering approximately 93ha on the southern side of the Capricorn Highway on MDL467
- landforms at-grade or only slightly below pre-mining topography associated with subsided areas from underground mining, covering approximately 2071ha
- landforms at-grade associated with rehabilitated infrastructure areas covering approximately 69ha.

3 The EIS process

The proposed Taroborah Coal Project was assessed by an EIS process under Chapter 3 of the EP Act. Table 3-1 provides a timeline of the key steps undertaken during the EIS process under the EP Act.

Table 3-1 The key steps undertaken during the Taroborah Coal Project EIS process

Step in the EIS process	Section of the EP Act	Responsibility for taking step	Statutory due date	Date completed
Application to voluntarily prepare an EIS was received by EHP	ss. 70 & 71	Proponent	N/A[1]	13/12/2011
Decision to approve the voluntary preparation of an EIS was given to the proponent	s. 72	EHP	N/A	16/12/2011
Written notice of decision to approve the voluntary preparation of an EIS was given to the proponent	s. 72	EHP	13/01/2012	21/12/2011
EHP received a draft TOR for the project accompanied by the fee prescribed under the EP Reg.	s. 41(1) & 41(2)	Proponent	N/A	12/03/2012
Written notice about the draft (TOR notice) for public notification was given to the proponent and the comment period was set at 30 business days	ss. 42(1) & 42(2)	EHP	2/04/2012	29/03/2012
The TOR notice was published in the Central Queensland News and The Courier-Mail newspapers	s. 43(1)	EHP	5/04/2012	30/03/2012 & 31/03/2012
Copies of the TOR notice were given to interested and affected persons [no other persons were decided by the chief executive under s. 43(3)(c)]	s. 43(3)	Proponent	5/04/2012	5/04/2012
The draft TOR comment period commenced on 2 April 2012 and concluded on 17 May 2012 [30 business days in total]	s. 42(3)	N/A	2/04/2012 to 17/05/2012	17/05/2012
Twenty sets of comments received during the comment period were given to the proponent	s. 44	EHP	31/05/2012	28/05/2012

Step in the EIS process	Section of the EP Act	Responsibility for taking step	Statutory due date	Date completed
EHP received advice in response to the 20 sets of comments	s. 45, & s. 11 of EP Reg.	Proponent	26/06/2012	6/07/2012
EHP considered the proponents' advice, finalised the TOR, gave a copy of the final TOR to the proponent, published the final TOR on the EHP website and published notices about the final TOR in the Central Queensland News and The Courier-Mail newspapers	s. 46, & s. 12 of EP Reg.	EHP	3/08/2012	2/08/2012
The proponent submitted the EIS to EHP	s. 47	Proponent	2/08/2014	8/01/2014
A longer period was agreed for deciding whether the EIS was suitable to proceed and an information request was issued to the proponent on 6 February 2014. The proponent submitted a revised EIS in response to the information request on 18 March 2014. A decision was made that the EIS was suitable to proceed on 15 April 2015	ss. 49(1), 49(2) and 62, & s. 13 of EP Reg.	EHP	16/04/2014	15/04/2014
Notice of decision that the EIS is suitable to proceed to public notification, and that the submission period would be 30 business days, was given to the proponent	ss. 49(3) to 49(5)	EHP	2/05/2014	29/04/2014
A copy of the EIS notice was given to interested and affected persons [No other persons were decided by the chief executive]	s. 51(2)(a)	Proponent	27/05/2014	14/05/2014
The EIS notice was published in the Australian (as prescribed under a regulation), The Courier-Mail and the Central Queensland News newspapers, and on the EHP website [No other way was decided by the chief executive]	s. 51(2)(b), & s. 8 of EP Reg	Proponent	27/05/2014	14/05/2014
The EIS submission period commenced on 15 May and concluded on 26 June 2014	s. 52(2)	N/A	15/05/2014 to 26/06/2014	26/06/2014
EHP received a declaration of compliance stating that a copy of the EIS notice had been given to interested and affected persons and that the approved form of the EIS notice had been published in relevant newspapers	s. 53	Proponent	28/05/2014	16/05/2014
Twenty-four submissions about the submitted EIS were received and accepted during the submission period were forwarded to the proponent. EHP also provided its own submission on the EIS to the proponent. Two late submissions were also accepted and forwarded to the proponent on 24 July and 7 August 2014.	ss. 55 & s56(1)	EHP	10/07/2014	10/07/2014
The proponent's response to submissions was received by EHP	s. 56(2)	Proponent	15/02/2015	24/11/2014
EHP considered the submitted EIS, the proponent's response to submissions and decided to allow the EIS to proceed under divisions 5 (EIS assessment report) and 6 (Completion of process)	ss. 56A(1), to 56A(3)	EHP	5/01/2015	5/01/2015
A notice of the decision to proceed was issued to the proponent	s. 56A(4)	EHP	19/01/2015	19/01/2015
EIS assessment report completed and issued to the proponent completing the EIS process	ss. 57 to 60	EHP	3/03/2015	3/03/2015

Table Notes: 1. N/A – Not applicable

4 Project approvals

The necessary approvals for the project are summarised in Table 4-1.

Table 4-1 Approvals required for the Taroborah Coal Project

Approval	Legislation (Administering Authority)	Detail
Approval to undertake an action that may impact on a matter of national environmental significance (MNES), including nationally listed threatened species and ecological communities, migratory species and water resources. Refer to section 1.4 and Appendix 2 for details	EPBC Act (DOTE)	A copy of this report will be given to the Commonwealth Minister to assist with making a decision about the approval of the project and any conditions that should apply under Part 9 of the EPBC Act
Environmental authority (EA)	EP Act, Chapter 5 (EHP)	On completion of the EIS process the proponent would apply for an EA for approval to mine up to 5.75Mt/y of black coal (Recommended EA conditions are contained in Appendix 1)
Grant of mining lease	*Mineral Resources Act 1989* (Department of Natural Resources and Mines - DNRM)	After EHP has issued the EA to the proponent, DNRM would decide whether or not to grant a mining lease for the project
Regional Interests Development Approval (RIDA)	*Regional Planning Interests Act 2014* (Department of State Development, Infrastructure and Planning – DSDIP)	After completion of the EIS process the proponent would assess whether the mining lease boundary (yet to be determined) overlaps with any areas of regional interest under the Central Queensland Regional Plan (potentially including a strategic cropping area (SCA) and priority agricultural area (PAA) identified on MDL467). If so, the proponent would apply to DSDIP for a RIDA.
Water licence to take or interfere with water from a water course, overland flow or groundwater. If the taking of, or interfering with, water is temporary, a water permit would be required	*Water Act 2000* (DNRM)	Following completion of the EIS process the proponent would apply to DNRM for a water licence, and/or a water permit
Cultural heritage management plan	*Aboriginal Cultural Heritage Act 2003* (EHP)	A CHMP is being negotiated with the relevant Aboriginal management body

Environmentally relevant activities

The EA would also authorise the following activities that are directly associated with, or facilitate or support, the mining activities, and which would otherwise require approval under the EP Act as environmentally relevant activities (ERAs listed in Schedule 2 of the EP Act):

- ERA 8 Chemical storage
- ERA 15 Fuel storage
- ERA 16 Extracting and screening
- ERA 33 Crushing, milling, grinding or screening
- ERA 63 Sewage treatment plant.

Notifiable activities

Notifiable activities are activities that have the potential to cause land contamination and are listed in Schedule 3 of the EP Act. The following notifiable activities being undertaken for the project would also be authorised under the project EA:

- 24. Mine wastes
- 29. Petroleum products or oil storage.

5 Adequacy of the EIS in addressing the final TOR

The final TOR for the Taroborah Coal Project were issued to the proponent on 2 August 2012. The final TOR outline the information required to be included in the EIS. A copy of the final TOR was included in Appendix 1 of the EIS. This section of the EIS assessment report discusses whether the various sections of the EIS adequately addressed the final TOR.

Executive summary

Volume 1 of the EIS included an executive summary as a stand-alone section. The executive summary adequately described the project and conveyed the most important aspects and environmental management options and key issues and conclusions, in a concise and readable form, as required by the final TOR.

Glossary of terms

Volume 1 of the EIS provided an adequate glossary of technical terms and acronyms used in the EIS.

Introduction

Volume 1, section 1 of the EIS included an Introduction to the EIS process for the project. It adequately discussed the purposes of undertaking the EIS process for the project, the relevant legislation and policies and approvals applicable to the project and the relevant audience of the EIS, as required by the final TOR.

The Introduction also included adequate information about the following aspects:

- project proponent
- brief project description
- project objectives and scope
- the EIS process for the project
- project approvals.

Project need and alternatives

Volume 1, section 2 of the EIS discussed the project need and alternatives, including project justification and project alternatives. It adequately justified the need for the project and discussed alternative project infrastructure layouts, and various alternatives considered for mining and processing, product transport, workforce and accommodation, water supply, and power supply.

Description of the project

Volume 1, section 3 of the EIS provided a detailed project description in terms of the local and regional context of the project. It adequately described the sequencing of construction, operations and rehabilitation activities and outlined how liquid, gaseous and solid wastes generated by the project would be managed. It also adequately discussed the off-lease, ancillary activities associated with product handling and transport, workforce transport and accommodation, and energy and water supply.

A description of the project is provided in section 2 of this report.

Environmental values and management of impacts

The rest of this section includes the following information about each environmental value listed in the final TOR:

- a summary of each environmental value, as identified in the EIS
- a summary of the project's relevant impacts on each environmental value, as identified in the EIS
- a summary of feasible mitigation measures to minimise the identified impacts on each environmental value, as identified in the EIS
- a summary of the major issues raised in the EIS submissions and the proponent's response to the submissions, and an assessment on whether the amendments to the EIS adequately addressed the issues
- a summary of any outstanding issues, or further actions required by the proponent to meet state policy and legislative requirements, identified during the EIS assessment process, and any recommendations to address these issues.

5.1 Climate

Section 4.1 of the EIS described the local and regional climatic conditions in the vicinity of the Taroborah Coal Project. Climate information was used in subsequent sections and appendices of the EIS (particularly air, noise, surface water and groundwater assessments) to assist with making predictions about likely project impacts.

The EIS adequately described the local and regional climate and how the climate would affect the potential for environmental impacts and the management of operations at the site.

The proposed mine site is only 8km south of the Tropic of Capricorn, and consequently the climate of the region is transitional between sub-tropical and tropical. The average annual rainfall is 650mm measured at Anakie, 19km west of the project site, and this occurs mainly in the wet season months of summer around January and February. Average monthly rainfall at Anakie ranges from about 110mm in February to 21mm in August.

Evaporation peaks in the summer months and averages 2,120mm/year, which is substantially higher than the average annual rainfall.

Temperatures range from a mean maximum temperature of 34.8 degrees Celsius (°C) in December to a mean minimum temperature of 6.9°C in July.

The prevailing mean annual wind direction is from the south-east. The mean prevailing wind directions during summer and spring vary from the south-east, east and the north-east. The mean prevailing wind direction during autumn is from the south-east. The mean prevailing wind direction during winter is predominantly from the south-east. Wind speeds are generally light (<10km/h) for approximately 80% of the time, and are greater than 20km/h for only a few percent of the time.

The relevance of climate to the Taroborah Coal Project is discussed in later sections of this report. The impacts of rainfall on soil erosion are discussed in section 5.2, Land. The impacts of storm events with regard to the design of waste containment systems and bunding, are discussed in section 5.4, Waste. The impacts of storm events with regard to stormwater management and tailings dams, are discussed in section 4.5, Water. The impacts of winds, rain, humidity and temperature inversions on air and noise quality, are discussed in section 5.6, Air, and section 5.7, Noise and vibration.

5.2 Land

The EIS adequately addressed the requirements of the final TOR for land associated with the Taroborah Coal Project. Section 4.2 of the EIS provided a detailed description of the existing land environmental values that may be affected by the project. Appendices 7, 8, 9 and 10 of the EIS presented detailed assessments of soil and land suitability, contaminated land, visual amenity and surface subsidence respectively. Section 4.2.2 of the EIS outlined the potential impacts of the project on land and the proposed mitigation measures.

5.2.1 Places affected by the project

MDL467 overlies parts of both the Capricorn Highway and the Central West rail line, which may be impacted in terms of increased usage and potential need for modifications. The majority of MDL467 is used for beef cattle grazing and some areas of rain-fed, broadacre cropping. Table 5-1 details the predominant land use of the lots on plans that underlie the project area on MDL467.

Table 5-1 Real property descriptions underlying MDL467

Real property description	Tenure type	Nature of the land
Lot 76 on plan PT372	Freehold	Private agriculture
Lot 12 on plan RP881318	Freehold	Private agriculture
Lot 13 on plan RP881318	Freehold	Private agriculture
Lot 14 on plan RP881318	Freehold	Private agriculture
Lot 15 on plan PLA4029	Freehold	Private agriculture
Lot 126 on plan PT372	Freehold	Private agriculture
Lot 21 on plan DSN29	Freehold	Private agriculture

Lot 201 on plan DN40176	Freehold	Private agriculture
Lot 23 on plan DN40176	Freehold	Private agriculture
Lot 24 on plan DN40201	Freehold	Private agriculture
Lot 20 on plan DSN377	Freehold	Private agriculture
Lot 124 on plan PT367	Leasehold	Private agriculture
Lot 203 on plan DSN377	Freehold	Private agriculture
Lot 4 on plan PT352	Leasehold	Private agriculture
Lot 12 on PT352	Leasehold	Private agriculture
Lot 81 on SP122079	State land	Queensland Rail, railway corridor
Lot 82 on SP122079	State land	Queensland Rail, railway corridor
Lot 101 on SP122080	State land	Queensland Rail, railway corridor
Lot 5 on PT132	State land	Queensland Rail, Capricorn Highway

Source: Table 4.6 of the EIS

5.2.2 Potential impacts and proposed mitigation measures

A summary of the potential impacts on the environmental values of land and the mitigation measures proposed in the EIS is outlined below.

5.2.2.1 Land use and suitability, subsidence and land disturbance

The potential impacts of the project on land use and suitability include:

- changes to land-use in open-cut areas to the south of the Capricorn Highway (e.g. out-of-pit spoil dumps, final void, alteration to physical and chemical properties of soils)
- Class A good quality agricultural land with the potential to support broadacre cropping located to the south of the Capricorn Highway would be temporarily or permanently impacted by mine infrastructure
- a strategic cropping area (SCA) and priority agricultural area (PAA) located to the north of the Capricorn Highway would be temporarily disturbed (i.e. changes to hydrology and pooling of water) by subsidence caused by underground mining
- subsidence modelling predicts a typical differential of 0.8m over 110m and a maximum of 1.1m over 130m in areas of strategic cropping land (SCL).

Most of the land disturbed during the construction and operational phases of the project would be rehabilitated. However, there would be some reduction in land suitability in some areas, such as out of pit spoil dumps. The two final voids from the open-cut operations would be the only non-beneficial final land use. The proposed measures to mitigate the land disturbance impacts of the project include:

- temporarily disturbed areas of the site, including an SCA and PAA, would be re-profiled, covered with topsoil and reseeded and returned to primary production land uses
- permanently disturbed areas of the site, including the final voids, would be rehabilitated to a conservation land use
- topsoil would be stripped and stockpiled for use in rehabilitation
- topsoil stockpiles would be bunded to reduce soil loss from erosion, and soil ameliorant, such as lime or gypsum, would be applied to maintain the physical properties of soils
- surface tension cracks caused by subsidence would be backfilled
- topsoil would be applied to areas of SCL that have had their topsoil disturbed by subsidence
- the use of soil loss mitigation strategies during project operations and rehabilitation activities (e.g. sediment retention ponds; landforms that follow natural contours; stepped slopes that have been ripped and seeded; use of landform designs that allow natural drainage of water; stormwater management designs that reduce the velocity of water; etc.)
- rehabilitation completion criteria would be used to measure rehabilitation success against each of the

rehabilitation goals. These criteria would include: safe to humans and wildlife; non-polluting; stable; and able to achieve an agreed final land use
- a rehabilitation monitoring program that would determine whether the completion criteria for each of the rehabilitation goals have been achieved and the rehabilitation has been successful.

Topsoil fertility would be maintained in terms of seed-stock viability, healthy micro-organism populations and nutrient values by stripping different soils types according to the soil management unit (SMU) stripping depths outlined in Table 5-2.

Table 5-2 Soil management units and their stripping depths

Soil management unit	Stripping depth (cm)	Limitations
Orion/Jimbaroo	60	No limiting physiochemical properties, variable depth to parent rock
Adelong	30	Extreme pH, moderate sodium levels
Adelong/College	30	Extreme pH, sodic subsoil
Rolleston/Glengallan	10*	Moderately saline and sodic
College/Lascelles	30	Highly alkaline pH, high soluble salts and sodium
Glengallan	10*	Shallow parent material
Glen Idol	30	Alkaline
Jimbaroo	20	No limiting physiochemical properties

Source: Table 4.17 of the EIS

Table note: *The specified stripping depth is too thin for practical soil stripping and therefore, soil horizons below this SMU will inevitably be included in the stripping process

Other measures proposed by the proponent to maintain fertile topsoils for use in rehabilitation include the following:

- no stripping of topsoil during wet conditions to minimise compaction and maximise oxygen diffusion into soil stockpiles
- engineering soil stockpiles with shallow slope angles and short slope lengths to reduce soil erosion
- ripping and seeding topsoil stockpiles with a quick establishment pasture grass to limit erosion and maintain a viable seed bank for stockpiling periods greater than six months
- constructing earthen bunds and sedimentation dams downstream of the soil stockpiles to capture any eroded topsoil
- signposting topsoil stockpiles for easy identification
- weed monitoring and control.

5.2.2.2 Land degradation and contamination

The potential impacts of the project that may result in land degradation or contamination include:

- release of contaminated water and sediment to land due to dam wall failure or overtopping
- leakage of contaminated water to land due to dam pipeline failure
- soil erosion due to excess surface water run-off during flood events
- release of hydrocarbons to land due to fuel spillage or leakage
- seepage of leachate to land from spoil dumps and ROM coal stockpiles
- release of contaminated water and sediment to land from vehicle washdown bays
- release of untreated sewage from the sewage treatment plant
- spillage of coal from rail wagons during coal transport.

The measures proposed by the proponent to mitigate land degradation and contamination include:

- dam design and construction with an adequate storage allowance to accommodate most flooding situations in accordance with relevant guidelines
- annual dam inspections and implementation of remedial actions in accordance with the EA conditions
- visual inspections of dam pipelines on a regular basis

- construction of stormwater drainage and sediment dams (designed to contain a 1-in-10 year Average Recurrence Interval rainfall event) downstream of infrastructure areas, spoil dumps and coal processing infrastructure to contain any spills of contaminated stormwater run-off
- fuel/chemical dispensing and storage areas designed, constructed and bunded to the necessary standards in accordance with relevant guidelines
- spill kits available at all fuel dispensing and storage areas for rapid response and clean-up of any hydrocarbon spills or leaks
- regular maintenance of vehicles, machinery and equipment to reduce the risk of hydrocarbon leakage
- adequate design of the sewage treatment plant to cater for the maximum number of personnel that can be accommodated on-site at any one time
- notifiable activities conducted on-site will be recorded on the Environmental Management Register and a register and map of all potentially contaminated sites and any remediation details will be kept on-site and regularly updated
- spill management and emergency response plans for all hazardous materials stored on-site would be developed and implemented, as required.

5.2.2.3 Erosion and stability

Erosion and stability issues may arise in areas of the landscape affected by the project that contain soils susceptible to dispersion. Table 5-3 shows the approximate volume of topsoils available for rehabilitation.

Table 5-3 Approximate volumes of topsoil available for rehabilitation on the project site

Land management unit	Approximate surface area to be disturbed (ha)	Approximate volume available for rehabilitation (ha)
Orion/Jimbaroo	173.3	1,039,800
Adelong/College	100.8	302,400
Rolleston/Glengallan	178.9	357,800
College/Lascelles	0.2	600
Glengallan	15.0	30,000
Jimbaroo	28.4	56,800
Total:	**496.6**	**1,787,400**

Source: Table 4.18 of the EIS

The SMUs in the project area having physicochemical properties indicating that they are susceptible to dispersion under adverse conditions are as follows:

- Rolleston/Glengallen
- College/Lascelles
- Glengallan.

These three SMUs make up about 22% of the topsoil available for rehabilitation. These soils may require additional erosion minimisation measures, which are outlined below:

- clearing activities will be limited to the minimum area required for the safe operation of the site
- areas to be cleared will be surveyed, marked out and signed-off by an authorised person to avoid unplanned clearing
- run-off from undisturbed areas will be diverted around disturbed areas and stockpiles to minimise erosion
- topsoil stockpiles will be ripped and seeded with a fast growing pasture grass to stabilise these areas
- spoil dumps will be progressively rehabilitated to minimise the total area of disturbance at any one time
- spoil will be deep ripped to maximise rainfall infiltration and minimise run-off
- contour banks and sediment dams will be constructed around rehabilitated slopes to minimise slope lengths and run-off velocities and to help remove suspended sediments from run-off, prior to leaving the site.

Erosion monitoring would include establishing an annual photographic record of slope areas associated with the following landforms:

- spoil dumps
- ROM pads and product stockpiles
- embankment walls of the reject dams
- mining void walls.

Photographs will be taken following each wet season as a record of potential erosion caused by runoff. The photographs will be compared to the previous years to determine any large areas of erosion that are increasing in size and may require remedial works.

Specific monitoring of the water control dams will be undertaken to ensure the stability of the embankment walls is maintained. Regular inspections will be carried out, and instrumentation, including survey monuments, piezometers and boreholes for sampling groundwater for water quality testing, will be installed and monitored.

5.2.2.4 Landscape character, visual amenity and lighting

The existing nature of the project site is open pastures with areas of dryland, broadacre cropping on the better soils of MDL467. The landscape is made up of various components ranging from alluvial plains with creeks and swamps to gently undulating rises and low hills.

Variations in land elevation range up to 50m. There are no distinctive viewpoints, landmarks, large perennial waterways, gateways or focal points surrounding the site, and no specific features that contribute to the visual amenity of the local area. Most of the major views are associated with local homesteads and local roads, since these locations represent the most significant places in the area that are occupied or used by people.

Although the majority of vegetation is sparse, visual buffers do exist around some areas of the site. Topography and vegetation provide the main buffers for residents and visitors who are located in the north and east of the site. The visual amenity of other residences located near the northern part of the site and which are outside the project boundary would be buffered by both topography and distance from major project infrastructure.

The following matters are relevant to the project's major infrastructure and its potential to cause visual and lighting impacts during operations:

- the open-cut pit would be below ground level and its visual amenity impact would be low, except for people passing close to the pit
- surface infrastructure and associated facilities would create a moderate visual amenity impact since these structures would be visible from limited viewpoints to the south
- the MIA (e.g. workshops, offices, laboratory and water storage and treatment tanks) would not pose a significant visual amenity impact, since they would not be multi-story structures
- mine site access and haul roads would have a low visual amenity impact as they would only be visible to people who travel on or near such infrastructure
- the land subsidence associated with underground mining is expected to pose low visual amenity impacts
- out-of-pit spoil dumps will pose the greatest visual amenity impact since they will be constructed up to 90m above ground level and would be visible at the greatest distance from the site
- the train load-out facilities and rail loop are anticipated to pose limited visual amenity impacts
- the two final voids have relatively small disturbance footprints, but may have a visual impact due to the close proximity to the Capricorn Highway
- artificial lighting used during night-time operations may cause impacts at the homesteads in close proximity.

The measures proposed by the proponent to mitigate the visual amenity and lighting impacts of the project include:

- construction of a visual amenity bund parallel to the Capricorn Highway to buffer project activities and infrastructure during mining
- all existing intact vegetation buffers along the Capricorn Highway will be maintained throughout the life of the project to reduce any potential visual impacts from intermittent highway use
- constructing bunds with a minimum height of 2m around the final voids which would buffer these features from traffic on the Capricorn Highway
- the visual impacts of the project will be minimised by locating the majority of project infrastructure to the south of the Capricorn Highway, so that only one viewing direction would be affected
- progressive backfilling and rehabilitation of open-cut pits and out-of-pit spoil dumps during the first seven years of project operations to blend disturbed areas into the surrounding environment well before the end of the twenty year mine life
- using earthy or natural colours on building exteriors to help blend the structures with the surrounding natural environment

- use of directional lighting pointing away from sensitive receptors and lighting hoods to focus light sources
- selection and use of light sources with low intensity to reduce long range impacts
- dipping of vehicle headlights in areas of close proximity to sensitive locations.

5.2.3 Major issues raised in submissions

DSDIP and DNRM both requested that the proponent identify the potential impacts of the project on areas of regional interest in the Central Queensland Regional Plan as regulated under the *Regional Planning Interests Act 2014*. In response, the proponent identified an area of PAA in the north-eastern part of MDL467. The proponent stated that if the final mining lease boundary within MDL467 overlaps with an area of regional interest, a Regional Interests Development Approval (RIDA) would be sought under the *Regional Planning Interests Act 2014*. After considering the proponent's response, DSDIP noted that there is also a strategic cropping area (SCA) on MDL467 that may also be impacted by the project. EHP considers that sufficient information about areas of regional interest potentially affected by the project has been provided in the EIS, and any impacts would be assessed by the RIDA.

EHP noted that a significant amount of non-acid forming (NAF) spoil would be required to construct site infrastructure (e.g. visual amenity bund, regulated dams, flood protection levee banks, etc.) and requested the proponent to clarify whether there would be sufficient spoil available to construct this infrastructure. In response, the proponent stated that a sufficient volume of suitable construction materials could be sourced from the site, or from the proponent's limestone quarry proposed to the south of the site, to construct all site infrastructure. EHP has assessed the additional information provided by the proponent and is satisfied that a sufficient volume of competent spoil should be available for construction purposes.

EHP requested that the proponent discuss the visual amenity alternatives considered for the project and how the preferred option (visual amenity bund) would be decommissioned to achieve the rehabilitation goals of being stable and self-sustaining. In response, the proponent stated that the alternative of vegetation screening using seedlings, tube stock and mature trees was also considered. However, due to a number of factors, including the relatively high cost of planting and maintaining trees, a high failure rate of tree survival and the significant timeframe of achieving an adequate tree density and height, the earthen bund was selected as the preferred option. The proponent also stated that by the end of mine life the amenity bund would be sufficiently vegetated to be stable and self-sustaining and would have a final profile that would support a final land use of low intensity cattle grazing. The proponent also updated section 3.7 (Rehabilitation and decommissioning) of the EIS to include rehabilitation objectives, completion criteria and indicators that would be used to demonstrate that the visual amenity bund would be stable and self-sustaining. EHP was satisfied with the proponent's response and has included the proponent's commitments in the rehabilitation section of the recommended draft EA conditions provided in Appendix 1 of this report.

5.2.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to land use related aspects of the Taroborah Coal Project. The proponent has committed to applying for a RIDA if the final mining lease boundary overlaps with any areas of regional interest, including priority agricultural areas or strategic cropping areas. None of the lot on plans that underlie MDL467 are recorded on the contaminated land register or environmental management register, and no significant sources of contamination that would be impacted by the project were identified during the preliminary site investigation. The proponent's commitment to construct a visual amenity bund parallel to the Capricorn Highway would help reduce the visual impacts of the project. No Native Title rights were identified to exist over the project land.

Recommendation

If the final mining lease boundary for the Taroborah Coal Project overlaps with any areas of regional interests identified in the Central Queensland Regional Plan, the proponent should submit to DSDIP a regional interests development approval (RIDA) application under the *Regional Planning Interests Act 2014*.

5.3 Transport

Sections 4.3.1 of the EIS included a description of the existing road, rail, air and port transport infrastructure relevant to the project. Section 4.3.2 of the EIS included an assessment of the potential impacts of the project on the transport infrastructure associated with the project, as well as the mitigation measures proposed by the proponent. Appendix 11 of the EIS included a road transport impact assessment prepared in accordance with the DTMR (2006) Guidelines for Assessment of Road Impacts of Development (GARID). Appendix A of Appendix 11 of the EIS included a rail level crossing assessment prepared in accordance with the Australian level crossing assessment model (ALCAM).

5.3.1 Road infrastructure

The road assessment considered the following state-controlled and local roads and road networks:

- Capricorn Highway (Rockhampton to Alpha)
- Bruce Highway (Brisbane to Rockhampton)
- Gateway Arterial Road and Port of Brisbane Road (Brisbane)
- Anakie – Sapphire Road.

5.3.1.1 Potential impacts

The potential impacts to the road network prior to the commencement of operations would include upgrades to the following roads:

- **Capricorn Highway**—an entrance to the project site would be constructed to receive deliveries and workforce vehicles. The upgrade works would include the construction of a T-intersection, with declared turning lanes and acceleration lanes allowing traffic to enter and exit the project site safely and without impeding the flow of traffic on the highway.
- **Interior roads on MDL467**—secondary roads, including project laydown and parking areas would be constructed on the project site to provide access to major project facilities.

A stock route running northward from Lake Maraboon to the Capricorn Highway will need to be relocated approximately 3km to the west in order to accommodate the planned open-cut pit and surface infrastructure. An alternative stock route has been preliminarily approved by the DNRM's Senior Lands Officer (Stock Routes), and both the DNRM and the CHRC stock route officers will be consulted in the detailed design stage to ensure the final suitability of the relocated route.

Table 5-4 summarises the potential impacts on the road network during the initial twelve month construction period for the open-cut mine and project infrastructure, and the additional six month construction period for the underground mine in the fifth year of project operations.

Table 5-4 Vehicle movements associated with the project's construction phase

Material to be transported	Vehicle description	Origin	Total return trips
Open-cut construction phase			
Excavation and construction equipment	Six axle articulated	Mackay	26
	B Double	Mackay	18
	Six axle articulated	Gladstone	6
Diesel fuel	B Double	Gladstone	300
Imported gravel	B Double	Sapphire	1,260
Rail, ballast and bridge steel	Six axle articulated	Sapphire	44
	B Double	Sapphire	898
	B Double	Gladstone	548
Buildings, plant and services	Six axle articulated	Brisbane	100
	Six axle articulated	Gladstone	50
	B Double	Mackay	50
Structural steel and equipment	Six axle articulated	Brisbane	410
	Six axle articulated	Gladstone	206

Material to be transported	Vehicle description	Origin	Total return trips
	B Double	Mackay	204
Concrete	Four axle truck	Emerald	1,200
Excavators, haul trucks, dozers etc.	Four axle truck	Brisbane	22
	Six axle articulated	Brisbane	98
	B Double	Mackay	90
	B Double	Brisbane	4
	Double road train	Brisbane	38
Underground construction phase			
Construction equipment	Six axle articulated	Mackay	10
		Gladstone	8
Building, plant and services	Six axle articulated	Brisbane	100
	Six axle articulated	Gladstone	50
	B Double	Mackay	50
Concrete	Four axle truck	Emerald	840
Structural steel and equipment	Six axle articulated	Brisbane	100
	Six axle articulated	Gladstone	50
	B Double	Mackay	50
Total:	—	—	**7,970**

Source: Table 4.23 of the EIS

Table 5-5 summarises other potential impacts associated with the delivery of supplies required during the construction phase, including maintenance and miscellaneous supplies, personnel supplies and waste removal.

Table 5-5 Vehicle movements associated with additional supplies required during the project's construction phase

Item/s to be transported	Vehicle description	Origin	Vehicle trips (return)
Domestic and construction wastes	Four axle truck	Emerald	50
General supplies including perishables and non-perishables	Four axle truck	Emerald	52
Total:	—	—	**102**

Source: Table 4.24 of the EIS

The construction workforces will consist of 150 personnel during the open-cut construction phase and 100 personnel during the underground mine construction phase. The operational workforce would consist of up to 375 full-time staff during the combined open-cut and underground operations. The open-cut mine would be in operation for seven years during which time between 58 and 133 staff would be employed. The operational workforce for the underground mine beginning in year 5 would steadily increase, peaking at approximately 250 staff.

It is estimated that 25% of the construction and operational workforces would be sourced from the local region. An additional 50% of the construction and operational workforces would be sourced from the Mackay, Rockhampton and Gladstone regions. The remaining 25% of the workforces would fly-in-fly-out (FIFO) from Brisbane. The FIFO workforces would be transported from the Emerald airport to their accommodation in Emerald via chartered bus services arranged by the proponent. Section 5.3.3 below discusses the potential impacts of the FIFO construction and operational workforces on the air services from Brisbane.

The regional construction and operational workforces are expected to drive to and from Emerald. From Emerald, the workforces would travel along the Capricorn Highway to the project site. It is anticipated that approximately 75% of the construction and operational workforces would be transported to the mine on a BIBO basis from Emerald, while 25% are expected to drive-in-drive-out (DIDO) using personal vehicles.

Tables 5-6 and 5-7 summarise the potential road related impacts associated with transporting the construction and operational personnel to and from the project site.

Table 5-6 Construction workforce vehicle movements per year

Personnel origin and destination	Vehicle description	Frequency	Vehicle movements per year*
Emerald airport to Emerald township	Chartered bus	Twice weekly	200
	Personal vehicle	Twice weekly	200
Emerald township to project site	Chartered bus	Daily	500
	Personal vehicle	Daily	500
Total:	—	—	**1,400**

Source: Table 4.26 of the EIS

Table note: *Assumes an average of 20 working days per month, 240 days per year and 50 working weeks in a year

Table 5-7 Operational workforce vehicle movements per year

Personnel origin and destination	Vehicle description	Frequency	Vehicle movements per year*
Emerald airport to Emerald township	Chartered bus	Twice weekly	200
	Personal vehicle	Twice weekly	200
Emerald township to project site	Chartered bus	Daily	500
	Personal vehicle	Daily	500
Total:	—	—	**1,400**

Source: Table 4.28 of the EIS

Table note: *Assumes an average of 20 working days per month, 240 days per year and 50 working weeks in a year

Table 5-7 summarises the potential road related impacts during the operational phase of the project associated with the transport of diesel, bulk ammonium nitrate fuel oil and emulsion, magnetite and flocculent, water treatment and solvents, concrete, gravel and mining consumables.

Table 5-7 Annual transport of operational materials

Material to be transported	Vehicle description	Origin	Trips per year (return)
Open-cut operational phase			
Bulk ammonium nitrate fuel oil and emulsion	B Double	Gladstone	250
Diesel fuel	B Double	Gladstone	750
Lubricants, tyres and machine parts	Four axle truck	Gladstone	14
	Four axle truck	Mackay	16
	Six axle articulated	Brisbane	14
	B Double	Brisbane	16
Magnetite and flocculent chemicals	Four axle truck	Gladstone	48
Water treatment and solvent chemicals	Four axle truck	Gladstone	8
Waste haulage	Four axle truck	Emerald	200
Underground operational phase			
Diesel fuel	B Double	Gladstone	200
Consumables including roof bolts, mesh, stone dust, timber, etc.	Six axle articulated	Brisbane	50
	Six axle articulated	Gladstone	26
	Six axle articulated	Mackay	24
Concrete	Four axle truck	Emerald	200
Magnetite and flocculent chemicals	Four axle truck	Gladstone	12
	Six axle articulate	Gladstone	6
	B Double	Gladstone	6
Water treatment and solvent chemicals	Four axle truck	Gladstone	8
Gravel	B Double	Sapphire	70
Waste haulage	Four axle truck	Emerald	100
Lubricants, tyres, machine parts, conveyor belt	Four axle truck	Mackay	20
	Four axle truck	Gladstone	20
	Six axle articulate	Brisbane	20
	B Double	Brisbane	20
Total:	—	—	**4,788**

Source: Figure 4.27 of the EIS

The traffic impact assessment predicted that during the initial 12 month construction period and the production period, the most significant traffic increases and pavement impacts would occur on the Capricorn Highway between Emerald and Alpha. However, no segments of the road were predicted to experience an increase considered significant under the GARID (DTMR 2006).

Traffic generated during the initial construction phase is predicted to result in traffic increases and pavement impacts on the local road network between Anakie and Sapphire Roads, managed by CHRC.

The Capricorn Highway may be affected by fly-rock exposure during the fifth to seventh years of the open-cut operation and may require temporary closure for short periods, up to 20 times per year, in order to maintain a blasting exclusion zone.

Subsidence on the Capricorn Highway is predicted to be a one-time event, occurring over a twelve month period, and would result in a maximum subsidence of 0.9m and a maximum grade change of approximately 1.0%.

5.3.1.2 Proposed mitigation measures

The safety of road users as a result of increased project-related traffic would be maintained by implementing the following management practices:

- training in the safe use and operation of heavy vehicles and vehicles transporting over-sized loads
- construction of an intersection at the entry to the mine site approved by the relevant state and local government authorities
- implementing a fatigue management plan developed in accordance with the national heavy vehicle regulator's fatigue management guidelines (NHVR, 2013)
- transporting hazardous chemicals associated with the project in accordance with the latest version of the Australian code for the transport of dangerous goods by road and rail (National Transport Commission, 2011).

The proposed measures to mitigate subsidence impacts of the project on road infrastructure would include:

- preparation of a subsidence management plan in consultation with relevant government departments
- preparation of a compensation infrastructure agreement for subsidence of the Capricorn Highway in consultation with the DTMR.

5.3.2 Rail infrastructure

For the first part of its journey, product coal would be transported from the project site approximately 24.4km to Emerald along the existing QR Central West railway system. Trains from the project would cross approximately 14 existing level crossings from the St. Helen's road level crossing eastward through Emerald to the Nogoa junction. From the Nogoa junction, product coal would be transported along the Aurizon Blackwater rail system approximately 372km to the WICET at Gladstone.

5.3.2.1 Potential impacts

Several railway infrastructure upgrades would be required to facilitate the transport of product coal along the proposed railway route, including:

- an upgrade of the current low-grade track to 20 or 26.5 tonne axel load (TAL) between Taroborah and Nogoa Junction
- strengthening of six minor timber bridges along the Taroborah and Nogoa Junction route
- track strengthening between Nogoa Junction and Burngrove
- a major upgrade of the Nogoa River bridge, in order to achieve 20 TAL and accept wider coal wagons
- sub-projects planned along the Blackwater System as part of the Wiggins Island rail project (WIRP)
- Taroborah train-load-out and rail loop facility on the mining lease area directly south of the Capricorn Highway.

The Central West railway system would be temporarily closed daily from late 2017 to late 2018 to allow the rail upgrades for the project to be completed. The closures would be scheduled to work around the existing regular train movements each week.

A rail level crossing assessment to determine the current and projected safety of all public level crossings was undertaken for the project using the Australian Level Crossing Assessment Model (ALCAM). With the application of mitigation measures (discussed in section 5.3.2.2 below) all train crossings were determined to be within acceptable safety limits.

The Blackwater railway system is not assessed under ALCAM, as it is a privately managed, commercial railway.

An assessment of the road operational impacts associated with the rail transport of coal at the three existing railway crossing locations within the township of Emerald was also undertaken. The crossings include:

- level crossing south of the Capricorn Highway and Gregory Highway intersection
- level crossing south of the Capricorn Highway and Opal Street intersection
- level crossing south of the Capricorn Highway and Selma Road intersection.

At a train speed of 40km/hour moderate traffic delays are predicted to occur in the morning and evening peak hour traffic at the Gregory Highway crossing and evening peak hour traffic at the Opal Street crossing. Furthermore, disruption is expected to eastbound traffic through the Opal Street intersection, where the queues waiting to turn south would eventually build to the point where they exceed the capacity of the turning lane and block the single lane prior to the turning lane. The modelling indicates that the traffic congestion is predicted to clear within 90 seconds or less following the passing of the train under current intersection configurations, which is considered to be of a moderate impact. Therefore, it is likely that upgrades to the Capricorn Highway infrastructure in this area would be required to reduce the queue lengths and delays.

Subsidence on the Central West rail line is predicted to be a one-time event, occurring over a twelve month period, and would result in a maximum subsidence of approximately 0.3m and a maximum grade change (tilt) of approximately 1.0% (i.e. subsidence of 0.1m over a distance of 35m horizontally and 11m laterally).

5.3.2.2 Proposed mitigation measures

The following measures are proposed to control dust emissions during the rail transport of product coal from the project site to the WICET:

- compacting the surface of coal loaded into train wagons
- veneering the coal product.

The proposed measures to mitigate the subsidence impacts to rail infrastructure would include:

- preparation of a subsidence management plan in consultation with relevant government departments
- preparation of a compensation infrastructure agreement for subsidence of the Central West rail line in consultation with Queensland Rail.

The proponent has committed to improving safety by installing boom gates and automated signals at the new rail crossing to be constructed on the project site for the train-load-out and rail loop facility.

5.3.3 Air travel infrastructure

The Emerald airport would be used by those members of the workforce who live outside of the regional area (mostly in Brisbane) and cannot realistically drive to Emerald for their rostered periods on a regular basis. The CHRC owns and operates the Emerald airport, which is located 6km south of the Emerald town centre. The Emerald airport services approximately 166,000 passengers per year, with a total of 3,126 aircraft movements.

An upgrade to the Emerald airport is being undertaken. The upgrade would expand the aerodrome by increasing the number of aircraft bays to support regular public transport and charter, as well as freight and emergency services aircraft, upgrading the cargo bays, a designated bay and a helipad bay for the royal flying doctor service. In addition, a covered all-weather walkway for passengers is being constructed.

5.3.3.1 Potential impacts and proposed mitigation measures

It has been estimated that the project workforce movements would require approximately 100 return flights between Brisbane and Emerald per year using Dash 8 or similar capacity aircraft. This equates to two return flights per week, which would accommodate 25% of the proposed maximum workforce. The impacts of the project on the Emerald and Brisbane airports are anticipated to be negligible.

5.3.4 Port infrastructure

Construction of Stage 1 of the WICET was completed in 2014, and its export capacity of 27Mt/y has been allocated through contractual commitments to other port users. Construction of Stage 2 of the WICET is due to be completed in 2018 and would provide an additional stockpiling and ship loading capacity of 25Mt/y. The proponent proposes to rail its first load of product coal from the project site in 2018 for export. The proponent is liaising with the WICET consortium to negotiate Stage 2 capacity at the WICET for stockpiling, handling and export of up to 5Mt/y of product coal.

5.3.4.1 Potential impacts and proposed mitigation measures

The construction of the WICET was approved under a separate assessment process, which took into account the potential impacts of using the infrastructure. The proponent for the Taroborah Coal Project does not propose any additional mitigation measures.

5.3.5 Major issues raised in submissions

DTMR requested that the proponent provide information about a subsidence management plan and compensation infrastructure agreement for potential subsidence impacts on the Capricorn Highway. In response, the proponent agreed to liaise with DTMR during the development of a subsidence management plan and in relation to a compensation infrastructure agreement. Given that subsidence of the highway would not commence until at least year 7 of project operations, EHP is satisfied that there is sufficient time to complete the plan and agreement requested by DTMR.

The QFES identified potential delays of emergency vehicles at rail level crossings when responding to emergencies and incidents and requested the proponent to consider widening the road network at key locations to alleviate any delays. In response, the proponent acknowledged that delays may occur and committed to considering alternatives to widening the road network at potentially affected rail level crossings. The proponent's commitment in the EIS has been formalised in the recommendations in section 5.3.6 below, which amongst other things, requires the proponent to propose contributions to road works to alleviate traffic congestion at rail level crossings (e.g. longer turning lanes to prevent congestion of through traffic). Consequently, EHP is satisfied that potential traffic delays at rail level crossings can be adequately managed.

DTMR requested that the proponent provide further information about how road closures during blasting associated with the project would be managed to minimise impacts to freight movements and other traffic. In response, the proponent stated, amongst other things, that the public would be notified prior to the closure or diversion of any public road and a closure management plan would be prepared, including traffic management controls to ensure safety. A recommendation for the proponent to prepare a closure management plan in consultation with DTMR has been included in section 5.3.6 below. Consequently, EHP is satisfied that potential impacts of road closures can be adequately managed.

The QPS requested that the proponent consider driver fatigue of DIDO workers travelling between Emerald and their homes in regional areas, and incorporate management measures in a fatigue management plan. In response, the proponent committed to incorporating fatigue management measures, including shorter shifts at the beginning and end of roster periods and mandatory rest periods at the end of each roster, into a fatigue management plan. The requirement for the proponent to prepare a fatigue management plan has been included as a recommendation in section 5.3.6 below. Consequently, EHP is satisfied that driver fatigue of the DIDO workforce can be adequately managed.

5.3.6 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to transport related aspects of the Taroborah Coal Project. A 3km relocation of part of the stock route between Lake Maraboon and the Capricorn Highway must be approved by DNRM and CHRC. This requirement is outlined in the recommendation below. Furthermore, a number of road and rail impacts are likely to occur as a result of the project. Consequently, DTMR requires the proponent to submit: a revised road impact assessment (RIA); RMP; traffic management plans; infrastructure agreement; coal dust management plan; and a series of associated documentation for the use and management of road infrastructure associated with the project. The proponent must also obtain relevant permits and licences for the use of the state-controlled and local road networks. These requirements are outlined in the recommendations below.

Stock route recommendation

1. At least 3 months prior to the anticipated commencement of the project the proponent must obtain approval from DNRM's Senior Lands Officer (Stock Routes) and the CHRC stock route officer for the relocation of a 3km length of the stock route between Lake Maraboon and the Capricorn Highway.

Road and rail recommendations

At least 6 months prior to the commencement of significant project-related construction works[1] the proponent must:

1. submit for review a revised RIA that has been developed by an appropriately qualified person in accordance with the DTMR Guidelines for Assessment of Road Impacts of Development (2006) (GARID). The revised RIA should include:
   a. a transport generation proforma (available from DTMR's Transport system management branch in Brisbane) detailing project-related traffic and transport generation information for state and local roads
   b. a pavement impact assessment using DTMR's pavement impact assessment tools
   c. information about the assumptions and methodologies used to estimate project related traffic, where detailed estimates are not available
   d. details of the final impact mitigation proposals, listing infrastructure-based mitigation strategies, including contributions to road works, rehabilitation, maintenance and summarising key road-use management strategies, including:
      i. the proposed T-intersection south of the Capricorn Highway to allow access to the project site
      ii. the proposed road works north of the Capricorn Highway to allow access to the project site
      iii. a closure management plan to mitigate the impacts of road works and the risk of fly-rock during blasting on the Capricorn Highway
      iv. wide load vehicles travelling through the township of Emerald
      v. road works at rail level crossings to alleviate traffic congestion
      vi. a fatigue management plan to address the increased risk of worker-driver fatigue, including DIDO workers travelling between Emerald and their homes in the greater region (i.e. Rockhampton, Mackay, Gladstone etc.) before and after shift rotation.
2. submit an RMP for the project that has been prepared in accordance with the DTMR Guide to Preparing a Road-use Management Plan, including:
   a. a table listing RMP commitments providing confirmation that all works and road-use management measures have been designed and will be undertaken in accordance with all relevant DTMR standards, manuals and practices
   b. optimised project logistics and minimised road-based trips on all state-controlled and local roads.

At least 3 months prior to the commencement of significant project-related construction works:

3. formalise arrangements about transport infrastructure works, contributions and road-use management strategies required under the impact mitigation program by submitting to DTMR and any relevant local government authority an infrastructure agreement that includes the following:
   a. project-specific works and contributions required to upgrade impacted road infrastructure and vehicular access to project sites as a result of the proponent's use of state-controlled and local roads by project traffic
   b. project-specific contributions towards the cost of maintenance and rehabilitation to mitigate impacts on state-controlled and/or local road pavements or other infrastructure
   c. infrastructure works and contributions associated with shared (cumulative) use of state-controlled and local road or rail infrastructure by other projects subject to an EIS
   d. performance criteria that detail protocols for consultation about reviewing and updating project-related traffic assessments and impact mitigation measures that are based on actual traffic volume and impacts, if previously advised traffic volumes and/or predicted impacts change.
4. submit detailed drawings of any works required to mitigate the impacts of project-related traffic to DTMR and the relevant local councils for review and approval

[1] Significant project-related construction works means physical construction, including major clearing or excavation for foundations or the placement, assembly or installation of facilities or equipment at any site related to the project

5. obtain all relevant licenses and permits required under the *Transport Infrastructure Act 1994* (TI Act) for works within the state-controlled road corridor, including road works approvals (s. 33 of the TI Act), approval of location of vehicular accesses to state roads (s. 62 of the TI Act) and approval for any structures or activities to be located or carried out in a state-controlled road corridor (s. 50 of the TI Act)
6. obtain permits for any excess mass or over-dimensional loads for all phases of the project in consultation with DTMR's heavy vehicles road operation program office, and the relevant local councils in accordance with the *Transport Operations (Road Use Management) Act 1995*
7. finalise traffic management plans for the construction and commissioning of each site where road works are to be undertaken, including site access points, road intersections or other works undertaken in the state-controlled road corridor, in accordance with DTMR's Guide to Preparing a Traffic Management Plan.

In relation to the rail transport of coal along QR's Central West railway system and Aurizon's Blackwater rail system, the proponent must:

8. prepare a coal dust management plan comprising control measures to effectively mitigate dust emissions from loaded and unloaded coal haulage trains in accordance with the aims, objectives and mitigation measures specified in the Aurizon Coal Dust Management Plan (2010)
9. manage the operation of rail traffic through the township of Emerald to occur during off-peak periods only, between the hours of 9am to 2.30pm and 6pm to 6am.

5.4 Waste

Section 4.4 of the EIS provided an assessment of the type and quantity of wastes likely to be generated by the project, and the proposed management of these wastes. Tables 3.20 and 3.21 of section 3 and Table 4.32 of section 4.4 of the EIS, presented estimates of the quantity of all wastes likely to be generated by the project; the proposed waste minimisation, reuse, recycle and disposal strategy for each waste; and the potential environmental impacts associated with the waste with reference to other sections of the EIS, which addressed management of potential impacts. Section 3.6.3 of the EIS provided estimates of the volume of excavated waste and predicted characteristics of the waste based on a detailed assessment presented in Appendix 12 to the EIS. Section 3.6.4 of the EIS provided estimates of the volume of reject material from the coal processing plant and outlined proposed storage and containment of rejects, including design criteria.

5.4.1 Waste streams generated by the project

Table 5-8 provides a summary of the waste streams, estimated volumes and proposed treatment methods of the waste materials likely to be generated by the project.

Table 5-8 Waste streams, quantities and treatment methods

Waste type	Estimated waste quantities	Preferred re-use, recycling, disposal option
Excavated waste (waste rock or spoil)	Estimated annual average quantity up to 22 million loose cubic metres (lcm)	Disposal in out-of-pit spoil dumps (mainly years 1 and 2)
Coarse and fine coal from the CHPP	Annual maximum 33 million lcm	In-pit dumping year 3 onwards
Cleared vegetation	Estimated annual average quantity up to 212,000 tonnes (t)	Mulch, landscape borders, fence posts, natural habitat for rehabilitation
General waste	Annual maximum 280,000 t	Re-use or recycle where appropriate
Scrap Metal	Estimated annual average quantity up to 36,000 t	Non-recyclable material stored in bins and collected by a licensed waste management contractor
Batteries	Annual maximum 72,000 t	Re-use or landfill (off-site or on-site)
Hydrocarbon and chemical drums	1000m^3 during construction	Stockpiled less than 3m high and 200m^2 area and at least 10m from other tyre storage area pending collection by licensed waste management contractor.

Waste type	Estimated waste quantities	Preferred re-use, recycling, disposal option
Tyres	20 tyres per annum	Removal by licensed waste management contractor during initial construction
Sewage	Up to 5ML per annum during construction	On-site treatment and spray irrigation
Mine affected water	Up to 10.15ML per annum during operations	Used in CHPP. Process water stored in recycled water dam and re-used.
Groundwater	Average of 2400ML per annum	Temporarily stored in the mine water dam, prior to recycling
Waste oils, hydrocarbons and solvents	220ML to 2100ML per annum	Waste oils etc. would be collected and stored in clearly marked containers for recycling

Source: Table 4.32 of the EIS

5.4.1.1 Excavated waste and wash plant rejects characterisation

An estimated annual average quantity of up to 22M loose cubic metres (lcm) of excavated waste would be produced. Over the life of the mine, the total volume of excavated waste from open-cut activities (i.e. overburden and interburden) was expected to be approximately 159M lcm. An annual average of up to 212,000t of wash plant rejects would be produced by proposed open-cut operations and 36,000t by underground longwall operations.

Excavated waste characterisation was based on two sampling programmes detailed in Appendix 12 to the EIS. The sampling was considered sufficient to estimate the relative proportion of geochemical material types for the purposes of planning, with further testing required to better delineate potential acid forming (PAF) horizons and reduce the volume of material requiring special handling. Results indicated that approximately two thirds of the overburden and interburden tested would likely be NAF, and one third PAF or PAF low capacity (PAF-LC). Wash plant wastes and ROM coal were determined likely to be mainly PAF with ROM coal from A and B seams (the main target seams), and coarse and fine rejects from A and B seam tops, having a high acid mine drainage (AMD) risk and the potential to rapidly release high acid and metal or metalloid contaminants. The results did not indicate a potential for alkaline mine drainage.

The characteristics of overburden and interburden determined by geochemical testing of samples from exploration boreholes are summarised in Table 5-9 below.

Table 5-9 Geochemical classification of materials to be mined

Material source	Number of samples	AMD category		
		NAF (%)	PAF-LC (%)	PAF (%)
Weathered Basalt	10	100	0	0
Weathered Sedimentary Rock	71	100	0	0
Fresh A Seam Overburden	78	40	40	20
Fresh A Seam	3	0	0	100
Fresh A-B Seam Interburden	70	29	44	27
Fresh B Seam	12	0	0	100
Fresh B Seam Floor	9	14	72	14

Source: Table 4.33 of the EIS

5.4.2 Potential impacts and proposed mitigation measures

The EIS highlighted the following potential impacts from waste streams associated with the project:

- contamination of land, surface water and groundwater as a result of contaminated runoff or seepage from:
    - the open-cut pit, spoil dumps, ROM and product coal stockpiles, and processing areas
    - waste storage areas
    - sewage
    - spillage of waste chemicals, fuel or oil
    - impacts on visual amenity due to the size of out-of-pit spoil dumps and general waste storage
    - attraction of scavenging fauna, including feral cats, foxes, scavenging birds and rodents
    - greenhouse gas emissions.

General waste would be disposed off-site, and tyres would be recycled or disposed off-site, or possibly buried on-site.

Sewage would be treated on-site to produce Class A effluent quality, as defined by the Queensland Water Recycling Guidelines (2005), and disposed of by irrigation to land within the project area.

Waste water from the coal processing plant would be stored in a dam (designed in accordance with EHP (2012) Guideline EM635 - Manual for Assessing Hazard Categories and Hydraulic Performance of Dams), and reused for coal washing.

Cleaner production strategies were proposed to be implemented in project design wherever possible, including:

- a site water management system with maximum possible recycling of water (refer EIS section 4.5.2.3)
- a waste minimisation plan based on the waste management hierarchy (avoid, reuse, recycle, disposal)
- a greenhouse gas (GHG) management plan focused on energy use efficiency
- minimisation of vehicle emissions.

Excavated waste would be backfilled in-pit as mining progresses and disposed of within three out-of-pit spoil dumps proposed to be located around the western and south-western edge of the open-cut pit. Investigations would be conducted in the mine infrastructure area to identify materials with geotechnical properties suitable for constructing the spoil dumps.

PAF material in the overburden and interburden would be disposed of as follows:

- out-of-pit spoil dumps would be constructed using NAF material where possible
- material would be screened for AMD potential and selectively handled to isolate PAF material
- PAF materials would be preferentially placed in-pit below the groundwater recovery level in order to facilitate inundation and limit long-term oxidation after mining has finished
- PAF material would be compacted in lifts of 5m or less to minimise material oxidation
- prior to inundation, the lifts and faces of placed PAF material would be treated where necessary with crushed limestone
- PAF material placed in-pit above the final groundwater recovery level would include a thick outer layer of NAF material (preferably high ANC) and may also be internally sealed to limit oxygen transfer and fluctuating moisture content
- PAF material placed in out-of-pit spoil dumps would be set back from the face of the dump and compacted during dumping to limit oxidation
- the base of out-of-pit spoil dumps would be constructed with at least a 1m deep layer of NAF material to limit the exposure of PAF material to water flowing along the interface between the dump and the natural ground level
- ANC materials would be blended with PAF and PAF-LC material to increase lag times before the onset of acid forming conditions
- further trials and kinetic testing would be undertaken to confirm the AMD management strategy.

Dewatered coarse and fine rejects would be combined and disposed of initially in the south-west and south-east out-of-pit spoil dumps, then placed in the pit when backfilling of the open-cut pit starts. An estimated 1.2 million lcm of rejects would need disposal over the life of the project. Purpose-built rejects isolation cells would be constructed, consisting of a 50mm thick geosynthetic clay liner (GCL) along the base, side walls and as a capping to restrict oxygen ingress and seepage.

Monitoring of seepage and run-off from open-cut pit walls and floors, ROM stockpiles, product coal stockpiles, spoil dumps and rejects storage areas would be undertaken to assess the performance of on-site waste rock management strategies, assess on-site water quality, and check whether changes are needed to the strategies.

The proposed rehabilitation strategy for in-pit and out-of-pit spoil dumps would reduce hydraulic conductivity, prevent capillary movement of moisture, and encourage the growth of vegetation suitable for the final land use. The rehabilitation strategy includes the following measures:

- constructing a NAF/ANC waste layer to encapsulate PAF waste to reduce the generation of AMD
- a 0.5m thick clay capping to limit water ingress and reduce the volume of water draining through the spoil dump
- a 0.4m thick capillary break layer (gravel) installed either side of the clay layer to prevent capillary movement of moisture
- a vegetative layer including hardy local native species to reduce soil erosion, minimise visual amenity impacts, and facilitate water evaporation from surface soils.

5.4.3 Major issues raised in submissions

EHP requested that Table 4.33 (Geochemical classification of materials to be mined) and section 3.6.3.4 (Acid generation) be amended to include the estimated volume of each waste rock unit having NAF and PAF properties, and that this information be used to amend the proposed design of the in-pit and out-of-pit waste rock dumps, if necessary. In response, the proponent provided further information to clarify the basis for estimates of the proportion of NAF and PAF in the waste rock, and the assumptions used in design of the in-pit and out-of-pit waste rock dumps. Table 3.24 of the EIS was amended to clarify the basis for the estimates and to better illustrate the amount of overburden material that is likely to be NAF or PAF as follows:

Table 5-9 The number of samples per volume of waste rock units

Waste rock unit	Estimated volume (m^3)	Number of samples
Weathered NAF – Low ANC	40,700,000	43
Weathered NAF – High ANC	9,400,000	38
Fresh NAF	18,400,000	26
Subtotal - NAF	**68,500,000**	**107**
Fresh PAF-LC	18,400,000	26
Fresh PAF A Seam Roof	22,400,000	26
PAF/PAF-LC Interburden	17,600,000	70
Subtotal – PAF and PAF-LC	**58,400,000**	**122**

Source: Table 3.24 of the EIS

EHP assessed the additional information and determined that the number of samples was generally proportional to the estimated volume of each waste rock unit. Consequently, the additional information was deemed adequate at this stage. However, additional sampling during mining, as outlined in the proposed mitigation measures and included in the recommended draft EA conditions in Appendix 1, would be required to further characterise the geochemical properties of the waste rock.

EHP requested the proponent to assess the hydraulic and nutrient loading characteristics of the proposed 2.5ha effluent irrigation area in accordance with the procedure outlined in the Model for effluent disposal using land irrigation (MEDLI, National Program for Sustainable Irrigation 1996). In response, the proponent followed the MEDLI procedure and calculated that, using class A treated water, an irrigation area of 0.9ha would be required at the proposed irrigation rate of 2.6mm per day to ensure no detrimental nutrient or salt impacts. Based on the additional information provided by the proponent, EHP is satisfied that the proposed irrigation area of 2.5ha would be more than sufficient to accept the volume of recycled water produced by the sewage treatment plant.

EHP and CHRC raised concerns that the Emerald landfill may not have sufficient capacity to accept the estimated volumes of general waste over the life of the project, and EHP requested a discussion of alternative disposal options if the landfill did have insufficient capacity. In response, the proponent advised that there would be potential for the annual waste volume to exceed the CHRC Emerald landfill capacity and proposed to work with CHRC on solutions, including disposal of waste within the project open-cut pit. However, EHP does not generally support the in-pit disposal of wastes and the proponent would need to provide additional information for EHP to consider authorising this activity under the EA for the project.

EHP identified that section 3.6.3.1 of the EIS stated that the overburden and interburden wastes were expected to swell by a factor of 25% following excavation. However, the typical spoil dump design parameters in Table 3.23 of EIS were based on a swell factor of 20%. EHP noted that the discrepancy in the swell factor could significantly alter the height and footprint of the waste rock dumps with implications for successful rehabilitation and final landform design. In response, the proponent confirmed that a 25% swell factor had been used as the basis for spoil dump design and amended Table 3.23 accordingly. Based on the additional information, EHP is satisfied that the proponent has applied an appropriate swell factor for the design and rehabilitation of the final landform.

DNRM and EHP requested details of the quantities and sources of extractive materials required for decommissioning of the out-of-pit spoil dumps, and DNRM also requested discussion on the effect of project demands on regional reserves of these materials. In response, the proponent provided preliminary estimates of gravel, clay, limestone and other extractive materials required for construction and decommissioning of the spoil dumps and indicated the all materials required were expected to be available within the planned open-cut excavation areas or in an adjacent mineral lease controlled by the proponent. DNRM did not request any further clarification in relation to this issue and EHP is satisfied that the proponent has provided sufficient evidence to support the proposed rehabilitation and decommissioning of the spoil dumps.

EHP noted that Table 4.32 of the EIS did not include cleared vegetation as project waste and that the proposed burning of cleared vegetation was not considered to be best practice. In response, the proponent provided, amongst other things, an amended Table 4.32 that included cleared vegetation as a waste stream and proposed measures for reuse as the preferred treatment. Condition C3 in section 6 of the EIS was amended to indicate the burning of waste vegetation would be a last resort. EHP does not support burning vegetation as a management practice, and would not consider authorising the activity without a standard operating procedure (which has not been provided by the proponent). Consequently, the recommended draft EA conditions would not permit burning vegetation on the mining lease.

5.4.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the TOR for the assessment of the wastes likely to be generated by the project, the potential environmental impacts associated with those wastes, and the appropriate strategies for dealing with each waste stream.

The waste rock (overburden and interburden), ROM coal, and rejects from the CHPP, present a high risk of AMD unless managed appropriately. The measures stated in the EIS are considered adequate to prevent significant risk from AMD, although further geochemical testing and refinement of management measures will be required during the detailed design and operational phases of the project. EHP's model mining conditions for waste rock are considered adequate to address the risks of excavated wastes from the project and have been included in the waste management schedule of the recommended draft EA conditions contained in Appendix 1 of this report. Additional waste management requirements are outlined in the recommendations below.

Recommendation 1

The proponent should continue to liaise with CHRC about disposal of project wastes at the Emerald landfill.

Recommendation 2

The proponent should consult with EHP about whether there are any waste streams from the project that would be suitable for disposal within the open-cut pit.

5.5 Water

Section 4.5 of the EIS contained an assessment of the impacts of the project on surface water and groundwater resources. A description of the existing surface water and groundwater values was provided in section 4.5.1. The potential impacts on surface water and groundwater values, as well as the proposed mitigation and management measures were provided in section 4.5.2. Additional supporting information was provided in Appendix 13, Surface water management plan, and Appendix 14, Groundwater impact assessment.

5.5.1 Existing environmental values

5.5.1.1 Existing surface water hydrology

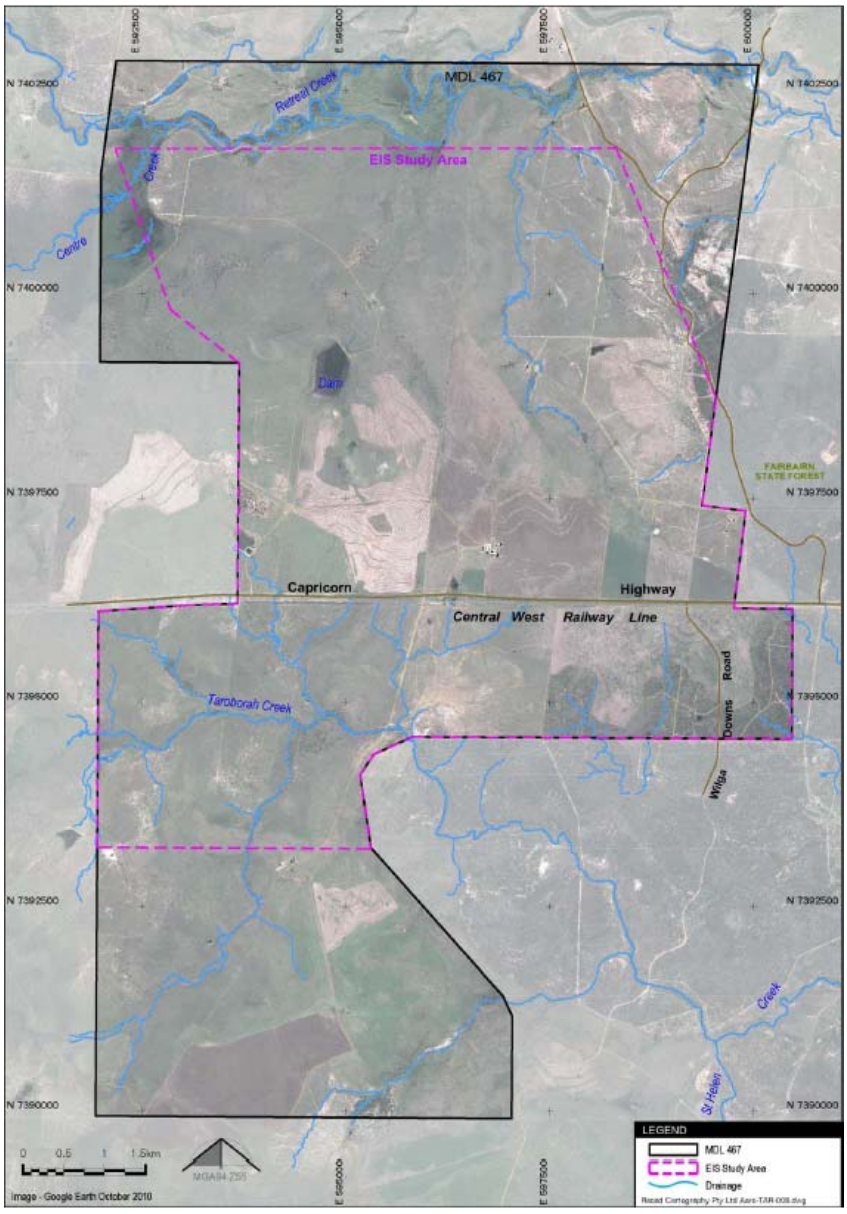
The Taroborah Coal Project is located within the Fitzroy River Basin, which has a total catchment area of approximately 142,600km^2. The Taroborah Coal Project is located in the lower Nogoa and Theresa Creek sub-basin. The major drainage features within the project site that are defined as watercourses under the *Water Act 2000* are identified in Figure 5-1, and include the following:

- Retreat Creek, which flows west to east across the north of the project site into Theresa Creek, before

joining the Nogoa River
- Centre Creek, which originates to the west of MDL467 and discharges into Retreat Creek in the north-west corner of the project site
- Taroborah Creek, which is located in the south of the project site and flows in an east to south-easterly direction into St. Helens Creek, which then flows into the Nogoa River.

Lake Maraboon and Fairbairn Dam are located 5km to the south of the project site. Lake Maraboon discharges to the Nogoa River and provides water to approximately 300 irrigators who farm in the Emerald area. However, the Taroborah Coal Project is located downstream of the catchment area for Lake Maraboon, and will not impact on it.

Figure 5-1 Surface water drainage features on the project site



Source: Figure 4.61 of the EIS

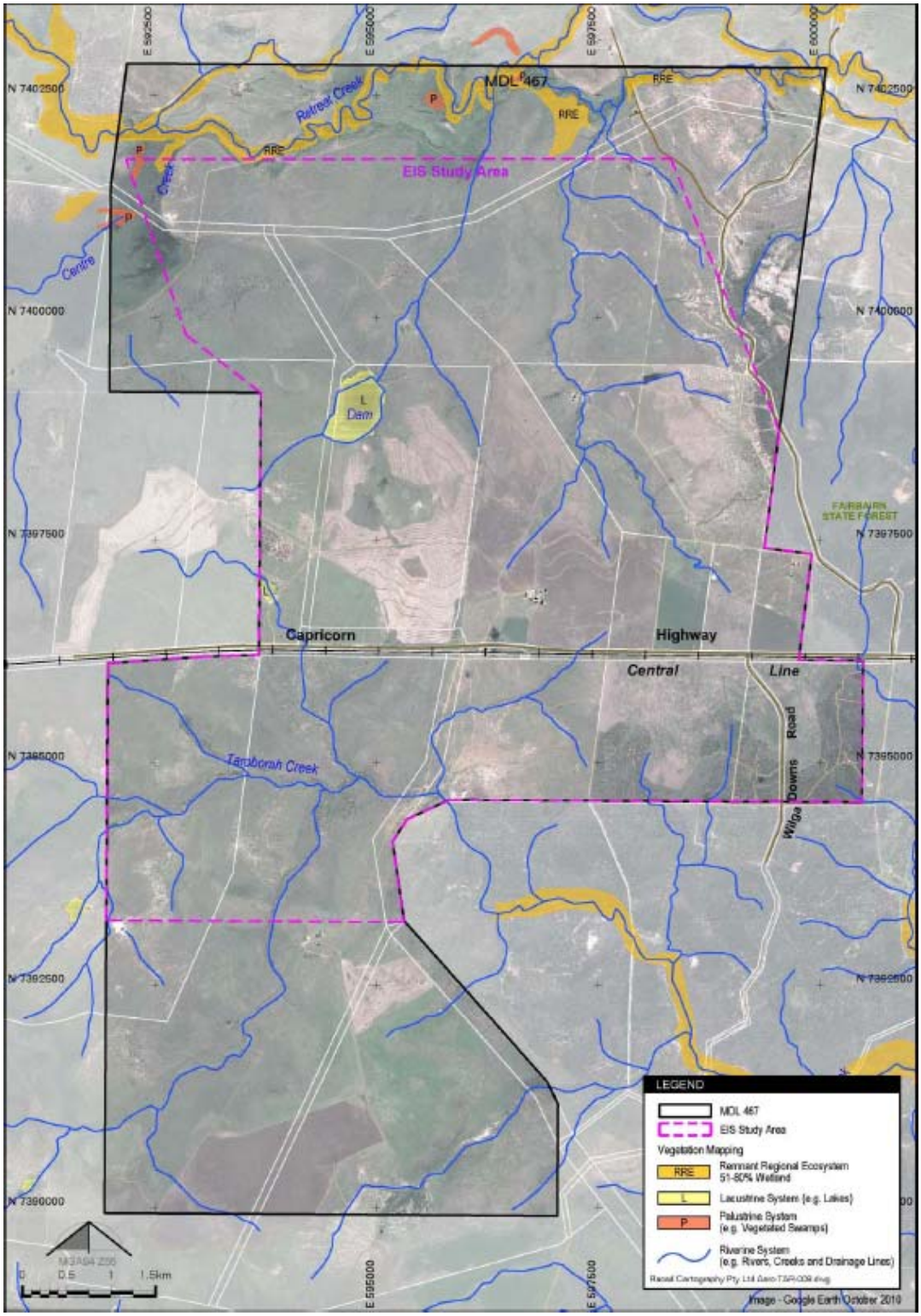
5.5.1.2 Wetlands

The major wetland features within the project site are highlighted in Figure 5-2 and include the following:

- remnant regional ecosystem (RE) consisting of 51% to 80% wetland along Retreat Creek
- lacustrine dam located in the west central portion of the project site
- limited areas of palustrine wetlands to the north and north-west of the project site.

Wetland systems on the site were assessed to have moderate to good aquatic habitat quality, and were considered to be important as permanent and semi-permanent water sources in a region characterised by ephemeral watercourses.

Figure 5-2 Wetland features of the Taroborah Coal Project site



Source: Figure 4.62 of the EIS

Lacustrine wetlands

Two lacustrine wetlands (in the form of artificially created dams) were identified on the project site. The larger dam in the central west of the project site is the only source of permanent water on-site and was found to support substantial and complex habitat for fauna, with an abundance of vegetation both in and surrounding the dam providing evidence of little erosion. This dam was scored as medium under the Aquatic Conservation Assessment (ACA) process. The smaller dam is located on a drainage line of Taroborah Creek near the Capricorn Highway. This dam was mapped during the field survey, but does not have permanent water and was not scored under the ACA process.

Palustrine wetlands

One large, ephemeral palustrine wetland was identified in the north-west of the project site, incorporating two smaller palustrine wetlands. The two small palustrine wetlands were scored as medium under the ACA process. During the dry season survey, only a small quantity of water was evident. However, the wetland was found to support good aquatic habitat, evidenced by the variation in substrate and cover elements. The banks of the wetland were dominated by grass species.

Regional ecosystems associated with wetlands

Some vegetation communities on the project site were noted for their potential to use groundwater. Measured groundwater levels in the vicinity of Retreat and Taroborah Creeks are approximately 6m–10m below ground level. That depth is shallow enough for deep-rooted vegetation species, such as eucalypt species, to have the potential to access and use the sub-surface groundwater. Refer to section 5.8 of this report for further information.

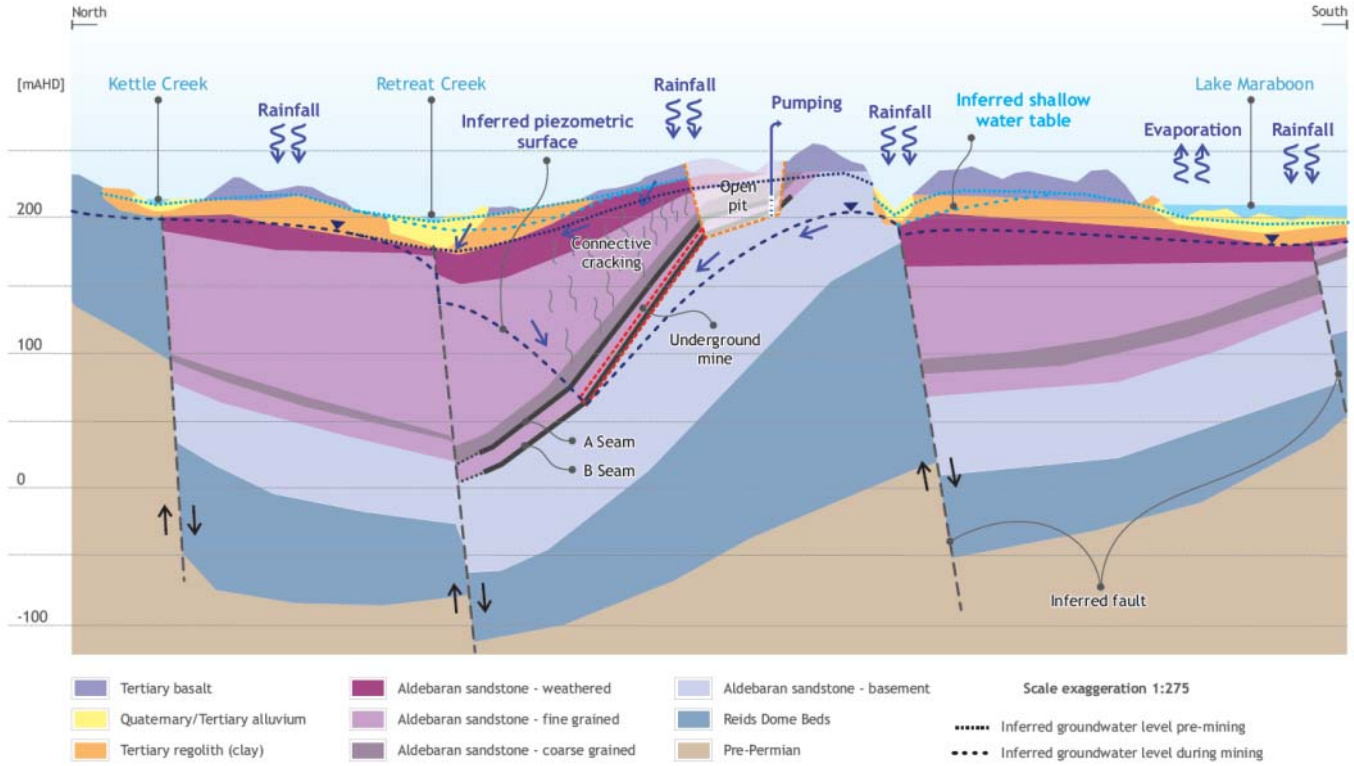
5.5.1.3 Groundwater regime

The three major geological units and their characteristics within the project area are described below:

1. Quaternary alluvium consists of a cover, less than 30m thick, of alluvial and colluvial sediments deposited across much of the western and northern portions of the project area. The alluvial cover, where encountered, generally comprises less than 25m of poorly consolidated clays, silts, sands and gravels. The alluvial deposits unconformably overlie Tertiary basalt and sediments. Where the Tertiary geology is absent, the Quaternary alluvium and colluvium directly overlie the Permian Aldebaran sandstone. The typical depth of groundwater in the alluvium is generally less than 10m below ground level. However, no users of alluvial groundwater were identified in the project area. The alluvium is generally a losing system and stored water is likely to discharge as leakage to nearby sub-cropping Tertiary and Permian units
2. Tertiary basalt and sediments outcrop throughout much of the middle and southern portions of the project area. The occurrence of fresh basalt is sporadic, and where encountered, is generally less than 30m thick. Fresh basalt is generally underlain by highly weathered Tertiary clays and sands, and occasionally by silts and gravels that range in thickness from 30m to 90m. Furthermore, the weathered clays and sands progressively grade into weathered Permian deposits beneath. Fractured rock aquifers in Tertiary basalts are predominantly used by landholders located to the west of the project area and by one landholder within the project area. Tertiary units are likely to be confined and hydraulically disconnected from the underlying Aldebaran Sandstone. Groundwater flow within the Tertiary is towards the east and north-east within the project area and surrounds, which suggests that the main source of recharge to the Tertiary is from rainfall percolation in the sub-crop areas to the west and south-west of the project area. Discharge from Tertiary sediments is likely to occur as lateral flow down-gradient of the project area. Leakage to underlying units may also occur where impermeable Tertiary clays are absent in the geological profile.
3. Permian Aldebaran sandstone sub-crops throughout the central and northern areas of the project area and is predominantly composed of quartzose sandstone deposited during cyclic marine to fluvial-deltaic environments, and is interbedded with conglomerate, shale, siltstone and coal. Below the base of weathering, strata are dominated by fine to very fine grained sandstones with occasional medium grained horizons deposited during a marine transgression. This fine grained sandstone is up to 150m thick in the northern portion of the project area, but has been removed by erosion in the south, where outcropping granite is present. Groundwater appears to be present under confined conditions throughout the Aldebaran Sandstone. A total of six of the 22 landholder bores identified within 10km of the project area target groundwater within the Aldebaran Sandstone. The main water bearing unit within the project area is the pebbly, coarse grained sandstone that lies directly on top of the ‘A’ coal seam. Recharge predominantly occurs through more permeable zones within the regolith and tertiary basalt, as well as downward percolation from quaternary alluvium associated with Retreat Creek.

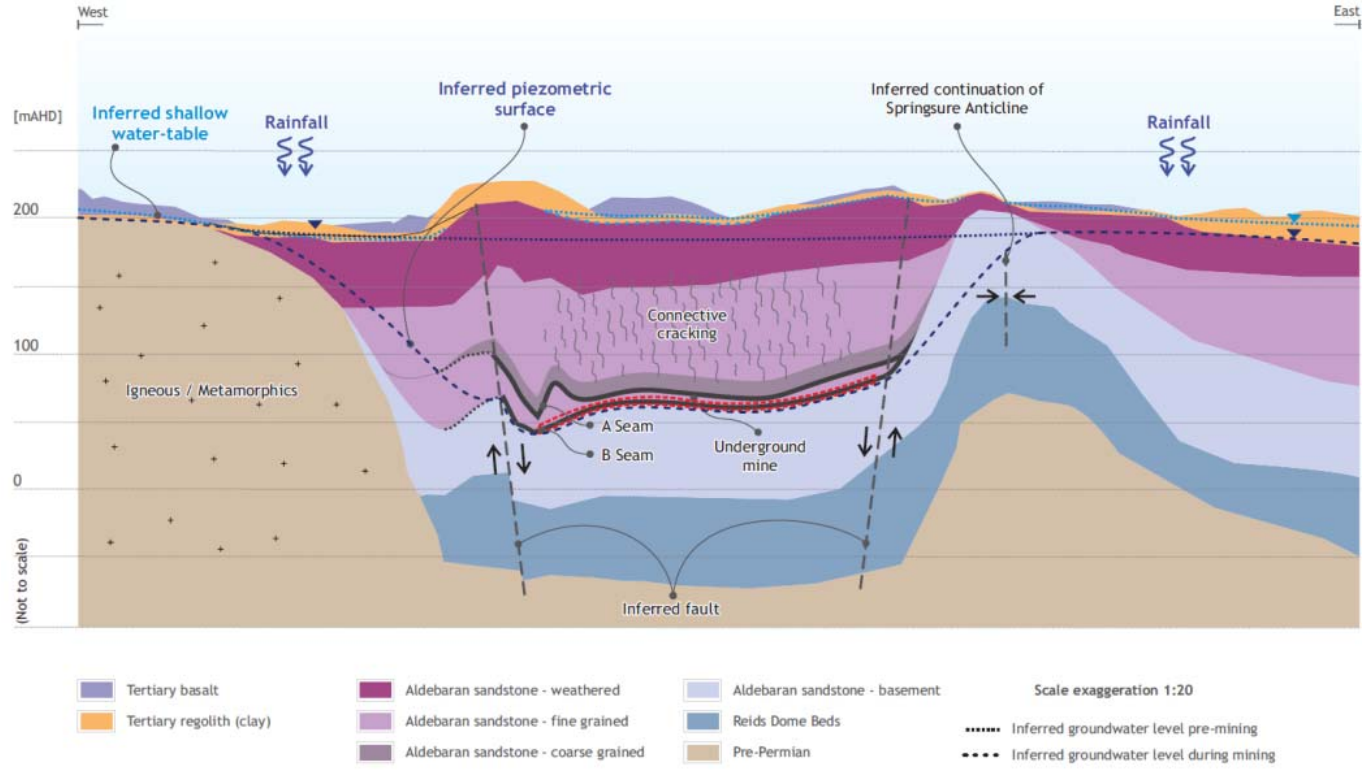
A geological conceptualisation of the groundwater regime in the vicinity of the project is shown in Figures 5-3 and 5-4 below.

Figure 5-3 Conceptual north to south geological cross-section of the project site



Source: Figure 16 of Appendix 14 of the EIS

Figure 5-4 Conceptual west to east geological cross-section of the project site



Source: Figure 17 of Appendix 14 of the EIS

5.5.1.4 Surface water quality

Background surface water quality at some locations around the project site was not always below, or within the range of, applicable water quality objectives (WQOs) or trigger values.

With regard to salinity levels in Retreat Creek and its tributaries, the average water quality results ranged from 768µS/cm to 2,302µS/cm. With regard to salinity levels in Taroborah Creek and its tributaries, the average water quality results ranged from 988µS/cm to 2,285µS/cm. All salinity results at all sites in Retreat and Taroborah Creeks exceeded the base flow salinity aquatic ecosystem protection WQO of 340µS/cm for the Lower Nogoa and Theresa Creek sub-basin specified in the Queensland Water Quality Guidelines.

With regard to other physio-chemical parameters in Retreat Creek, the mean pH at one site (9.04) and dissolved oxygen at three sites (74.73%, 57.15% and 72.2%) fell outside the ranges of both the Lower Nogoa and Theresa Creek trigger values and the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of pH 6.5 to 8.5 and 85% to 110% dissolved oxygen. Mean measurements of turbidity (476NTU, 907NTU, 419NTU and 1430NTU) at four sites exceeded the Lower Nogoa and Theresa Creek trigger values of 50NTU. The mean of 1430NTU at one site in Retreat Creek also exceeded the ANZECC (2000) Livestock Drinking Water Guidelines of 1000 NTU. Mean concentrations of total phosphorus (0.17mg/L, 0.31mg/L, 0.19mg/L and 0.11mg/L) at four sites, sulfate at one site (54mg/L), and nitrate at a different site (0.12mg/L) exceeded the Lower Nogoa and Theresa Creek trigger values of 0.05mg/L, 25mg/L and 0.06mg/L respectively.

With regard to heavy metals in Retreat Creek, mean dissolved concentrations of copper (0.002mg/L and 0.003mg/L) and silver (0.00010mg/L and 0.0004mg/L) at two sites, and zinc (0.009mg/L) at one site, exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of 0.0014mg/L, 0.00005mg/L and 0.008mg/L respectively.

With regard to other physio-chemical parameters in Taroborah Creek, the mean pH (8.66 and 8.89) and dissolved oxygen (67.40% and 140.16%) at two sites, fell outside the ranges of both the Lower Nogoa and Theresa Creek trigger values and the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of pH 6.5 to 8.5 and 85% to 110% dissolved oxygen. Mean measurements of turbidity (432NTU and 919NTU), nitrite (0.18mg/L and 0.07mg/L), nitrate (1.71mg/L and 0.35mg/L), total nitrogen (0.7mg/L and 4.07mg/L) and total phosphorus (0.10mg/L and 0.75mg/L) at two sites, exceeded the Lower Nogoa and Theresa Creek trigger values of 50NTU, 0.06mg/L, 0.06mg/L, 0.5mg/L and 0.05mg/L respectively. The mean concentration of total phosphorus (0.75mg/L) at one site also exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQO of 0.5mg/L. The mean concentration of sulfate (30.14mg/L) at one site also exceeded the Lower Nogoa and Theresa Creek trigger value of 25mg/L.

With regard to heavy metals in Taroborah Creek, mean dissolved concentrations of copper (0.002mg/L and 0.005mg/L) at two sites, and silver (0.0004mg/L) at one site exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of 0.0014mg/L and 0.00005mg/L respectively.

5.5.1.5 Groundwater quality

Groundwater at the site is slightly brackish. The average recorded values for salinity (measured as conductance) in the Alderbaran sandstone geology are 1,435µS/cm in the course-grained sandstone, 1,765µS/cm in the fine-grained sandstone, and 2,301µS/cm in the coal measures. The average recorded values for salinity in the Tertiary geology are 2,059µS/cm and 1,354µS/cm in the Tertiary regolith and Tertiary basalt respectively. The average recorded values for salinity in the alluvium is 1,430µS/cm. Salinity of the coal seams is comparatively low for the Bowen Basin, which typically ranges from 5,000µS/cm to 50,000µS/cm. The lower salinity in the coal seams is likely related to leakage of fresher groundwater from the immediately overlying pebbly coarse sandstone unit, and from rainfall infiltration where it sub-crops to the south.

A significant number of salinity samples exceeded the 80th percentile limit specified for deep (>30m) groundwater quality objectives for the Nogoa River and all waters of the Nogoa River sub-basin, listed under the Environmental Protection (Water) Policy 2009. Major ion exceedences included sodium, calcium, magnesium, bicarbonate, chloride and sulfate. A number of minor ions and metals also exceed the groundwater quality objectives.

Comparison of the data against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000) for irrigation indicates that groundwater collected from most of the monitoring bores is suitable for short term irrigation.

Comparison of the data against the Australian Drinking Water Guidelines 2011 (NRMMC, 2011) (ADWG) show that in general all of the groundwater tested is not suitable for human consumption because it exceeds either the aesthetic or health guidelines. All bores exceeded, or fell outside the range of, the ADWG health guidelines for at least two criteria, including total dissolved solids, pH, total hardness, chloride, sodium, sulfate, aluminium, iron, and manganese. All bores exceeded the ADWG aesthetic guidelines for smell, taste, and appearance.

5.5.2 Potential impacts

5.5.2.1 Surface water impacts

The potential impacts of the project on surface water would include the following:

- aquifer dewatering associated with open-cut and underground coal mining activities
- permanent alteration (e.g. due to final void and out-of-pit spoil dumps) of the direction and quantity of surface drainage south of the Capricorn Highway
- temporary alteration of the direction and quantity of surface drainage north of the Capricorn Highway due to subsidence of the land surface associated with underground mining.

5.5.2.2 Cumulative surface water impacts

A study conducted by EHP in 2009 investigated the cumulative impacts of mining activities on water quality in the Fitzroy River Basin. The study determined that salinity presents the most significant risk to water quality in the Basin due to discharges of mine-affected water from coal mines. The proponent referred to the EHP study in the EIS for the Taroborah Coal Project and concluded that the project would not pose a significant cumulative impact from controlled or uncontrolled releases, due to the following reasons:

- the EHP investigation of cumulative surface water impacts found that a number of mines in the northern Isaac-Connors sub-catchment posed the greatest risk of cumulative impacts in the Fitzroy Basin
- the investigation found that all of the mines (with the exception of Ensham mine) in the southern sub-catchments (i.e. Dawson, Nogoa and Mackenzie river systems) posed a low risk to cumulative water quality impacts
- the Taroborah Coal Project would be located in the Nogoa River sub-catchment, which was found by the EHP study to be in a low risk catchment for cumulative surface water impacts
- no operating mines exist upstream of the project and the nearest downstream operating mine is Ensham, which is located 60km to the east
- the EHP's Fitzroy Basin model water conditions would be applied to the environmental authority for the project, and those conditions were specifically developed to prevent the cumulative impacts of multiple mine discharges on the downstream surface water environment
- the Taroborah Coal Project is expected to require controlled discharges of less than 100ML/y with a salinity concentration below 2,500µS/cm.
- discharges would be undertaken in accordance with the model water conditions which would include minimum flow requirements, discharge limits and trigger investigation levels developed with regard to the spatial location of the project within the sub-catchment.

5.5.2.3 Groundwater impacts

A three-dimensional numerical simulation of groundwater flow for the project was run for the 21 year life of the mine to, amongst other things, predict the zone of depressurisation in alluvial and other aquifers, and predict changes in the groundwater regime. The model predicts that the Taroborah Coal Project would result in the following impacts:

- an average groundwater inflow rate to mine workings of 2.6 megalitres per day (ML/day), peaking at 5.7ML/day at around year 19
- groundwater level drawdown within the alluvium extending up to 3.5km east of the MDL467 boundary
- groundwater level drawdown within the Tertiary basalt extending up to 3km south of the boundary of MDL467 resulting in drawdown on two known bores of up to 1m, and seven bores of over 2m
- gradual recovery of groundwater levels to 194m Australian Height Datum (AHD) and 190m AHD for the western and eastern pit voids respectively, with both pit lake levels well below the pit crest.

5.5.2.4 Cumulative groundwater impacts

With regard to potential cumulative groundwater impacts, the nearest proposed coal mine is the Teresa Coal Project, which if developed would be located approximately 19km to the north of the Taroborah Coal Project MDL467 boundary. Based on the findings of the EIS for the Teresa Coal Project, the worst-case modelled drawdown is predicted to extend 2.5km to the north and west of the project boundary and 10km to the south and south-east of the project boundary. Groundwater drawdown for the Taroborah Coal Project is predicted to extend up to 3.5km outside of the project boundary. Given the two project boundaries are approximately 19km apart, there should be no overlap of impacts, and the Teresa and Taroborah Coal Projects may each be considered in isolation rather than having a cumulative impact on the groundwater aquifer.

5.5.3 Proposed mitigation measures

Measures proposed to mitigate the impacts of the project on surface and groundwater resources include:

- construction activities that affect stormwater flow paths would commence only after suitable stormwater management infrastructure has been established
- clearing of vegetation would be undertaken in a staged manner to minimise the disturbance footprint at any one time
- stabilisation of disturbed areas would be undertaken as soon as practicable after disturbance
- the majority of the current surface water drainage patterns disturbed in open-cut areas would be rehabilitated
- ongoing surface and groundwater monitoring in accordance with the requirements specified in the water management plan for the project.

5.5.4 Major issues raised in submissions

DNRM and SunWater requested the proponent to provide further information about the proposed beneficial use of excess mine water, including the piping and pumping infrastructure required to transfer water from the mine to the proposed release location in the Selma irrigation channel. In response, the proponent stated that a 100kW pumping station would be installed at the mine site and a 250mm diameter water pipeline capable of transferring up to 5ML/day would be constructed parallel to the Central West railway line. DNRM and SunWater were satisfied with the additional information provided by the proponent, subject to pre-approval consultation with the relevant parties (refer to the recommendation in section 5.5.5 below).

DNRM requested the proponent to provide any additional groundwater monitoring data that was collected after April 2013 (i.e. any new data since the EIS was released for public notification) to identify any trends or seasonal variation in groundwater level and quality, and determine whether the groundwater model requires recalibration. In response, the proponent provided additional data collected in May and September 2014. The proponent's analysis of the data indicated that there were no significant changes in groundwater levels recorded between April 2013 and September 2014, and water quality was generally within 10% of the April 2013 dataset. The proponent concluded that the additional monitoring results indicate that there is little seasonal variation in the groundwater regime, which validates the assumptions used in the groundwater model. However, groundwater quality and levels would continue to be monitored in accordance with the proposed groundwater monitoring program. DNRM considered the proponent’s response, but determined that a minimum of 12 consecutive months of groundwater level and quality data would be required to support the proponent’s conclusions. DNRM recommended that a peer review of the groundwater model be undertaken, and that an ongoing transient calibration of the groundwater model be conducted once additional permeability, groundwater levels and baseflow data is available. DNRM recommended that the groundwater model be reviewed and recalibrated no later than 3 years after dewatering commences. EHP has incorporated the DNRM recommendations in the recommended draft EA conditions for the project.

DNRM requested the proponent to outline any mitigation measures to address the potential impacts of the project on neighbouring groundwater bores. In response, the proponent proposed to enter into make good agreements with potentially affected landholders, and either deepen any affected bores, or provide an alternative supply from the mine dewatering scheme. EHP is of the opinion that the proposed mitigation measures are consistent with the legislative requirements under the *Water Act 2000* and the EP Act and would satisfactorily mitigate impacts on neighbouring groundwater users.

EHP referred the proponent to Section 52 of the Environmental Protection Regulation 2008 that requires adequate buffer zones between site activity and sensitive areas, commenting that while the proponent had proposed an adequate buffer to Retreat Creek, they had not proposed buffers to the wetlands or other riparian areas. In response to this issue, the proponent committed to provide 50m buffers to sensitive aquatic ecosystems. EHP is satisfied that the buffer distance would be adequate for protecting the sensitive areas of the site.

5.5.5 Conclusions and recommended conditions

The EIS used adequate studies, survey methodology, and survey effort to assess potential impacts on surface water and groundwater resources. The mitigation and management measures proposed by the proponent are considered adequate to manage potential impacts during the life of the project. The proponent’s commitments in the EIS to undertake ongoing monitoring programs during the life of the Taroborah Coal Project are reflected in the recommended draft EA conditions included in Appendix 1 of this report.

The surface and groundwater monitoring programs proposed to be carried out by the proponent during the life of the project are considered adequate to identify the potential impacts of the project on the surface and groundwater resources. Conditions to manage surface water and groundwater resources have been included in the recommended draft EA conditions contained in Appendix 1 of this report. Conditions about conducting a peer

review, and recalibration of the groundwater model have also been included in Schedule E, Groundwater, of the recommended draft EA conditions contained in Appendix 1.

With regard to the potential beneficial use of mine affected water, the following action is recommended:

Recommendation

Contact DNRM, EHP and SunWater for pre-approval advice about the proposed release of excess mine water for beneficial use in the Selma irrigation channel.

5.6 Air

Section 4.6 of the EIS discussed the air quality aspects of the project. Section 4.6.1 of the EIS included a description of the environmental values, including the existing air quality in the area and the proximity of all residences and other sensitive environments to the project— such locations will be referred to as relevant places in this assessment report. Section 4.6.2 of the EIS outlined the potential air quality impacts and proposed mitigation measures. Appendix 15 of the EIS included further supporting air quality information, including background monitoring and dispersion modelling of the potential air quality impacts of the project. Appendix 15a of the EIS included additional air quality information in response to the public submissions on the EIS.

5.6.1 Existing environmental values

There are 14 potentially affected relevant places within and surrounding the project site. Figure 5-5 provides the location of relevant places within and surrounding the project. No kindergartens, schools, hospitals, aged care facilities, office buildings, factories or workshops are known to exist near the project.

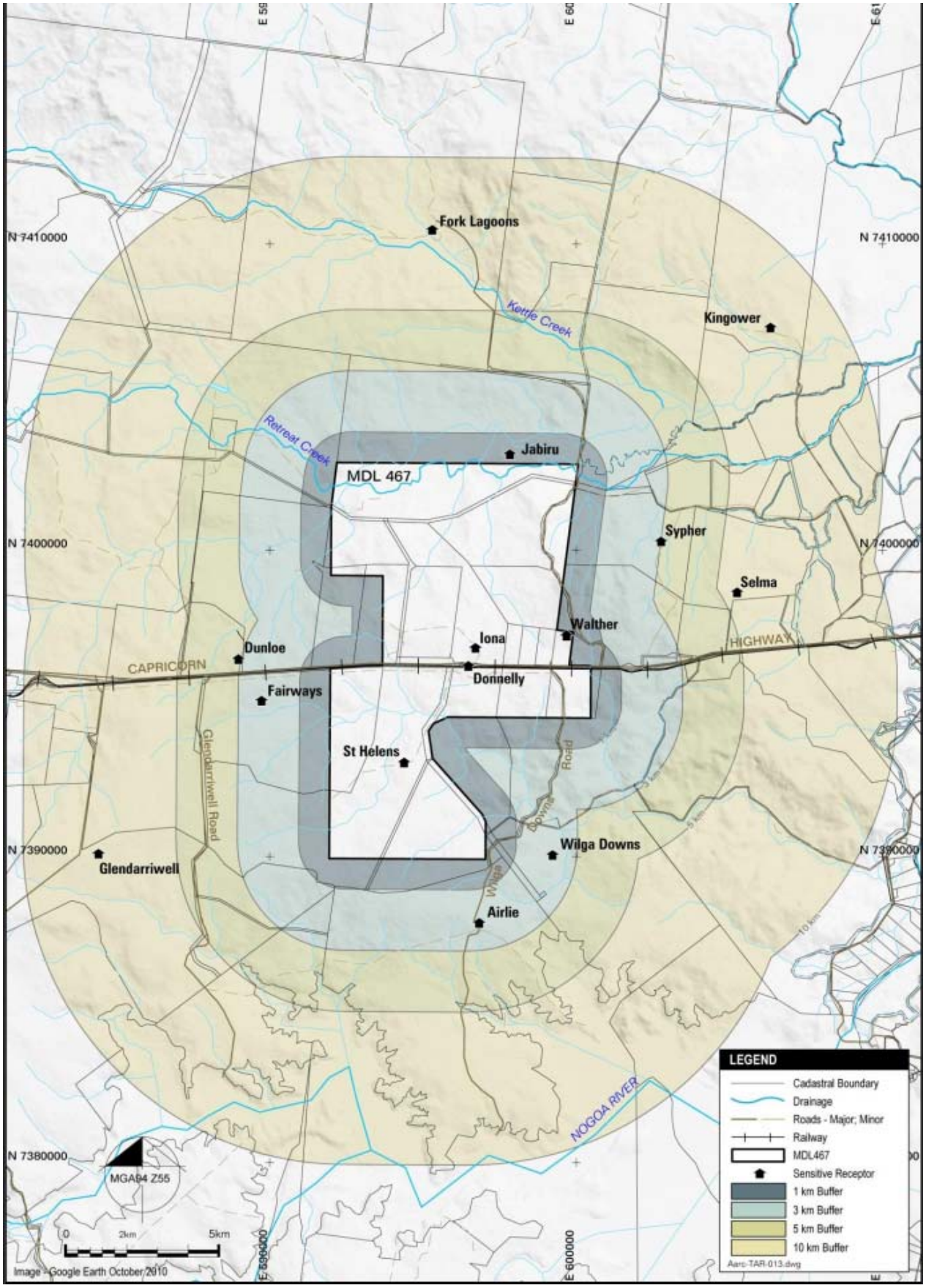
A dust deposition air quality monitoring program was conducted at six homesteads located within and surrounding the project area. The St. Helens, Iona Downs and Walther homesteads are located within MDL467. The Jabiru, Airlie and Dunloe homesteads are located outside of MDL467, but are indicative of dust deposition levels in the region. The lowest average dust deposition rate measured during the five month monitoring period was 24.3mg/m^2/day at the Dunloe homestead, located about 6km west of the proposed open-cut pit. The highest average dust deposition rate measured during the monitoring period was 40.7mg/m^2/day at the Airlie homestead, located approximately 7km south of the proposed open-cut pit. The background dust deposition value used in the air quality model was 40.7mg/m^2/day. The background concentrations of total suspended particulates (TSP), PM_{10} and $PM_{2.5}$ used in the air quality model were derived from monitoring data obtained from other coal mines in the region. Table 5-10 outlines the background values of the air quality indicators used in the model.

Table 5-10 Background air quality parameters used in the model

Air pollutant	Averaging period	Concentration
Total suspended particulates	Annual	28
PM_{10}	24-hour	21
$PM_{2.5}$	24-hour	5.4
	Annual	2.8
Dust deposition	Annual	40.7

Source: Table 19 of Appendix 15 of the EIS

Figure 5-5 Relevant places within and surrounding the project area



Source: Figure 4.99 of the EIS

Note: A 'sensitive receptor' in the above figure equates to a relevant place in the discussion.

5.6.2 Potential impacts and proposed mitigation measures

Years 2 and 5 of project operations were used in the modelling as these years are representative of the open-cut operation and are likely to generate the most dust at the closest relevant places. The later years of operation involve predominantly underground mining with only coal handling and preparation contributing to surface based dust generation.

Tables 5-11 and 5-12 show the predicted levels of each air pollutant at relevant places during Years 2 and 5 of project operations respectively.

Table 5-11 Predicted ground-level concentrations and deposition rates at relevant places during Year 2 of project operations

Receptor	Annual average				Monthly average		24-hour average			
	TSP (µg/m^3)		$PM_{2.5}$ (µg/m^3)		Dust (mg/m^2/day)		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m3)	
	Project site[1]	Cumulative[2]	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative
St. Helens	52.2	80.2	4.3	7.1	92.7	133.4	228.4	249.4	30.7	36.1
Jabiru	1.6	29.6	0.2	3.0	2.5	43.2	24.6	45.6	4.1	9.5
Iona Downs	41.3	69.3	3.1	5.9	111.3	152.0	294.3	315.3	37.7	43.1
Walther	6.2	34.2	0.7	3.5	17.1	57.8	112.2	133.2	15.9	21.3
Airlie	3.9	31.9	0.6	3.4	6.6	47.3	67.1	88.1	11.4	16.8
Glendarriwell	2.6	30.6	0.5	3.3	4.1	44.8	25.5	46.5	6.3	11.7
Dunloe	12.4	40.4	2.0	4.8	17.6	58.3	114.0	135.0	21.9	27.3
Selma	0.7	28.7	0.1	2.9	1.8	42.5	48.3	69.3	8.9	14.3
Kingower	0.5	28.5	0.1	2.9	0.8	41.5	14.8	35.8	2.3	7.7
Fork Lagoons	0.5	28.5	0.1	2.9	0.5	41.2	18.5	39.5	3.7	9.1
Donnelly	85.9	113.9	5.3	8.1	258.5	299.2	330.6	351.6	49.1	54.5
Wilga Downs	1.3	29.3	0.1	2.9	6.0	46.7	32.2	53.2	5.9	11.3
Fairways	17.1	45.1	2.3	5.1	21.8	62.5	138.5	159.5	24.8	30.2
Sypher	1.1	29.1	0.2	3.0	2.1	42.8	28.5	49.5	4.5	9.9
Air quality objective	**90**		**8**		**120**		**50**		**25**	

Source: Tables 21 and 22 of Appendix 15 of the EIS

Table notes: 1. Modelled contributions of the project at each relevant place
2. Modelled contribution of the project, plus estimated background concentrations at each relevant place

Table 5-12 Predicted ground-level concentrations and deposition rates at relevant places during Year 5 of project operations

Receptor	Annual average				Monthly average		24-hour average (maximum)			
	TSP (µg/m^3)		$PM_{2.5}$ (µg/m^3)		Dust (mg/m^2/day)		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m3)	
	Project site[1]	Cumulative[2]	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative
St. Helens	39.0	67.0	3.8	6.6	60.9	101.6	224.2	245.2	31.5	36.9
Jabiru	1.8	29.8	0.3	3.1	2.3	43.0	41.9	62.9	6.9	12.3
Iona Downs	71.1	99.1	5.4	8.2	199.6	240.3	689.0	710.0	86.9	92.3
Walther	7.5	35.5	0.9	3.7	18.7	59.4	138.9	159.9	19.5	24.9
Airlie	3.7	31.7	0.6	3.4	4.8	45.5	56.7	77.7	12.1	17.5
Glendarriwell	2.5	30.5	0.5	3.3	3.9	44.6	27.2	48.2	6.7	12.1
Dunloe	11.8	39.8	1.9	4.7	15.6	56.3	111.6	132.6	21.6	27.0
Selma	0.8	28.8	0.1	2.9	1.8	42.5	52.2	73.2	9.9	15.3
Kingower	0.6	28.6	0.1	2.9	0.8	41.5	18.9	39.9	2.9	8.3
Fork Lagoons	0.6	28.6	0.1	2.9	0.6	41.3	16.7	37.7	3.4	8.8
Donnelly	249.0	277.0	14.4	17.2	776.0	816.7	909.9	930.9	117.1	122.5
Wilga Downs	1.7	29.7	0.2	3.0	6.7	47.4	45.7	66.7	6.9	12.3
Fairways	16.2	44.2	2.3	5.1	22.2	62.9	149.9	170.9	27.1	32.5
Sypher	1.3	29.3	0.2	3.0	2.3	43.0	33.8	54.8	5.3	10.7
Air quality objective	**90**		**8**		**120**		**50**		**25**	

Source: Tables 23 and 24 of Appendix 15 of the EIS

Table notes:
1. Modelled contributions of the project at each relevant place
2. Modelled contribution of the project, plus estimated background concentrations at each relevant place

The annual average ground-level concentrations of TSP, including background levels at all relevant places outside of MDL467 for both modelled scenarios are predicted to be below the air quality objective of 90µg/m³. The TSP air quality objective was predicted to be exceeded at one of the four residences located within MDL467 during Year 2 of project operations, and at two of the four residences located within MDL467 during Year 5 of project operations.

The annual average $PM_{2.5}$ concentrations, including background levels at all relevant places outside of MDL467 for both modelled scenarios are predicted to be below the air quality objective of 8µg/m^3. The $PM_{2.5}$ air quality objective was predicted to be marginally exceeded at one of the four residences located within MDL467 during Year 2 of operations, and at two of the four residences during Year 5 of project operations.

The maximum monthly average dust deposition concentrations, including background levels at all relevant places outside of MDL467 for both modelled scenarios are predicted to be below the air quality objective of 120mg/m^2/day. The dust deposition air quality objective was predicted to be exceeded at three of the four residences located within MDL467 during Year 2 of operations, and at two of the four residences during Year 5 of operations.

The maximum 24-hour average PM_{10} concentrations, including background levels are predicted to exceed the air quality objective of 50µg/m^3 at all four relevant places within MDL467 for both modelled scenarios, and at five of the eleven relevant places outside of MDL467 during Year 2 of operations, and at seven of the eleven relevant places

outside of MDL467 during Year 5 of operations.

The maximum 24-hour average $PM_{2.5}$ concentrations, including background levels are predicted to exceed the air quality objective of 25µg/m^3 at three of the four relevant places within MDL467 and two of the eleven relevant places outside of MDL467 for both modelled scenarios.

Proposed mitigation measures

The proponent proposes a proactive and reactive air quality management strategy during construction and operations to reduce emissions below the air quality objectives at all relevant places.

A dust management plan would be developed in conjunction with a construction management plan that would include the following measures:

- constructing bunds and wind breaks around stockpiles or earthmoving areas
- avoiding earthmoving activities during unfavourable meteorological conditions, where possible
- setting on-site speed limits to minimise wheel generated dust
- watering down bunds, stockpiles and unsealed roads to minimise dust
- limiting vegetation and soil clearing to approved areas, to minimise exposed surfaces
- compact construction sites to minimise dust
- continuous PM_{10} monitoring
- altering site activities when monitoring results show an increase in dust levels
- limiting, reducing, redirecting or stopping significant dust generating activities at times of elevated risk.

An air quality management plan would be developed to minimise emissions during the operational phase of the project and would include the following measures:

- watering and grading haul roads and using road surface treatments
- using water sprays, covers and chutes during coal handling and preparation operations
- progressively revegetating disturbed areas as mining operations develop
- constructing wind breaks (such as tree plantings) around stockpiles
- carrying out continuous, real-time monitoring of meteorological conditions and dust concentrations at all sensitive receptors
- continuously improving train load profiles and loading techniques to avoid coal spillage
- shaping the profile of coal in rail wagons and applying a surface treatment to minimise coal dust emissions during transit to the WICET
- implementing adaptive management strategies (such as reducing extraction rates) when meteorological condition monitoring indicates adverse wind conditions, or dust monitoring at sensitive receptors indicates that dust levels are approaching the air quality objectives
- implementing reactive management strategies, including additional mitigation measures (such as further reducing activity rates, covering equipment or temporarily ceasing operations) when meteorological conditions become particularly adverse
- implementing a complaints management procedure
- consulting with potentially impacted landowners and negotiating site-specific mitigation measures such as installing first flush systems on rainwater tanks.

5.6.3 Major issues raised in submissions

EHP identified that Year 6 of project operations (rather than Year 5) may represent the worst-case scenario for dust emissions because Year 6 was anticipated to result in the greatest volume of overburden stripped during the life of the project. Consequently, EHP requested the proponent to model the predicted dust emissions at relevant places during Year 6. In response, the proponent provided estimates of the emissions rates of dust for Year 6 of project operations and compared them to the emissions rates estimated for Year 5. Based on the predicted change (increase) in emissions rates for Year 6, the proponent inferred that:

- concentrations of TSP, PM_{10}, $PM_{2.5}$ and dust deposition are likely to increase by up to 9% at relevant places
- the annual average concentrations of TSP would remain below the air quality objective at all relevant places
- the 24-hour average concentrations of PM_{10} would not exceed the air quality objective at any additional relevant places
- the maximum 24-hour average concentrations of $PM_{2.5}$ would marginally exceed the air quality objective at one additional relevant places
- the annual average concentrations of $PM_{2.5}$ would not exceed the air quality objective at any additional relevant places

- the maximum monthly average dust deposition rates would not exceed the air quality objectives at any additional relevant places.

EHP considered the additional information provided by the proponent and decided that site-specific air conditions, in addition to the model mining conditions for air quality, could be developed for the draft EA to manage the predicted additional impacts (refer to the air conditions contained in Appendix 1 of this report).

CHRC voiced concerns raised by the Emerald community about the potential for increased coal dust levels from trains hauling product coal from the project through Emerald. CHRC requested the proponent to establish baseline and ongoing dust monitoring in Emerald to identify any impacts. In response, the proponent confirmed its commitment to using low profiling of coal loads and veneering the coal surface in the rail cars to suppress dust from loaded rail cars. The proponent also committed to establishing a dust monitoring program in Emerald, prior to and during, project operations.

DOTE and EHP noted that dust deposition rates greater than the air quality objective of 120mg/m^2/day were predicted in the Brigalow woodland and Brigalow/Belah low open woodland, located close to the proposed open-cut pit and in areas of the adjacent Fairbairn State Forest. Consequently, the departments requested the proponent to assess the potential impacts on the ecological health of vegetation in these areas. In response, the proponent presented, amongst other things, a literature review about the factors influencing the effects of dust on vegetation and concluded that dust loads only exceeding 5g/m^2/day would likely have an adverse effect on plant growth, which is far greater than the highest modelled dust deposition rates.

EHP requested further information from the proponent about the selection and application of various parameters used in the air quality model. In response, the proponent provided further information about the modelling methodology and configuration. EHP reviewed the information provided by the proponent and determined that the modelling methodology was adequate for the project site.

5.6.4 Conclusions and recommendations

The EIS included an adequate assessment of the impacts on air quality as a result of the project. The predicted exceedences of the air quality objectives at relevant places beyond the boundary of MDL467 should be able to be managed by the mitigation and management measures proposed by the proponent. However, the predicted exceedences of the air quality objectives at relevant places within, or near, the boundary of MDL467 are unlikely to be adequately mitigated due to the close proximity of the mining activities to those locations. Consequently, the proponent should continue to liaise with the property owners within, or near, the boundary of MDL467 to either purchase the properties in question, or implement site-specific mitigation measures to the satisfaction of the property owners. Furthermore, EHP has prepared suitable site-specific air conditions that have been included in the recommended draft EA conditions in Appendix 1 of this report. The conditions have a strong emphasis on establishing a proactive and reactive air quality monitoring program that can respond to potential air quality issues.

Recommendation

It is recommended that the proponent continue to liaise with landowners potentially affected by exceedences of the air quality objectives with the intention of reaching outcomes agreeable with the property owners (e.g. purchasing properties or entering into lease agreements).

5.7 Noise and vibration

Section 4.7 of the EIS discussed the noise and vibration aspects of the project. Section 4.7.1 of the EIS included a description of the environmental values, including the existing acoustic environment in the area and the proximity of all residences and other sensitive environments to the project. Section 4.7.2 of the EIS outlined the potential noise and vibration impacts and proposed mitigation measures. Appendix 17 of the EIS included further supporting noise and vibration information, including background monitoring and modelling of the predicted noise and vibration impacts of the project.

5.7.1 Existing environmental values

Figure 3-5 in section 5-6 of the air section above, identifies 14 potentially affected sensitive receptors within and surrounding the project site. No kindergartens, schools, hospitals, aged care facilities, office buildings, factories or workshops are known to exist near the project.

Both attended and unattended noise monitoring to characterise the existing noise environment surrounding the project was conducted between 19 and 27 April 2012 at the Iona Downs, St. Helens, Walther and Jabiru properties. Table 5-13 provides a summary of the unattended background noise levels measured at the four properties.

Table 5-13 Measured background noise levels

Location	Background Noise Level, minL_{90}, dB(A)[1]		
	Day	Evening	Night
Iona Downs	31	36	20
St. Helens	31	24	18
Walther	33	43	27
Jabiru	25	35	19

Source: Table 4.100 of the EIS

Table notes: 1. Lowest tenth percentile corresponding to the median day

The results indicate that background noise levels are lowest during the day at the Jabiru property, lowest during the evening and night at the St. Helens property and highest during the day, evening and night at the Walther property.

The attended noise monitoring indicated that the main contributors to background noise levels were:

- trains
- traffic from the Capricorn highway
- cows, dogs, horses and insects
- mechanical plant
- banging and grinding from homestead shed.

5.7.2 Potential impacts and proposed mitigation measures

The following potential noise and vibration sources from the project were identified:

- light and heavy vehicles accessing the project
- blasting activities during open-cut mining
- underground vent fan and motors
- open-cut mining activities (excavation, hauling, drilling, etc.)
- crushing coal
- conveying and stacking coal
- loading of coal trains.

The following potential low frequency noise sources (i.e. less than 200 Hertz) from the project were identified:

- pumps
- transformers
- cooling fans
- compressors
- oil and gas burners
- electrical installations
- diesel engines
- air-conditioning equipment.

Year 3 of project operations was modelled to predict noise and vibration emissions from the project. Year three was considered to be the worst-case scenario for noise and vibration as the operations include out-of-pit dumping, the majority of mobile equipment would be in use, and mining operations would generally occur across the full extent of the open-cut pits. The CHPP was included in the day and evening noise level predictions, but wasn't included in the night-time noise level predictions, because the plant wouldn't operate at night. The noise and vibration levels from the project were modelled without noise mitigation measures.

Table 5-14 provides a summary of the predicted noise levels at sensitive receptors and a comparison with the noise quality objectives for Year 3 of project operations (representing worst-case conditions).

Table 5-14 Predicted noise levels at sensitive receptors during Year 3 of operations

Location	Predicted Noise Level $L_{eq,1hr}$, dB(A)		
	Day and Evening (dB(A))	Night-time	
	Neutral	Neutral	Adverse
Airlie	22	22	28
Donnelly	47	47	53
Dunloe	24	23	30
Fairways	27	26	33
Fork Lagoons	15	15	18
Glendarriwell	16	15	19
Iona Downs	44	44	51
Jabiru	22	22	28
Kingower	14	14	17
Selma	20	20	24
St. Helens	37	37	44
Sypher	21	21	27
Walther	31	31	39
Wilga Downs	25	25	31
Noise quality objective	**40**	**35**	

Source: Table 4.104 of the EIS

Based on the modelling results, noise levels at two sensitive receptors located within the boundary of MDL467 are predicted to exceed the day and evening noise quality objective of 40dB(A). Noise levels under neutral conditions at three sensitive receptors, and under adverse conditions at four sensitive receptors, located within the boundary of MDL467 are predicted to exceed the night-time noise quality objective of 35dB(A).

The sound power level during the construction phase of the project was estimated to be less than the sound power level during operations. Consequently, the noise emissions during construction are predicted to be less than the noise emissions during operations and would result in fewer (if any) exceedences of the noise quality objectives.

Low frequency noise

Based on the modelling results, the low frequency noise levels at all sensitive receptors are predicted to be below the external low frequency noise quality objective of 55dB, and/or have a spectral difference between the unweighted and A-weighted low frequency noise levels of less than 15dB.

Airblast overpressure and vibration

Based on the modelling results, the airblast overpressure levels at two sensitive receptors located within 1km of the open-cut pit are predicted to exceed the airblast overpressure noise quality objective of 115dB for four out of five blasts.

Based on the modelling results, the ground vibration levels at one sensitive receptor located within 600m of the open-cut pit is predicted to exceed the ground vibration noise quality objective of 5mm/second peak particle velocity for nine out of ten blasts.

Sleep disturbance

Based on the WHO Guidelines for Community Noise (2009) a maximum outdoor sleep disturbance noise quality objective of 47dB(A) was selected for the project. The predicted compliance of the project with the sleep disturbance criterion was not modelled. However, based on an average external noise quality objective of 35dB(A) and a predicted difference between the average and maximum noise events of up to 8dB(A), the sleep disturbance objective of 47dB(A) should be met at all sensitive receptors located beyond the boundary of MDL467.

Rail noise

Up to three trains (six train movements) per day would be required to transport coal from the project to the WICET for export. Trains from the project would travel 24.4km along the Central West rail system to Emerald, and then an additional 372km along the Blackwater rail system to the WICET.

It is predicted that the QR noise quality objective of 87dB(A) would be met at a distance of 40m or more from passing trains under normal meteorological conditions, and at 60m or more under adverse meteorological conditions.

Proposed mitigation measures

The proponent proposes the following measures to mitigate the predicted worst-case noise impacts at sensitive receptors:

- purchasing properties of, or entering into lease agreements with, the landowners of the four properties predicted to be worst affected
- attenuating fixed and mobile plant
- constructing noise barriers at noise sources (i.e. around crushers, pumps etc.)
- implementing alternative (quieter) operating methods (e.g. re-routing haul roads, re-allocating mobile plant, restricting dumping (particularly at night), significant bunding in close proximity to haul routes etc.)
- limiting the power applied to diesel locomotives as they pull away from the mine site
- restricting operations during adverse meteorological conditions
- blast parameter design controls
- no blasting between 6pm and 7am
- responding to noise complaints in consultation with affected residents
- implementing a noise and vibration monitoring program.

5.7.3 Major issues raised in submissions

Two members of the public raised concerns about the noise likely to be generated by mining activities and the potential for sleep disturbance at nearby sensitive receptors. One of the submissions proposed some specific noise reduction measures to be implemented. In response, the proponent included some of the proposed measures into the EIS as additional mitigation measures to be implemented for the project (e.g. noise barriers at noise sources and limiting power to diesel locos as they pull away from the mine). However, some of the proposed measures (electrifying the railway line and daylight train loading only) were excluded by the proponent due to financial and operational constraints. EHP is satisfied that the proponent has added the feasible measures proposed in the submission into the proposed noise mitigation measures for the project.

One member of the public raised concerns about the potential for noise and vibration from blasting to frighten cattle and requested notification prior to blasting from the project. In response, the proponent noted that the blasting impacts were predicted to be very low at the property in question. However, the proponent agreed to include the property owner and any other potentially affected landholders on a blasting notification protocol for the project. EHP is satisfied with the proponent's response to this issue.

5.7.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR for the noise and vibration aspects of the project. The EIS adequately described the existing noise environment potentially affected by the project and the potential impacts of the project on the receiving environment. The predicted exceedences of the noise quality objectives at sensitive receptors well beyond the boundary of MDL467 should be able to be managed by the implementation of mitigation and management measures proposed by the proponent. However, the predicted exceedences of the noise quality objectives at sensitive receptors within, or near, the boundary of MDL467 are unlikely to be adequately mitigated due to the close proximity of the mining activities to those locations. Consequently, the proponent should continue to liaise with the property owners within, or near, the boundary of MDL467 to either purchase the properties in question, or implement site-specific mitigation measures to the satisfaction of the property owners. Furthermore, EHP has prepared site specific noise conditions that have been included in the recommended draft EA conditions in Appendix 1 of this report. These conditions have a strong emphasis on

establishing a proactive and reactive noise monitoring program that can respond to potential noise issues.

QR has recommended (see section 5.3.6 of this report) that the proponent manage the rail transport of coal from the project site to the WICET so that train movements through the Emerald township occur during off-peak times (i.e. 9am-2.30pm and 6pm-6am) to minimise traffic congestion during peak road use periods. Sleep disturbance from train movements during night-time may become an issue for nearby sensitive receptors and the proponent should liaise with the CHRC to determine how this issue should be managed.

Recommendation 1

It is recommended that the proponent continue to liaise with landowners potentially affected by exceedences of the noise quality objectives with the intention of reaching outcomes agreeable with the property owners (e.g. purchasing properties or entering into lease agreements).

Recommendation 2

It is recommended that the proponent liaise with the CHRC to determine how best to manage potential sleep disturbance in Emerald during off-peak, night-time train movements.

5.8 Ecology

Section 4.8 of the EIS discussed ecology. Sections 4.8.1 and 4.8.2 of the EIS provided a description of the ecological environmental values of the site. Section 4.8.3 of the EIS discussed the potential impacts on the ecological environmental values and proposed mitigation measures. Further supporting information was provided in Appendix 18, Terrestrial flora and fauna assessment, Appendix 19, Waterway and aquatic ecology assessment, Appendix 20, Stygofauna survey report, and Appendix, 21 Environmental offsets strategy. The EIS addressed MNES under the EPBC Act in Section 5, Matters of national environmental significance, while Appendix 2 of this report includes an assessment of MNES.

Terrestrial flora and fauna surveys were carried out in the dry season from the 8 to 16 September 2011 and in the wet season from 28 February to 5 March 2012. Aquatic flora and fauna surveys were carried out in October 2011 and February 2012. A stygofauna assessment was carried out in September 2011, and a targeted bat survey on 7 and 8 August 2012.

5.8.1 Existing environmental values

The Taroborah Coal Project is located in the Nogoa River catchment. Retreat Creek and Taroborah Creek, which are tributaries of the Nogoa River, both flow through the site. The project area is in the Basalt Downs subregion of the Northern Brigalow Belt bioregion, but has been extensively clear and is mostly used for agriculture. The proposed mining lease area covers 5186.2ha, of which 30.2% is remnant vegetation.

5.8.1.1 Vegetation communities

Table 5-15 lists twelve distinct vegetation communities identified within the project area during field surveys. Ten of those communities meet the descriptions of regional ecosystems (REs), while two do not. Of the ten REs, four have endangered biodiversity status, five have of concern biodiversity status, and the remaining one has no concern at present biodiversity status.

Table 5-15 Regional ecosystems in the Taroborah project area

RE[1]	Description	VMA[2] class	Biodiversity status	Ground-truthed RE area (ha)	Subsidence disturbance area (ha)	Total area to be cleared (ha)
11.3.3a	Riverine wetland or fringing riverine wetland and *Melaleuca bracteata* woodland on alluvial plains	Of concern	Of concern	143.0	0	0
11.3.6	*Eucalyptus melanophloia* woodland on alluvial plains	Least concern	Of concern	33.2	33.2	0
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Least concern	Of concern	190.1	0	0

RE[1]	Description	VMA[2] class	Biodiversity status	Ground-truthed RE area (ha)	Subsidence disturbance area (ha)	Total area to be cleared (ha)
11.3.27	Palustrine wetlands dominated by persistent emergent vegetation	Least concern	Of concern	112.5	0	0
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* on Cainozoic clay plains	Endangered	Endangered	31.2	0	0
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	Endangered	4.1	4.1	0
11.5.3	*Eucalyptus populnea* and/or *E. melanophloia* and/or *Corymbia clarksoniana* on Cainozoic sand plains	Least concern	No concern at present	191.2	31.9	0
11.9.1	*Acacia harpophylla*/*Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks	Endangered	Endangered	72.6	2.76	2.76
11.9.10	*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks	Of concern	Endangered	130.9	67	0
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks, crests and scarps	Least concern	No concern	95.2	11.2	0
	Lacustrine (artificial freshwater dam) wetlands	N/A	N/A	32.2	27.4	0
	Non-remnant grasslands	N/A	N/A	5,632.5	1,701.6	320.8

Source: Table 4.113 of the EIS

Table notes: 1. RE = Regional ecosystem 2. VMA = *Vegetation Management Act 1999*

During the field surveys some vegetation communities on the project site were noted for their potential to have some reliance on groundwater. A close association was noted between palustrine wetlands and REs along Retreat Creek in the north of the project site. These REs consists of 190.1ha of river red gum riparian woodland (RE11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines) and 26.2ha of river teatree riparian woodland (RE 11.3.3a riverine wetland or fringing riverine wetland and *Melaleuca bracteata* woodland on alluvial plains). About 117ha of RE11.3.3a in the riparian area of Taroborah Creek was also mapped during the field survey.

Measured groundwater levels in the vicinity of Retreat and Taroborah Creeks range between 6m–10m below ground level. That depth is shallow enough for deep-rooted vegetation species, such as eucalypt species of RE11.3.25 and RE11.3.3a, to have the potential to access and use the sub-surface groundwater.

5.8.1.2 Terrestrial flora species

A total of 205 flora species including 33 introduced species were identified within or immediately adjacent to the project area. No species of conservation significance as listed under the *Nature Conservation Act 1992* (NC Act) or under the *Environmental Protection and Biodiversity Conservation Act 1999* were recorded.

5.8.1.3 Terrestrial fauna species

A total of 124 vertebrate fauna species were recorded within the project survey area, comprising seven amphibians (one introduced), eight reptiles, 81 birds and 28 mammals (six introduced).

The little pied bat (*Chalinolobus picatus*), which is listed as near threatened under the NC Act, was the only species of conservation significance located in the project area surveys.

The EIS also identified fauna species listed under the NC Act that could possibly occur in the project area based on habitat availability. The species considered to possibly occur included:

- squatter pigeon (southern) (*Geophaps scripta scripta*) – vulnerable
- black-chinned honeyeater (*Melithreptus gularis*) – near threatened
- cotton pygmy-goose (*Nettapus coromandelianus*) – near threatened
- red-tailed tropicbird (*Phaethon rubricauda*) – vulnerable
- Australian painted snipe (*Rostratula australis*) – vulnerable
- radjah shelduck (*Tadorna radjah*) – near threatened
- common death adder (*Acanthophis antarcticus*) – near threatened
- ornamental snake (*Denisonia maculate*) – vulnerable
- yakka skink (*Egernia rugosa*) – vulnerable
- grey snake (*Hemiaspis damelii*) – endangered
- brigalow scaly-foot (*Paradelma orientalis*) – vulnerable
- Fitzroy river turtle (*Rheodytes leukops*) – vulnerable
- golden-tailed gecko (*Strophurus taenicauda*) – near threatened.

Aquatic species

The ecological assessment identified the following aquatic values in the survey area:

- Centre Creek originates to the west of MDL467 and flows into Retreat Creek in the north-west corner of the project site
- Retreat Creek is a fourth order watercourse that flows in a west to east direction in the north of the project area and flows into Theresa Creek, before joining the Nogoa River
- Taroborah Creek is a second order watercourse that flows in a west to south-east direction in the south of the project area and flows into St. Helens Creek, before joining the Nogoa River
- all other surface water drainages are ephemeral stream order 1 and 2 drainage lines
- several palustrine and lacustrine wetlands occur in the project area (scoring as medium under the Queensland Aquatic Conservation Assessment)
- no threatened plants under either the NC Act or EPBC Act were located at aquatic survey sites
- surveys identified 47 macro-invertebrate taxa; 43% of all specimens collected in the dry season were from four families: true fly (*Diptera*: *Tanypodinae*), backswimmers (*Hemiptera*: *Notonectidae*), water boatmen (*Hemiptera*: *Corixidae*) and diving beetles (*Coleoptera*: *Dytiscidae*)
- surveys identified six fish species with the most common being spangled perch (*Leiopotherapon unicolour*), southern purple-spotted gudgeon (*Mogurnda adspersa*) and Agassiz's glassfish (*Ambassis agassizi*).
- Surveys identified five amphibian and six reptile species in association with the riparian communities in the project area
- no subterranean fauna were detected from 7 sample locations.

5.8.2 Potential impacts and significance of impacts

The following potential impacts on conservation values may occur as result of project activities:

- complete loss of 473ha of vegetation cover (of which 152.2ha is remnant vegetation) would occur in the area associated with open-cut mining and surface infrastructure
- construction of the eastern open-cut mine haul road through brigalow woodland (RE 11.9.1) would result in the loss of 2.76ha of the 72.6ha of brigalow identified on-site
- injury or death of fauna could occur during the life of the project, with the greatest potential during the construction phase
- edge effects from proposed works could alter microclimatic conditions due to greater light intensity, increased wind penetration and lower humidity due to vegetation removal
- dust cover generated by vehicle movement on unsealed roads could reduce plant health through the reduction of photosynthesis
- additional noise from mine site operations could disturb fauna. Noise would be concentrated around the open-cut pit, coal processing plant, haul roads and decline areas
- artificial lighting commonly attracts insects, which would in turn result in a higher abundance of amphibians, microbats and reptiles that would take advantage of increased numbers of prey
- reduction of habitat provided by leaf litter, trees with hollows, and fallen timber, plus resultant changes to soil biota, may result in a loss of biological diversity
- land clearing activities may increase soil erosion, causing silting or sedimentation of riverine habitats and

waterholes downstream, and disruption of natural nutrient cycling
- increased concentrations of nutrients such as nitrogen and phosphorous from by-products of human and industrial waste could increase the abundance of algae and aquatic plants that could lead to eutrophication of wetlands
- an increase of pest fauna species could result from increased availability of food sources such as improperly disposed food scraps by staff during project operations
- processing and mining activities could contaminate riverine habitats and waterholes downstream
- introduction of additional weeds and spread of weeds within the project area via seed transport on vehicles and machinery
- the predicted groundwater drawdown in the alluvium of Retreat and Taroborah Creeks, both on and off the project site, has the potential to reduce the availability of groundwater for the deep-rooted eucalypt species of RE11.3.25 and RE11.3.3a on-site, and other potential GDEs off-site
- 33.1ha of ephemeral aquatic habitat with associated tributaries could be impacted by subsidence due to underground mining
- wetlands, especially the lacustrine wetland in the centre of the subsidence area, are likely to experience tension cracking along the banks and potentially alter the depth and extent of water
- the seven vegetation communities within the subsidence area may experience the following impacts:
    - changes to the drainage profile and additional ponded areas
    - if water in ponded areas has sufficient depth (typically 1m or more), this could significantly impact on remnant vegetation causing dieback
    - surface cracking due to subsidence is predicted to be up to 5m deep with a maximum width of 0.3m; and while cracking itself would not necessarily impact on vegetation, the rehabilitation of cracks would involve remedial earthworks that could impact on vegetation due to land disturbance and vehicle movements.

5.8.3 Proposed mitigation measures

The EIS proposed several measures to avoid and mitigate potential impacts on ecological values. The main mitigation measures may be summarised as follows:

- vegetation clearing within the project area would be minimised to only those areas required for project operations
- native vegetation removal would only occur after:
    - clearance areas are clearly delineated and made clear to equipment operators and supervisors
    - weed control measures, such as vehicle wash-down, are implemented to prevent weed species spreading along riparian corridors
    - appropriate erosion and sediment-control structures are in place
    - clearing permission is attained from the site's environmental staff
- suitable sediment and erosion control measures would be implemented to prevent sediment deposition in adjacent retained habitats. All retained areas of remnant vegetation would be protected and maintained for the life of the project to ensure seed availability for mine rehabilitation works
- flora species used for rehabilitation would be appropriate to the landscape of the project area and consistent with relevant vegetation community descriptions
- landforms would be created and contoured to resemble the original local topography
- planning and construction of project infrastructure would avoid the creation of shallow, ponded areas that could form a permanent seep
- habitat areas due to be impacted would be surveyed prior to clearance to determine fauna presence, and any fauna located would be given the opportunity to move themselves away or be relocated prior to clearing
- staff induction program would incorporate information on the conservation values of the project area and its surrounding areas to increase staff awareness. This information would include photographs, descriptions and the management requirements for known conservation values
- progressive rehabilitation of disturbed areas would occur as soon as practicable, to minimise soil erosion and the length of time land is altered from its pre-mining condition. Rehabilitation will aim to restore native vegetation such that it is capable of supporting low intensity cattle grazing. A rehabilitation strategy specific for riparian habitat requirements would be developed following annual monitoring of riparian areas likely to be impacted by subsidence
- subsidence impacts would be mitigated in accordance with a Subsidence Management Plan, which would include the following mitigation measures:
    - subsidence-induced ponding would be mitigated by remedial earthworks designed to re-establish free drainage
    - monitoring for the locations of tension cracks would be undertaking followed by remedial

earthworks to seal surface cracks. The plan would include measures to ensure that remediation works on tension cracks would minimise impacts on surrounding vegetation, and any disturbance to vegetation communities during repairs to tension cracks would be rehabilitated to return the vegetation to pre-disturbance condition

- in order to minimise impacts on aquatic flora and fauna, the proponent proposes the following measures:
  - all contaminated mine and process water would be contained within a closed loop system and recycled. No contaminated mine or process water would be discharged from the project area
  - sediment traps would be place downstream of all land disturbance (such as spoil dumps) to remove sediment from stormwater flowing off these areas prior to release
  - a water and sediment quality monitoring program would be initiated and be in place for the life of the project. This monitoring program would ensure early detection of impacts and provide for corrective action to be undertaken
  - disturbed areas would be progressively rehabilitated at the earliest opportunity
  - a 50m buffer zone would be implemented around sensitive aquatic ecosystems
- to avoid eutrophication of aquatic water systems, nutrient control strategies include:
  - installation of sewage treatment facilities with sufficient capacity to handle site waste
  - retention of wastewater effluents and diversion of non-mine-affected water as part of the surface water management system for the project
  - minimised use of detergents containing phosphate
  - bioactive glyphosate would be used for weed treatment in areas located close to watercourses
  - monitoring of the quality of receiving waters
- proposed management strategies for the protection of the little pied bat within the project area include:
  - maximised retention of hollow-bearing trees, alive and dead, as potential roosting sites
  - maximised retention of remnant vegetation adjacent to wetlands such as dams and watercourses, in order to maintain habitat to support insect diversity and abundance
  - fauna spotters to thoroughly survey areas prior to vegetation clearing
- control measures for introduced flora species include:
  - undertaking a risk assessment of high biosecurity risk species and their locations
  - restriction of vehicle movement to designated roads except where necessary for mine operations
  - prevention of water and fertiliser run-off into bushland
  - maintenance of buffers or windbreaks around disused revegetated area when applicable
  - machinery and off-road vehicles cleaned (inclusive of visitors)
  - weed management covered in site induction program to inform staff of possible weed species in the project area, known weed infestations and how to report new infestations
- a pest management plan would be developed, in which the presence and success of pest control strategies would be monitored within the project area. Control measures for pest animal control will include:
  - implementation of effective dingo control methods such as shooting and fencing in combination with current land management practises
  - feral cat control including trapping
  - European rabbit control, including warren ripping and shooting
  - feral pig control using physical controls including shooting and/or barrier construction
  - disposal of food scraps in appropriate containers for collection by a suitably qualified contractor.

5.8.3.1 Offsets

The proponent has committed to providing offsets after project approval, but before commencement of project activities. The proponents preferred option to meet regulatory requirements is to provide a land-based offset via an agreement with an offset broker or provider. The proponent has not detailed impacts that are likely to occur to MSES values, such as watercourse vegetation and connectivity. The EIS did not adequately assess potential groundwater drawdown impacts on RE11.3.25 and RE11.3.3a. EHP believes that these regional ecosystems, on and off the project site within the predicted extent of groundwater drawdown (including Retreat Creek to the north and 3.5km east of the MDL467 boundary), must be suitably monitored during project operations to identify any changes in ecosystem health. Where impacts to ecosystem health are identified, additional offsets would need to be provided. Appendix 1 of this report provides recommended draft EA conditions for monitoring ecosystem health and potential offsets.

The proponent has not quantified the impacts of subsidence to either MNES or MSES values and, should any impacts occur to any values within the subsidence area, these would need to be offset accordingly. The proponent is committed to providing the following offsets for significant impacts on MNES:

- 2.76ha of brigalow threatened ecological community (TEC) for which the proponent is prepared to locate an offset of 11.04ha
- 149.43ha of natural grassland TEC for which the proponent is prepared to locate an offset of 587.72ha.

5.8.4 Major issues raised in submissions

In its submission on the EIS, EHP commented that the Queensland Herbarium regional ecosystem mapping indicated there were areas of the natural grasslands TEC mapped within the project area. Furthermore, during a site visit undertaken during the EIS submission period, an EHP officer sighted key natural grassland species. However, the proponent had not undertaken a flora survey at any sites within these mapped areas. EHP recommended that the proponent should conduct flora surveys within the natural grassland mapped areas to confirm the extent of the TEC. In response to this issue, the proponent acknowledged that natural grassland areas existed within the project area and agreed that further field surveys would be prudent in order to identify the extent of the natural grasslands TEC. The proponent committed to conducting the assessment prior to the project development, and to offsetting any found TEC to the extent of the mapped natural grassland TEC that would be impacted by the project. EHP was satisfied that this would be an acceptable mitigation measure.

5.8.5 Conclusions and recommendations

With the exception of the natural grassland TEC and potential groundwater dependent ecosystems (RE11.3.25 and RE11.3.3a on-site, and other potential GDEs off-site), the EIS used adequate studies, survey methods and effort to assess and quantify the potential impacts of the project on the ecological values of the site, and met the requirements of the final TOR. Potential impacts to RE11.3.25 and RE11.3.3a on-site, and other potential GDEs off-site, were not adequately quantified in the EIS. Consequently, the proponent will be required to identify the potentially impacted GDEs on the project site, or off the site where access is available or can be obtained. They will also be required to monitor the ecological health of these communities during project operations, and offset any identified impacts. The proponent has made commitments to manage, monitor and rehabilitate disturbed areas to achieve appropriate ecological outcomes. However, as noted above, the flora surveys within the mapped natural grassland TEC were not adequate. Nevertheless, the proponent's commitment to offset the impacts to this community satisfactorily addressed any potential impacts of the project on this community.

Following Commonwealth approval, the proponent would need to propose a suitable offset strategy that would compensate for significant impacts to MNES under the requirements of the EPBC Act environmental offsets policy. Conditions for biodiversity offsets have been included in Schedule H of the recommended draft EA conditions to limit and manage adverse impacts to biodiversity likely to be caused by project activities. In order for the project impacts from subsidence to be managed, Schedule H of the draft EA conditions require a subsidence management plan (including rehabilitation) to be developed and implemented by the proponent. Under the plan, the proponent is required to monitor the extent of subsidence impacts, such as cracking and ponding on ecological values. This would be particularly relevant where such impacts affect tributaries of Taroborah and Retreat Creeks, aquatic ecosystems, MSES and MNES values and any groundwater dependent ecosystems.

The following recommendations address the key outstanding issues in relation to the ecological values of the site:

Recommendation 1

The proponent should complete flora surveys before any disturbance for construction of the mine at the site to ensure that impacts on MNES are as described in the EIS and/or as summarised in this report. The surveys should cover areas that would be affected by underground mining as well as open-cut mining, including the associated infrastructure. Before any disturbance for construction, the proponent should report the results of pre-clearing surveys to the Department of the Environment, and state the extent of the necessary offsets for residual impacts.

Recommendation 2

The proponent should finalise the biodiversity offset strategy consistent with the EPBC Act environmental offsets policy and offsets assessment guide. This would include field surveys to confirm the presence of the natural grasslands TEC within the project area. The strategy should describe the mechanism for delivering offsets. There would also need to be field surveys to confirm that brigalow TEC and natural grassland TEC are present at proposed offset locations and to confirm that the condition and extent of the proposed offset area(s) is sufficient to offset the residual impact to 2.76ha of brigalow and 149.43ha of natural grassland.

Recommendation 3

The proponent should use the Australian Groundwater Dependent Ecosystem Toolbox evaluation framework to identify the ecological water requirements of potential GDEs located within the predicted zone of groundwater depressurisation. The survey area should include land on the project site (including RE11.3.25 and RE11.3.3a), and off-site within or adjacent to publicly accessible land, and any other land where access can be obtained.

Recommendation 4

The proponent should complete a baseline assessment of the condition (using the Biocondition methodology[2]) and extent (in hectares) of all potentially impacted GDEs identified out of recommendation 3 above.

Recommendation 5

The proponent should assess the likely causes and extent of potential impacts on the identified GDEs, and propose mitigation measures, and offsets for residual impacts. Offset actions that could be undertaken should be included in a revised biodiversity offset strategy (refer to the recommended draft EA conditions in Appendix 1 for further details).

Recommendation 6

The proponent should establish groundwater monitoring bores in the location of all potentially impacted GDEs and monitor groundwater depth and quality according to the groundwater monitoring conditions (refer to the recommended draft EA conditions in Appendix 1 for further details).

Recommendation 7

The proponent should monitor the health of all potentially impacted GDEs during project operations for such changes as vegetation dieback, or a significant change in species diversity that could be associated with groundwater depressurisation or a change in groundwater quality as a result of the project. The monitoring program should include trigger values for monitored parameters that would prompt corrective action to be taken to avoid, minimise or offset impacts.

Recommendation 8

The proponent should liaise with EHP's wildlife management branch to determine whether clearing permits and/or species management plans are required under the Nature Conservation (Wildlife Management) Regulation 2006.

5.9 Cultural heritage

Section 4.9 of the EIS discussed the indigenous and non-indigenous cultural heritage aspects of the project. Section 4.9.1.1 of the EIS provided a description of the non-Indigenous cultural heritage environmental values based on a historic heritage study. Section 4.9.2.2 of the EIS provided a description of the Indigenous cultural heritage values. Appendix 22 of the EIS included a historic heritage management plan.

5.9.1 Non-Indigenous cultural heritage values

No sites or places of non-Indigenous heritage significance on the project site were found on the National, Queensland or local government heritage registers. A non-Indigenous historical heritage study was undertaken to identify any historical cultural and landscape heritage values in the project area. Table 5-15 provides a summary of the sites identified on the project site during the survey.

Table 5-15 Cultural heritage sites identified on-site during the non-Indigenous survey

Site name	Site description
Taroborah siding	Rail siding with lengthsman's residence, (early 20th century) located along the Capricorn Highway
Surveyor's tree	Mature bloodwood with surveyor double marks from the late 19th century
Iona station	Substantial station comprised of two houses and numerous functional buildings and structures, from 1950 to 2000s, including a major dam and a former dip
St. Helens station	Head station with buildings spanning the 1950s to 1980s, as well as yards and water

[2] BioCondition: a condition assessment framework for terrestrial biodiversity in Queensland: assessment manual. T.J. Eyre [et al.] Ver 2.2 (2015) (or later versions)

Site name	Site description
	infrastructure. Former St. Helens run
Telegraph pole/alignment	One of two identified poles along the St. Helens main farm track (access road)
Stock route and loading yards	Stock route alignment from the 19th century, with related loading yards (unknown date)
Taroborah residence	House relocated from Taroborah siding during the early 20th century

Source: Adapted from Table 4.118 of the EIS

All seven of the identified non-Indigenous cultural heritage sites were assessed to be of low State and local significance based on the criteria under the EHP guideline, Using the criteria; a methodology (EPA 2006), and the standard criteria under the *Queensland Heritage Act 1992*. However, Taroborah siding was assessed as having some significance sufficient to warrant further research and recording should its integrity be affected by the project in the future.

5.9.2 Potential impacts and proposed mitigation measures

The potential impacts of the project on the non-Indigenous cultural heritage sites identified on site are summarised in Table 5-16.

Table 5-16 Potential project impacts on non-Indigenous cultural heritage sites

Site name	Potential impacts
Taroborah siding	Direct impact due to ground subsidence, or cumulative indirect impact due to the proximity of the site to other infrastructure
Surveyor's tree	Possible impact from subsidence
Iona station	Possible impact from subsidence
St. Helens station	Not impacted
Telegraph pole/alignment	Not impacted
Stock route and loading yards	Not impacted
Taroborah residence	Possible impact from subsidence

Source: Adapted from Table 4.121 of the EIS

Of the seven cultural heritage sites that have been identified during the assessment, one would be directly impacted by subsidence (Taroborah siding), and three other sites may be impacted by subsidence.

The proponent has developed an historic heritage management plan (HHMP) that includes a record of each site and measures to manage any direct or indirect impacts. With regard to the Taroborah siding, the HHMP recommends that the following management measures be implemented prior to any anticipated ground subsidence, or impacts from constructing the road and rail infrastructure associated with the project:

- brief additional research to attempt to confirm the provenance of the complex and establish details about its history
- a detailed archival report prepared by a qualified cultural heritage professional, including a statement of significance, site sketch map, description, and photographic record
- lodgement of the archival report in local libraries and the John Oxley State library.

Other management measures proposed to be implemented include:

- a cultural heritage induction booklet issued to all relevant staff during site induction
- a stop works procedure if any unexpected cultural heritage material or sites are encountered during the construction and operational phases of the project.

5.9.3 Indigenous cultural heritage values

No Indigenous heritage sites were listed on the Queensland Heritage Register for the area. A search of the DATSIMA register and database identified nine Indigenous heritage sites within MDL467. However, all nine sites are located 4.5km, or further, south of the mining disturbance footprint and would not be impacted by the project.

Two Native Title determinations by the Bidjara #7 People and the Western Kangoulu People are under consideration by the National Native Title Tribunal.

5.9.4 Potential impacts and proposed mitigation measures

A cultural heritage management plan (CHMP) is currently being prepared for the project between the proponent and the Bidjara #7 People and the Western Kangoulu People, who are the registered cultural heritage claimants for the area. The management approach under the CHMP would involve systematic surveying of mine disturbance areas and mitigation of any impacts to cultural heritage significance identified.

5.9.5 Major issues raised in submissions

No major cultural heritage issues were raised in submissions on the EIS for the project.

5.9.6 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to Indigenous and non-Indigenous cultural heritage. Indigenous cultural heritage on the project site would be managed according to the CHMP approved under the *Aboriginal Cultural Heritage Act 2003*. The non-Indigenous cultural heritage sites identified on-site have been recorded and management measures to address any impacts have been included in the HHMP for the project.

There are no specific indigenous or non-Indigenous cultural heritage recommendations for the project

5.10 Social

Section 4.10 of the EIS outlined a social impact assessment (SIA) for the area that was developed in consultation with the social impact assessment unit of DSDIP. Appendix 23 of the EIS included a social impact management plan (SIMP) that outlined a number of plans and strategies to minimise the social impacts of the project.

5.10.1 Social values

The EIS stated that there are 19 properties located either partly or entirely within MDL467 (excluding easements) with 11 registered owners. Properties directly affected by the project would either be purchased by the proponent, or surface rights would be acquired to allow the proponent to use the land for the term of the mining lease, and then the surface rights revert back to the original owner when the lease is relinquished. Such arrangements would be subject to discussions with each affected landholder.

The EIS stated that consultation with various community stakeholders revealed that local residents value their relaxed lifestyle and safe environment. The rich history and active community of Emerald is highly valued by its residents, who also have access to a range of services and community facilities, including:

- **health** – the Central Highlands is serviced by Blackwater, Springsure and Emerald hospitals that include medical and surgical, specialist clinics, clinical support and allied health services. Also, the Emerald region is serviced by 16 general practitioners
- **emergency** – the Emerald police station is supported by 20 uniformed officers and two traffic officers. Ambulance services are provided from Emerald and currently consist of three vehicles and eight officers on 24-hour rosters. Anakie, in the Gemfields area, has a single ambulance and officer. Emerald is located within Queensland Fire and Rescue Service's Central Region
- **education** – Emerald provides important education services for the region, including three state primary schools, a state secondary school, three independent colleges, the Capricorn School of Distance Education, Technical and Further Education , a University and the Emerald Agricultural and Pastoral College. Five child-care services are located in Emerald, some of which offer preschool facilities. Child-care facilities are under pressure in Emerald, with demand for places exceeding supply
- **transport** – Emerald offers aeroplane, train and bus services across the region. Transport issues are discussed in the Transport section of this assessment report
- **recreation, leisure and culture** – Emerald offers well-resourced and well-utilised sport, recreation and leisure facilities in region. Facilities include gymnasium, art gallery, cinemas and a range of sport and recreation clubs.

The EIS described the demographic profile of the study area based on the 2011 ABS Census and more recent research, which found that:

- Emerald's residential population was 13,576, constituting approximately 46% of the Central Highlands local government area (LGA) population of 29,533
- 1,021 persons in Central Highlands were of Indigenous origin, 441 of whom resided in Emerald
- unemployment rates in Emerald and Central Highlands (2.2%) were less than half the Queensland average (5.5%)
- mining was the principal industry of employment in the Emerald and Central Highlands areas (22.6% and 26.0%, respectively), compared to Queensland at 2.6%. This was followed by the construction industry in Emerald and the agriculture, forestry and fishing industry in Central Highlands
- there were 7,698 separate houses in the Central Highlands local government area, 3,176 of which were in Emerald, constituting approximately 68% of all private dwellings. This compares to 70.4% for Queensland
- the highest rate of unoccupied dwellings (20.7%) occurred in the Central Highlands LGA, followed by Emerald (16.4%) and Queensland (10.3%)
- the median house price in Emerald dropped to $425,000 which is a fall of 7.8% in 12 months. Median unit prices fell 16.9% during the same period
- there were 69 accommodation villages in the Bowen Basin in 2012, including 20 small camps (less than 100 beds), 30 medium camps (100 to 499 beds), 14 large camps (500 to 999 beds) and five very large camps (1,000+ beds). The 69 villages had a total sleeping capacity of 27,565 beds.

5.10.2 Potential social impacts

A number of potential social impacts on the affected landholders and the Emerald area (and more broadly, the Central Highlands LGA) were identified during the social impact assessment process. Of these, the major impacts included:

- **landholders/rural lifestyle** – many landholders expressed concerns about project related increases in dust, noise and light levels, resulting in a devaluation of their land. Also, landholders expressed concern that the region could experience a loss of identity as more people move from traditional industries to mining as a result of the higher wages
- **land use** – the predominant land use concern is potential impact on the local area's water supply. Landholders fear that the project would negatively impact the aquifer beneath MDL467, resulting in bore water levels decreasing, thereby placing the local area at risk during drought conditions
- **childcare** – while it is not expected that the project would greatly impact local childcare services, it is understood that this is a key issue for the region as childcare places are limited
- **highways and roads** – the section of the Capricorn Highway between Emerald and Taroborah is of concern, with local residents reporting ongoing road maintenance due to structural problems since the highway base is situated on unstable black soil. Another major concern is the potential for coal trains to travel through Emerald, traversing two major roads at three level crossings. If the level crossings are blocked simultaneously due to the length of the coal trains, road safety issues and the blocking of emergency vehicle could arise. However, the proponent stated that planned length of the coal trains would not be long enough to block both level crossings at the same time.
- **local business and employment** – there is real potential for project related opportunities but the project may also put pressure on non-resource businesses.

The other potential social impact areas include the cumulative effect of nearby Galilee projects coming to fruition, including effects on:

- changing demography, psychological impacts
- community values, recreation and leisure pursuits
- social order; education
- healthcare, emergency services, public and community transport; utilities, tourism
- housing and accommodation
- cultural heritage and the environment.

Mitigation measures to address potential social impacts are incorporated in Tarobarah's social impact management plan (SIMP) that includes:

- establishing a community consultative committee, supported by key community influencers, Queensland government and council to monitor and address cumulative impacts jointly and relatively
- participating in regional planning and contributing to initiatives that attract government funding for improved community infrastructure and services
- maximising local business and employment opportunities through maintaining close relationships with key

business and employment facilitators, such as the industry capability networks, Training Queensland and the Kinetic group
- developing and implementing a number of key strategies and plans, including:
    - land access management plan
    - traffic management plan
    - environmental management plan
    - drive safe program
    - enquires and complaints management process
    - community investment program
    - indigenous participation strategy
    - workforce accommodation strategy
    - employee behavioural code
    - employee induction program.

5.10.3 Major issues raised in submissions

DATSIMA requested the proponent to provide further information about the consultation undertaken with Aboriginal People during the EIS process. In response, the proponent stated that, in addition to regular liaison with Traditional Owner groups, consultation was undertaken with a range of local Indigenous stakeholders, including DATSIMA, the Central Highlands Aboriginal Corporation and local health service providers to understand Indigenous health, education and employment issues across the region. Furthermore, the consultation process with Indigenous stakeholders was used to develop the project's Indigenous participation plan provided in Appendix 23 of the EIS. DATSIMA was satisfied with the proponent's response and did not ask any further questions in relation to this issue.

DATSIMA requested the proponent to develop an Aboriginal and Torres Strait Islander action plan that aligned with existing programs and resources, and that identified:

- opportunities for training and employment supported by funding
- full-time, part time and school based traineeships and apprenticeships
- opportunities for cadetships
- business development and contracting opportunities and support to ensure ongoing development
- potential barriers to success and initiatives necessary to support success.

In response, the proponent amended the social impact management plan to include an outline for an Indigenous participation plan in Appendix 23 of the EIS. DATSIMA was satisfied with the proponent's response and did not raise any further issues.

5.10.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the social aspects of the project. The EIS adequately described the potential impacts of the project on the social environment and proposed impact mitigation and management measures to minimise these impacts, including establishing a community consultative committee to monitor and address cumulative impacts from mining and expansion.

There are no specific social and economic recommendations for the project.

5.11 Health and Safety

Section 4.11 of the EIS described the health and safety aspects of the local community potentially impacted by the project. Section 4.11.1 of the EIS provided a description of the community values for public health and safety that may be affected by the project. Section 4.11.2 of the EIS included a description of the potential impacts on those values and proposed mitigation measures to address the potential impacts.

5.11.1 Description of environmental values

The community values potentially affected by the project include the following:

- downstream water quality
- air quality and noise nuisance impacts at residences close to the mine
- community health
- transport safety.

The potentially affected places nearby to the project are shown in Figure 5-5 of section 5.6, Air, of this report.

5.11.2 Potential impacts and proposed mitigation measures

The following project impacts have been identified as having the potential to affect the health and safety of the local community:

- air quality impacts from dust emissions
- noise and vibration impacts from operating project machinery and blasting
- degradation of downstream water quality from contaminated surface run-off and unplanned discharges from the project
- health risks associated with an increase in disease vectors on-site
- health risks from contaminated land on-site
- transport safety from more traffic and driver fatigue associated with the project
- critical failures of on-site containment infrastructure.

The measures proposed by the proponent to mitigate potential impacts of the project on health and safety include the following:

- air and noise controls on-site to reduce off-site impacts
- purchasing or leasing properties predicted to be adversely affected by noise and dust impacts from the project
- monitoring the off-site air and noise environment and implementing adaptive management practices on-site, as necessary
- construction and operation of regulated dams on-site according to the relevant standards and best practices to minimise the likelihood of overtopping or dam break and prevent the release of contaminants that may impact on downstream water quality
- emergency action plans and response procedures to address any unplanned critical failures or impacts from natural disasters
- feral animal control and good practice in water management to prevent the increase or spread of disease vectors
- notifying of any potentially contaminated sites for possible listing on the Environmental Management Register
- remediating any contaminated land on-site, prior to returning the land to the underlying landholder
- project related traffic increases would be minimised by transporting staff to and from the site by bus
- the Capricorn Highway would be upgraded to include turning lanes to ensure safety for traffic entering and leaving the mine site.

Refer to sections 5.6 and 5.7 of this report for further details about the proposed air and noise mitigation measures.

5.11.3 Major issues raised in submissions

There were no major health and safety issues raised in submissions on the EIS.

5.11.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the health and safety aspects of the project. The EIS adequately described the potential health and safety impacts of the project on the community values and proposed impact mitigation and management measures to minimise these impacts, including emergency action plans and response procedures.

There are no specific health and safety recommendations for the project.

5.12 Economy

Section 4.12 of the EIS described the local, State and national economic aspects of the project. Section 4.12.1 of the EIS described the regional and socio-economic profiles potentially affected by the project. Section 4.12.2 of the EIS outlined the potential economic impacts of the project and proposed mitigation measures to address the impacts.

5.12.1 Description of the economic profile

The project lies within the Central Highlands region which covers approximately 60,000km^2 and covers a significant portion of the Bowen Basin. The two main towns in the Central Highlands are Emerald and Blackwater. The region contributes significantly to the Queensland and Australian economies, predominantly through mining and agriculture. Other activities such as ownership of dwellings and construction also contribute significantly to the economic activity of the Central Highlands region.

In 2011 to 2012, the Central Highlands regional economy contributed $6.03 billion to the gross State product (GSP) of $265.32 billion. Mining accounted for 70% of the gross regional product (GRP) in that year, contributing $3.2 billion to the economy.

Based on the Australian bureau of statistics data, a total of 1,970 businesses in the Central Highlands region were actively trading in 2011 to 2012. There were 38 mining businesses in Central Highlands in 2011 to 2012, representing 2% of the total number of businesses in the region.

As at June 2013, there were 22 mining projects in various stages of development across the Central Highlands region, including new projects and expansions of existing mines, with a total estimated investment of $9 billion. In addition to mining projects, coal seam gas resources are currently being developed in the region.

The EIS provided an overview of the trends in the relevant economic indicators of the Central Highlands region, including population size and structure, regional employment, income levels, education attainment, housing and infrastructure and land values. According to Queensland Treasury projections in 2011, the Central Highlands population is projected to reach 50,742 by 2031, with an average annual rate of growth of 2.4%, whilst Queensland is expected to have an average annual growth rate of 1.8%.

5.12.2 Potential impacts and proposed mitigation measures

The project has a total determined resource of 202.1Mt of coal, to be mined at an eventual rate of up to 2.3Mt/y of ROM coal from open-cut operations and up to 5.7Mt/y ROM coal from underground operations, with an expected mine life of 21 years.

During the construction period, the project is predicted to add $852 million to GSP, of which nearly 50% would be retained in the Central Queensland regional economy. Over 1,475 jobs would be supported during the construction phase, with the majority of these being outside the Central Queensland region.

During mine operations, the project is predicted to add $3,826.5 million to GSP, of which nearly 50% would be retained in the Central Queensland region. The operational phase would support 1,082 jobs, of which over 60% would be in the Central Queensland region.

The project would also use 473ha of land presently used for grazing and non-irrigated agriculture, although the vast majority of this land would be rehabilitated and returned to prior uses after mine closure. The cost-benefit analysis has included the foregone income from this alternative land use as a cost of the project, valued at $519,000 in net present value (NPV) terms.

After considering the social, environmental and economic benefits and costs, the cost-benefit analysis demonstrated that the project would result in a net increase in social welfare in the order of $1,911 million in NPV terms.

The project is consistent with the development of the region in terms of its competitive advantage in coal production. The analysis shows that moving from grazing to coal mining produces a significant increase in the value of economic output.

Although housing availability is a key mining community concern, Emerald has no obvious development constraints, since there is good availability of appropriately zoned vacant-blocks and a solid number of existing houses available for purchase or rent.

Some existing land users would be negatively affected by the project in that their current land use is discontinued and they would potentially face noise, dust and visual amenity impacts. However, these impacts are mitigated through purchase of properties and additional actions to prevent, or alleviate, actual impacts.

Local businesses have been under pressure since the global financial crisis and subsequent mining industry downturn, and are therefore actively seeking new commercial opportunities. These businesses would be encouraged to tender for supplies and services during both project construction and operation. The proponent would liaise with the industry capability network and local business groups, such as the Central Highlands development corporation, to facilitate participation with local suppliers. The proponent proposed to adopt the Queensland Resources and Energy Sector Code of Practice for Local Content to facilitate local industry participation.

The proponent is openly committed to local employment. However, low unemployment levels in the region, together with a projected demand for skilled workers from the broader resources industry throughout the State, is expected to lead to a skills shortage for the project. Unskilled and semi-skilled people working in the region's traditional agricultural and forestry industries may not have the range of experience or skills that can be directly transferrable to the mining industry. The proponent has provided a commitment of undertaking regional training, resulting in people taking up mining positions such as plant operators and tradespersons' assistants.

5.12.3 Major issues raised in submissions

No major issues related to the economic impact assessment were raised in submissions on the EIS.

5.12.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the economic impact assessment. The project would make a significant positive contribution to the regional and State economies. Potential negative economic impacts would be managed and mitigated to alleviate their actual effects on the local and regional economies. Economic analysis showed that moving from grazing (the current land use) to coal mining produces a significant increase in the value of economic output, consistent with economic and regional development strategies.

Recommendation

The proponent should continue to liaise with relevant stakeholders when finalising the Queensland Resources and Energy Sector Code of Practice for Local Content for the project.

5.13 Hazard and risk

Section 4.13 of the EIS described the hazards and risks associated with the project. Section 4.13.1 of the EIS provided a description of the values related to people and property that may be affected by the project. Section 4.13.2 of the EIS included a description of the potential hazards and risks that could impact on the identified values, and proposed mitigation measures to address the potential impacts.

5.13.1 Description of values

The values related to people and property that could be affected by the hazardous materials and operations associated with the project include the following:

- the air and acoustic environment in the context of health and wellbeing
- Indigenous and non-Indigenous cultural heritage values in the context of unexpected finds during project construction and operations
- agricultural productivity and the economic value of the land after mining has been completed
- surface water and groundwater supply and quality after mining has been completed
- visual amenity of the natural landscape
- community health and safety
- workforce health and lifestyle values.

5.13.2 Potential impacts and proposed mitigation measures

A preliminary hazard analysis identified the following potential hazards during the construction, operation and decommissioning phases of the project that could impact on the identified values:

- transporting, storing, handling and using hazardous chemicals and dangerous goods
- operating light and heavy vehicles
- staff contact with regulated site water storages
- staff exposure to sources of heat, pressure and electricity
- staff contact with ignition sources
- staff use of, and contact with, explosives
- staff contact with potentially harmful wildlife
- accidents associated with site clearing and rehabilitation activities
- pit wall and spoil dump instability or mass failure
- staff interaction with the mining pit, regulated dams, CHPP, ROM stockpiles, spoil dumps, coal conveyors and truck loading and unloading
- noise and dust nuisance at identified sensitive receptors and affected places respectively
- pipeline failure resulting in contaminated water entering the receiving environment
- staff injury when dismantling and removing site infrastructure
- flooding and cyclone related hazards.

The mitigation measures proposed to control the identified hazards include the following:

- progressive rehabilitation and biodiversity offsets
- quality blasting products, correctly designed shots and blasting clearance zones
- geotechnical studies prior to constructing infrastructure
- appropriate engineering designs of the pit, spoil dumps and regulated dams

- exclusion zones around unsafe infrastructure areas and steep slopes
- noise attenuation on mining equipment
- dust suppression spraying on stockpiles and haul roads
- adequate compensation for potentially affected landholders
- disposing rejects in engineered cells below ground level
- having operating procedures in place for engineered structures
- conducting annual inspections of engineered structures
- conducting regular inspections and maintenance of project infrastructure
- constructing site water management infrastructure to prevent contaminated water run-off
- implementing surface water and groundwater monitoring programs
- designing final voids to be above the probable maximum flood level
- constructing firebreaks around the mining lease boundary and potential ignition sources
- installing fire extinguishers in all vehicles
- conducting a final contaminated land assessment and implementing remedial actions, if required
- conducting staff induction and safety awareness training
- transporting, storing, handling and using hazardous chemicals according to relevant standards
- implementing relevant Australian standards and best practice health and safety procedures
- implementing emergency response procedures.

A risk assessment of each hazard found that with the implementation of control measures, all but two risks were reduced to a medium or low risk rating. Table 5-17 shows the two risks that were assessed as retaining a high risk rating with the implementation of control measures.

Table 5-17 Project-related hazards with a high risk rating

Hazard	Potential impact	Control measure
Operating light and heavy vehicles and equipment	Personal injury	Implement health and safety procedures
Dismantling and removing infrastructure during decommissioning	Death or personal injury	Implement operational procedures, training, emergency response and first aid

Source: Table 4.160 of the EIS

An integrated risk management plan (IRMP) would be developed to manage the risks identified with the construction, operation and decommissioning phases of the project. The IRMP would include a detailed operational hazard analysis and construction and decommissioning safety assessments to identify additional control measures to further reduce the risk rating of potential hazards, including the high risk rating of the two hazards identified above.

Independent hazard audits would also be conducted to identify previously unrecognised hazards and early recognition of below standard performance in areas such as management controls and the maintenance and testing of equipment.

5.13.3 Major issues raised in submissions

The QFES advised that due to the distance to the project site, project emergency personnel must be sufficiently trained and equipped to be self-sufficient to manage and control any incident until the QFES response arrives. QFES requested that an agreement between the proponent and QFES be developed to implement safety and health management systems. QFES also requested that the emergency response plan include: contact details for key stakeholders in case of a disaster or emergency; details of possible helicopter and fixed wing landing sites; treatment plans for injured workers; and details about entry to the site in the event of an emergency. The QPS also requested the proponent to liaise with them when preparing the emergency response plan for the project. In response, the proponent agreed to undertake a collaborative process for developing the emergency response plan and comply with the requirements at the appropriate time, and to use relevant guidelines in future hazard and risk assessment for the project. EHP reviewed the additional information provided by the proponent and is satisfied with the proponent's commitment to liaise with relevant stakeholders during the preparation of the emergency response plan.

5.13.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the hazard and risk aspects of the project. A number of potential project hazards were identified that could impact on the values of people and property. The proponent has proposed a range of mitigation measures to reduce the risk of project hazards and has established procedures to address the project hazards with a high risk rating.

Recommendation

The proponent should liaise with QFES, Queensland Ambulance Service, QPS and any other relevant stakeholders during the preparation and implementation of the emergency response plan for the project.

6 Recommendations about the suitability of the project

In this EIS process the detailed information compiled by the proponent about the proposed Taroborah Coal Project, and the potential impacts of the project on the identified environmental values have been assessed by representatives of the Australian, state and local governments, industry, interest groups and members of the public through an open, public review process. The proponent has also met the EIS process requirements including for notification, responding to comments and submissions as required by chapter 3 of the EP Act.

The EIS has complied with the requirements of the final TOR, and has outlined a range of mitigation measures to avoid, minimise or offset adverse environmental, social and economic impacts. The majority of issues were covered satisfactorily in the EIS and in the proponent's responses to the submissions in the supplementary report. However, a number of additional actions are required to be completed, including the completion of various field surveys, reports, plans and agreements to formalise the proponent's commitments in the EIS. These actions have been clearly outlined in the recommendations under each section of this EIS assessment report and should be fully implemented in consultation with relevant stakeholders.

Nevertheless, no issues of sufficient magnitude have been identified during the EIS process that would prevent the project from proceeding. Consequently, the project has been determined to be suitable to proceed.

7 Recommendations for conditions of any approval

7.1 Environmental authority approval

After the EIS process has been completed, the proponent would apply under chapter 5 of the EP Act for an environmental authority to authorise the mining activities for the Taroborah Coal Project. As required by section 59(d) of the EP Act, this report includes recommended draft environmental authority conditions in Appendix 1. EHP's model mining conditions (EHP, 2013) and the model conditions for regulated structures (EHP, 2013) were considered in the development of the recommended draft environmental authority conditions. All recommended conditions are considered necessary and desirable for the regulation of identified and potential environmental impacts determined in this assessment. Some of the recommended conditions are incomplete and would require finalisation prior to issue of the draft environmental authority.

7.2 Mining lease approval

After the EIS process has been completed, the proponent would apply under the *Mineral Resources Act 1989* to DNRM for a new mining lease on which the proposed mining activities would largely be conducted. The mining lease application is subject to its own process of public notification, which would take place after the EIS process for the project had been completed. Consequently, DNRM would prepare any conditions of approval after the proponent has applied for the new mining lease, and the public notification period has been completed.

7.3 Australian government approval

The proponent has referred the project to the Australian government Department of the Environment, which determined the project to be a controlled action, requiring approval under the EPBC Act. This report includes recommendations in Appendix 2 that should be completed by the proponent, before the Commonwealth Minister can make a decision about the approval. A copy of this report will be given to the Commonwealth Minister to assist with making a decision about the approval of the project and any conditions that should apply under Part 9 of the EPBC Act.

8 Approved by

Delzpo.	03/03/2015.
Signature	**Date**

Lindsay Delzoppo
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Recommended draft environmental authority conditions for EIS assessment report

Taroborah Coal Project

Schedule A – General

Scope of approval

A1 This environmental authority authorises environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.

A2 This environmental authority authorises the extraction of no more than 5.75 million tonnes of run-of-mine (ROM) coal per annum.

A3 In carrying out the mining activity authorised by this environmental authority, the holder of this environmental authority must comply with **Attachment 1 – Authorised disturbance footprint.**

Monitoring

A4 Except where specified otherwise in another condition of this environmental authority, all monitoring records or reports required by this environmental authority must be kept for a period of not less than five years.

Financial assurance

A5 The activity must not be carried out until the environmental authority holder has given financial assurance to the administering authority as security for compliance with this environmental authority and any costs or expenses, or likely costs or expenses, mentioned in section 298 of the Act.

A6 The amount of financial assurance must be reviewed by the holder of this environmental authority when a plan of operations is amended or replaced or the authority is amended.

Risk management

A7 The holder of this environmental authority must develop and implement a risk management system for mining activities which mirrors the content requirement of the Standard for Risk Management (ISO31000:2009), or the latest edition of an Australian standard for risk management, to the extent relevant to environmental management, by <<Insert date 3 months from date of issue>>.

Notification of emergencies, incidents and exceptions

A8 The holder of this environmental authority must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with, the conditions of this environmental authority.

A9 Within 10 business days following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following:

a) results and interpretation of any samples taken and analysed;

b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm; and

c) proposed actions to prevent a recurrence of the emergency or incident.

Complaints

A10 The holder of this environmental authority must record all environmental complaints received about the mining activities including:

a) name, address and contact number for of the complainant;

b) time and date of complaint;

c) reasons for the complaint;

d) investigations undertaken;

e) conclusions formed;

f) actions taken to resolve the complaint;

g) any abatement measures implemented; and

h) person responsible for resolving the complaint.

A11 The holder of this environmental authority must, when requested by the administering authority, undertake relevant specified monitoring within a reasonable timeframe nominated or agreed to by the administering authority to investigate any complaint of environmental harm. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures, where implemented, must be provided to the administering authority within 10 business days of completion of the investigation, or no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.

Third-party reporting

A12 The holder of this environmental authority must:

a) within one year of the commencement of this environmental authority, obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority;

b) obtain further such reports at regular intervals, not exceeding three-yearly intervals, from the completion of the report referred to above; and

c) provide each report to the administering authority within 90 days of its completion.

A13 Where a condition of this environmental authority requires compliance with a standard, policy or guideline published externally to this environmental authority and the standard is amended or changed subsequent to the issue of this environmental authority, the holder of this environmental authority must:

a) comply with the amended or changed standard, policy or guideline within two years of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation;

b) until compliance with the amended or changed standard, policy or guideline is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.

Schedule B – Air

Dust and particulate matter monitoring

B1 The holder of this environmental authority shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive or commercial place:

a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of Australian Standard *AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method*.

b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM_{10}) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, for no more than five exceedances recorded each year, when monitored in accordance with the most recent version of either:

i) *Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM_{10} high volume sampler with size-selective inlet – Gravimetric method*, or

ii) *Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM_{10} low volume sampler—Gravimetric method*.

c) A concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometres ($PM_{2.5}$) suspended in the atmosphere of 25 micrograms per cubic metre over a 24-hour averaging time, when monitored in accordance with the most recent version of *AS/NZS3580.9.10 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM (sub)$_{2.5}$ (/sub) low volume sampler—Gravimetric method*.

d) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of *AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—Total suspended particulate matter (TSP)—High volume sampler gravimetric method*.

B2 The holder of this environmental authority must monitor air quality for the activity, which must include, but not be limited to:

a) continuous monitoring of PM_{10} at one location and dust deposition at five locations (representative of the worst affected receptors) during the operation of the activity;

b) high-volume air sampling of TSP, 1-day-in 6 sampling regime, collected over 24 hours (midnight to midnight);

c) meteorological monitoring (including at least temperature, wind speed and direction) at a single location representative of the approved place;

d) the monitoring locations must comply with the *Australian Standard AS/NZS 3580.1.1:2007 "Methods for siting and analysis of ambient air. Part 1.1: Guide to siting air monitoring equipment"*;

e) regular reporting of the measured dust deposition rates and PM_{10} concentrations to a publicly available web site;

f) investigation of all measured exceedances to determine the influence of emissions from the mining site; and

g) should an alternative sampling method (other than as discussed in Condition B1 is required; the Proponent may seek approval from administering authority to exclude this requirement. In seeking such exclusion, the reasons for the exclusion shall be provided and be fully justified.

B3 To ensure that the air quality monitoring program remains effective and well-targeted through the life of the project, the monitoring locations must be reviewed periodically. The periodic review should consider:

a) the frequency and cause of any exceedances of air quality objectives measured by the monitoring program over period of at least 2 years;

b) dust complaints;

c) future progression of the mining activities;

d) locations of sensitive receptors relative to the mining activities; and

e) mining operating modes.

B4 Prior to the commencement of the environmental relevant activity, the holder of this environmental authority must develop and implement a Dust Management Plan to outline measures to minimise and manage any impacts from the operation of the project on local air quality. The management plan shall include, but not necessarily be limited to:

a) dust control measures including watering of haul roads and application of water to raw and product coal stockpiles and transfer points and waste rock emplacement areas;

b) ambient Air Quality Monitoring Program to specify how the ambient dust impacts of the project will be monitored;

c) reactive and/or proactive dust management measures, which potentially could involve curtailment of activities in adverse weather; and

d) the regular review of the air quality management plan and analysis of complaints and air quality monitoring data to refine knowledge of actual site-specific emissions and to improve the effectiveness of dust emission controls.

Schedule C – Waste management

C1 Unless otherwise permitted by the conditions of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste must not be burnt.

Tailings disposal

C2 Tailings must be managed in accordance with procedures contained within the current plan of operations. These procedures must include provisions for:

a) containment of tailings;

b) the management of seepage and leachates both during operation and the foreseeable future;

c) the control of fugitive emissions to air;

d) a program of progressive sampling and characterisation to identify acid producing potential and metal concentrations of tailings;

e) maintaining records of the relative locations of any other waste stored within the tailings;

f) rehabilitation strategy; and

g) monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

Waste rock disposal

C3 A waste rock and spoil disposal plan should be developed and include, where relevant, at least:

a) effective characterisation of the waste rock and spoil to predict under the proposed placement and disposal strategy the quality of run-off and seepage generated concerning potentially environmentally significant effects including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances;

b) a program of progressive sampling and characterisation to identify dispersive and non-dispersive spoil and the salinity, acid and alkali producing potential and metal concentrations of waste rock;

c) a materials balance and disposal plan demonstrating how potentially acid forming waste rock will be selectively placed and/or encapsulated to minimise the potential generation of acid mine drainage;

d) where relevant, a sampling program to verify encapsulation and/or placement of potentially acid-forming and acid-forming waste rock;

e) how often the performance of the plan will be assessed;

f) the indicators or other criteria on which the performance of the plan will be assessed;

g) a rehabilitation strategy; and

h) monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of the placed materials, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.

Schedule D – Noise

Noise limits

D1 The holder of this environmental authority must ensure that noise generated by the mining activities does not cause the criteria in **Table D1 – Noise limits** to be exceeded at a sensitive place or commercial place.

Table D1 – Noise limits

Sensitive Place						
Noise level dB(A) measured as:	**Monday to Saturday**			**Sundays and Public Holidays**		
	7am to 6pm	**6pm to 10pm**	**10pm to 7am**	**9am to 6pm**	**6pm to 10pm**	**10pm to 9am**
LAeq, adj, 15 mins	45	40	30	45	40	30
LA1, adj, 15 mins	55	50	45	50	45	40
Commercial Place						
Noise level dB(A) measured as:	**Monday to Saturday**			**Sundays and Public Holidays**		
	7am to 6pm	**6pm to 10pm**	**10pm to 7am**	**7am to 6pm**	**6pm to 10pm**	**10pm to 7am**
LAeq, adj, 15 mins	50	45	40	45	40	35

D2 The holder of this environmental authority must ensure that noise generated by mining activities does not cause the low frequency noise to exceed 55 dB(Lin) when measured outdoor at a sensitive place or commercial place.

Note: low frequency noise is defined by the maximum linear sound pressure level measured over an hour period in one third octave band centered in the frequency range 10Hz to 200Hz.

D3 The holder of this environmental authority must ensure that noise generated by the mining activities does not cause the instantaneous maximum noise during night time to exceed 50 dB(A) LAmax measured outdoor at a sensitive place or commercial place.

Airblast overpressure nuisance

D4 The holder of this environmental authority must ensure that blasting does not cause the limits for peak particle velocity and air blast overpressure in **Table D2 – Blasting noise limits** to be exceeded at a sensitive place or commercial place.

Table D2 – Blasting noise limits

Blasting noise limits	Sensitive or commercial blasting noise limits place limits	
	7am to 6pm	6pm to 7am
Airblast overpressure	115 dB (Linear) Peak for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear) Peak at any time	No blasting to occur
Ground vibration peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time	No blasting to occur

Monitoring and reporting

D5 Noise monitoring and recording must include the following descriptor characteristics and matters:

a) $L_{AN,T}$ (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins);

b) background noise LA90;

c) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels;

d) atmospheric conditions including temperature, relative humidity and wind speed and directions;

e) effects due to any extraneous factors such as traffic noise;

f) location, date and time of monitoring; and

g) if the complaint concerns low frequency noise, Max LpLIN,T and one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range.

D6 The holder of this environmental authority must develop and implement a blast monitoring program to monitor compliance with **Table D2 – Blasting noise limits** for:

a) 100% of all blasts undertaken at the nearest sensitive place or commercial place; and

b) all blasts conducted during any time period specified by the administering authority at the nearest sensitive place or commercial place.

D7 When requested by the administering authority, noise monitoring and recording must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint of environmental nuisance at any sensitive place or commercial place, and the results must be notified within 10 business days to the administering authority following.

D8 The method of measurement and reporting of noise levels must comply with the latest edition of the administering authority's *Noise Measurement Manual* or the most recent version of *AS1055 Acoustics – description and measurement of environmental noise*.

Schedule E – Groundwater

Contaminant release

E1 The holder of this environmental authority must not release contaminants to groundwater.

Monitoring and reporting

E2 All determinations of groundwater quality and biological monitoring must be performed by an appropriately qualified person.

E3 Groundwater quality and levels must be monitored at the locations and frequencies defined in **Table – E1 Groundwater monitoring locations and frequency** and **Attachment 2 – Groundwater Monitoring Locations** for quality characteristics identified in **Table E2 – Groundwater quality triggers and limits**.

Table E1 – Groundwater monitoring locations and frequency

Monitoring point[1]	Location		Surface RL	Monitoring frequency[4]
	Easting (GDA94 – Zone 54)	Easting (GDA94 – Zone 54)	(m)[3]	
Reference bores[2]				
MB01B	592504	7399983	213.8	Monthly
MB02C	594017	7397580	236.8	Monthly
MB02S	594017	7397580	236.8	Monthly
MB03S	599667	7399771	230.5	Monthly
MB04_C	593513	7399534	234.9	Monthly
MB04S	593493	7399537	235.0	Monthly
MB06_B	592471	7394530	221.1	Monthly
MB07_B	592065	7393041	223.1	Monthly
MB08B	594668	7390096	242.6	Monthly
MB09T	593575	7401714	201.6	Monthly
MB10T	600020	7402656	193.4	Monthly
TAR040C	6000263	7396108	230.5	Monthly
Compliance bores				
TAR016C	594956	7395372	228.2	Monthly
TAR053	595642	7395113	213.6	Monthly
TAR176C	595549	7400349	204.0	Monthly
TAR177C	594586	7400197	221.1	Monthly
TAR189C	595543	7398818	236.8	Monthly
MB05_C	598860	7398819	237.7	Monthly
TAR249C	596635	7397000	236.2	Monthly

1. *Monitoring is not required where a bore has been removed as a direct result of the mining activity.*
2. *RL must be measured to the nearest 5cm from the top of the bore casing.*
3. *Reference sites must:*

(a) have a similar flow regime;

(b) be from the same bio-geographic and climatic region;

(c) have similar geology, soil types and topography; and

(d) not be so close to the test sites that any disturbance at the test site also results in a change at the reference site.

4. After 24 months of monitoring, the environmental authority holder may seek (via an environmental authority amendment application) to reduce the monitoring frequency to quarterly.

Table E2 – Groundwater quality triggers and limits[1]

Parameter	Contaminant triggers	Contaminant limit
TBA	TBA	TBA
TBA	TBA	TBA
TBA	TBA	TBA
TBA	TBA	TBA
TBA	TBA	TBA

*1. The environmental authority holder is required to submit the proposed groundwater quality triggers and limits after 24 months of monitoring (i.e. 24 monitoring events) is obtained in accordance within conditions **E2** and **E3**.*

E4 Groundwater levels when measured at the monitoring locations specified in **Table E1 – Groundwater monitoring locations and frequency** must not exceed the groundwater level trigger change thresholds specified in **Table E3 – Groundwater level monitoring** below.

Table E3 – Groundwater level monitoring

Monitoring location	Level trigger threshold[1]	Monitoring frequency
Reference bores		
MB01B	TBA	Daily
MB02C	TBA	Daily
MB02S	TBA	Daily
MB03S	TBA	Daily
MB04_C	TBA	Daily
MB04S	TBA	Daily
MB06_B	TBA	Daily
MB07_B	TBA	Daily
MB08B	TBA	Daily
MB09T	TBA	Daily
MB10T	TBA	Daily
TAR040C	TBA	Daily
Compliance bores		
TAR016C	TBA	Daily
TAR053	TBA	Daily

TAR176C	TBA	Daily
TAR177C	TBA	Daily
TAR189C	TBA	Daily
MB05_C	TBA	Daily
TAR249C	TBA	Daily

1. *The environmental authority holder is required to submit the proposed groundwater level trigger thresholds after 24 months of monitoring (i.e. 24 monitoring events) is obtained in accordance within conditions **E2** and **E3***

Exceedance investigation

E5 If quality characteristics of groundwater from compliance bores identified in **Table E1 – Groundwater monitoring locations and frequency** exceed any of the trigger levels stated in **Table E2 – Groundwater quality triggers and limits** or exceed any of the groundwater level trigger threshold stated in **Table E3 – Groundwater level monitoring**, the holder of this environmental authority must compare the compliance monitoring bore results to the reference bore results and complete an investigation in accordance with the ANZECC and ARMCANZ 2000.

E6 Results of monitoring of groundwater from compliance bores identified in **Table E1 – Groundwater monitoring locations and frequency**, must not exceed any of the limits defined in **Table E2 – Groundwater quality triggers and limits**.

Bore construction and maintenance and decommissioning

E7 The construction, maintenance and management of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring.

Groundwater model

E8 Within six (6) months of issue of this environmental authority, the environmental authority holder must submit to the administering authority a peer review of the groundwater model. The peer review should consider the following:

a) the geological conceptualisation;
b) appropriateness of the model boundary conditions;
c) appropriateness of the model interaction with surface creek systems; and
d) appropriateness of the sensitivity analysis and hydraulic parameters.

E9 Within three (3) years from the date of commencing mine dewatering, and every three (3) years thereafter, the environmental authority holder must submit to the administering authority a review and recalibration of the groundwater. The methodology should include the following:

a) hydraulic conductivity values based on additional field measurements in the target coal seams;
b) transient calibration of the groundwater model, using additional seasonal groundwater data; and
c) any additional data input requirements, to account for the effects of fracturing as mining progresses.

Schedule F – Water (Fitzroy model conditions)

Contaminant release

F1 Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.

F2 Unless otherwise permitted under the conditions of this environmental authority, the release of mine affected water to waters must only occur from the release points specified in **Table F1 – Mine affected water release points, sources and receiving waters** and depicted in **Attachment 3 – Mine affected water release points** attached to this environmental authority.

F3 The release of mine affected water to internal water management infrastructure installed and operated in accordance with a water management plan that complies with condition **F28** is permitted.

Table F1 – Mine affected water release points, sources and receiving waters

Release point (RP)	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Mine affected water source and location	Monitoring point	Receiving waters description
RP1	TBA*	TBA*	CPP Water Recycle Dam	Pipe or drain	Taroborah Creek
RP2	TBA*	TBA*	Mine Wastewater Dam	Pipe or drain	Taroborah Creek
RP3	TBA*	TBA*	Sediment Dam 03	Pipe or drain	Taroborah Creek
RP4	TBA*	TBA*	Sediment Dam 04	Pipe or drain	Taroborah Creek
RP5	TBA*	TBA*	Mine Wastewater Dam	Intake pipe to pumping system	Selma Irrigation System – main channel adjacent to Capricorn Highway underpass

**The environmental authority holder is required to submit the location (latitude and longitude) of the proposed release limits to the administering authority prior to mining operations commencing.*

F4 The release of mine affected water to waters in accordance with **condition F2** must not exceed the release limits stated in **Table F2 – Mine affected water release limits** when measured at the monitoring points specified in **Table F1 – Mine affected water release points, sources and receiving waters** for each quality characteristic.

Table F2 – Mine affected water release limits

Quality characteristic	Release limits	Monitoring frequency	Comment
Electrical conductivity (µS/cm)	Release limits specified in **Table F4 – Mine affected water release during flow events** for variable flow	Daily during release (the first sample must be taken within two hours of commencement of release)	
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	Daily during release (the first sample must be taken within two hours of commencement of release)	
Turbidity (NTU)	TBA	Daily during release* (first sample within two hours of commencement of release)	Turbidity is required to assess ecosystems impacts and can provide instantaneous results.

TBA: The environmental authority holder is required to submit the proposed release limits to the administering authority within 24 months of the issue date of the environmental authority, or prior to mining operations commencing; whichever is earlier.

F5 The release of mine affected water to waters from the release points must be monitored at the locations specified in **Table F1 – Mine affected water release points, sources and receiving waters** for each quality characteristic and at the frequency specified in **Table F2 – Mine affected water release limits** and **Table F3 – Release contaminant trigger investigation levels, potential contaminants**.

Note: The administering authority will take into consideration any extenuating circumstances prior to determining an appropriate enforcement response in the event condition F5 is contravened due to a temporary lack of safe or practical access. The administering authority expects the environmental authority holder to take all reasonable and practicable measures to maintain safe and practical access to designated monitoring locations.

Table F3 – Release contaminant trigger investigation levels, potential contaminants

Quality characteristic	Trigger levels (µg/L)	Comment on trigger level	Monitoring frequency
Aluminium	55	*For aquatic ecosystem protection, based on SMD guideline*	
Arsenic	13	*For aquatic ecosystem protection, based on SMD guideline*	
Cadmium	0.2	*For aquatic ecosystem protection, based on SMD guideline*	
Chromium	1	*For aquatic ecosystem protection, based on SMD guideline*	
Copper	2	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Iron	300	*For aquatic ecosystem protection, based on low reliability guideline*	
Lead	4	*For aquatic ecosystem protection, based on SMD guideline*	
Mercury	0.2	*For aquatic ecosystem protection, based on LOR for CV FIMS*	
Nickel	11	*For aquatic ecosystem protection, based on SMD guideline*	

Quality characteristic	Trigger levels (μg/L)	Comment on trigger level	Monitoring frequency
Zinc	8	*For aquatic ecosystem protection, based on SMD guideline*	Commencement of release and thereafter weekly during release
Boron	370	*For aquatic ecosystem protection, based on SMD guideline*	
Cobalt	90	*For aquatic ecosystem protection, based on low reliability guideline*	
Manganese	1900	*For aquatic ecosystem protection, based on SMD guideline*	
Molybdenum	34	*For aquatic ecosystem protection, based on low reliability guideline*	
Selenium	10	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Silver	1	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Uranium	1	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Vanadium	10	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Ammonia	900	*For aquatic ecosystem protection, based on SMD guideline*	
Nitrate	1100	*For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN*	
Petroleum hydrocarbons (C6-C9)	20		
Petroleum Hydrocarbons (C10-C36)	100		
Fluoride (total)	2000	*Protection of livestock and short term irrigation guideline*	
Sodium	180		
Suspended Solids	TBA – Limit to be determined based on receiving water reference data and achievable best practice sedimentation control and treatment*		
Sulfate (SO_4^{2-}) (mg/L)	TBA – Limit to be determined based on receiving water reference data and achievable best practice sedimentation control and treatment*	*Drinking water environmental values from NHMRC 2006 guidelines OR ANZECC*	

Table F3 – Release contaminant trigger investigation levels, potential contaminants *notes:*

1. *All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger.*
2. *The quality characteristics required to be monitored as per* ***Table F3 – Release contaminant trigger investigation levels, potential contaminants*** *can be reviewed once the results of two years monitoring data is available, or if sufficient data is available to adequately demonstrate negligible environmental risk, and it may be determined that a reduced monitoring*

*frequency is appropriate or that certain quality characteristics can be removed from **Table F3 – Release contaminant trigger investigation levels, potential contaminants** by amendment.*

3. *SMD – slightly moderately disturbed level of protection, guideline refers ANZECC & ARMCANZ (2000).*

4. *LOR – typical reporting for method stated. ICPMS/CV FIMS – analytical method required to achieve LOR.*

5. TBA – *the environmental authority holder is required to submit the proposed trigger values to the administering authority within 24 months of the issue date of the environmental, or prior to mining operations commencing; whichever is earlier.*

F6 If quality characteristics of the release exceed any of the trigger levels specified in **Table F3 – Release contaminant trigger investigation levels, potential contaminants** during a release event, the environmental authority holder must compare the downstream results in the receiving waters to the trigger values specified in **Table F3 – Release contaminant trigger investigation levels, potential contaminants** and:

a) where the trigger values are not exceeded then no action is to be taken; or

b) where the downstream results exceed the trigger values specified **Table F3 – Release contaminant trigger investigation levels, potential contaminants** for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and:

i) if the result is less than the background monitoring site data, then no action is to be taken, or

ii) if the result is greater than the background monitoring site data, complete an investigation into the potential for environmental harm and provide a written report to the administering authority within 90 days of receiving the result, outlining:

1) details of the investigations carried out

2) actions taken to prevent environmental harm.

Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with **F6 b) ii)** of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

F7 If an exceedance in accordance with condition **F6 b) ii)** is identified, the holder of the environmental authority must notify the administering authority in writing within **24 hours** of receiving the result.

Mine affected water release events

F8 The holder must ensure a stream flow gauging station/s is installed, operated and maintained to determine and record stream flows at the locations and flow recording frequency specified in **Table F3 – Release contaminant trigger investigation levels, potential contaminants**.

F9 Notwithstanding any other condition of this environmental authority, the release of mine affected water to waters in accordance with condition F2 must only take place during periods of natural flow in accordance with the receiving water flow criteria for discharge specified in **Table F4 – Mine affected water release during flow events** for the release point(s) specified in **Table F1 – Mine affected water release points, sources and receiving waters**.

F10 The release of mine affected water to waters in accordance with condition **F2** must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in **Table F4 – Mine affected water release during flow events** when measured at the monitoring points specified in **Table F1 – Mine affected water release points, sources and receiving waters**.

Table F4 – Mine affected water release during flow events

Receiving waters / stream	Release point (RP)	Gauging station	Gauging station latitude (decimal degree, GDA94)	Gauging station longitude (decimal degree, GDA94)	Receiving water flow recording frequency	Receiving water flow criteria for discharge	Maximum release rate (for all combined RP flows)	Salinity release limits (maximum)
Taroborah Creek	RP1 RP2 RP3 RP4	Taroborah Creek upstream (TBA*)	TBA*	TBA*	Continuous (minimum daily)	Low / No Flow: 28 days after natural flow events that exceed 0.15m^3/s at Nogoa River	0.05m^3/s	Electrical conductivity: 488µS/cm Sulfate: 300mg/L
						Medium Flow: ≥0.15 m^3/s in the Nogoa River	0.08m^3/s	Electrical conductivity: 1,500µS/cm Sulfate: <600mg/L
							0.02m^3/s	Electrical conductivity: 3,500µS/cm Sulfate: <600mg/L
Selma Irrigation System – main channel adjacent to Capricorn Highway underpass	RP5	TBA*	TBA*	TBA*	TBA*	TBA*	TBA*	TBA*

**The environmental authority holder is required to submit the proposed release limits to the administering authority within 24 months of the issue date of the environmental, or prior to mining operations commencing; whichever is earlier.*

F11 The daily quantity of mine affected water released from each release point must be measured and recorded.

F12 Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in such waters.

Notification of release event

F13 The environmental authority holder must notify the administering authority as soon as practicable and no later than **24 hours** after commencing to release mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information:

a) release commencement date/time;

b) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (that is, contaminant limits, natural flow, discharge volume);

c) release point/s;

d) release rate;

e) release salinity; and

f) receiving water/s including the natural flow rate.

Note: Notification to the administering authority must be addressed to the Manager and Project Manager of the local Administering Authority via email.

F14 The environmental authority holder must notify the administering authority as soon as practicable and nominally no later than **24 hours** after cessation of a release event of the cessation of a release notified under condition **F13** and within **28 days** provide the following information in writing:

a) release cessation date/time;

b) natural flow rate in receiving water;

c) volume of water released;

d) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (i.e. contaminant limits, natural flow, discharge volume);

e) all in-situ water quality monitoring results; and

f) any other matters pertinent to the water release event.

*Note: Successive or intermittent releases occurring within **24 hours** of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with conditions **F13** and **F14**, provided the relevant details of the release are included within the notification provided in accordance with conditions **F13** and **F14**.*

Notification of release event exeedance

F15 If the release limits defined in **Table F2 – Mine affected water release limits** are exceeded, the holder of the environmental authority must notify the administering authority within **24 hours** of receiving the results.

F16 The environmental authority holder must, within **28 days** of a release that is not compliant with the conditions of this environmental authority, provide a report to the administering authority detailing:

a) the reason for the release;

b) the location of the release;

c) the total volume of the release and which (if any) part of this volume was non-compliant;

d) the total duration of the release and which (if any) part of this period was non-compliant;

e) all water quality monitoring results (including all laboratory analyses);

f) identification of any environmental harm as a result of the non-compliance;

g) all calculations; and

h) any other matters pertinent to the water release event.

Receiving environment monitoring and contaminant trigger levels

F17 The quality of the receiving waters must be monitored at the locations specified in **Table F6 – Receiving water upstream background sites and downstream monitoring points** and **Attachment 4 – Receiving water monitoring points** for each quality characteristic and at the monitoring frequency stated in **Table F5 – Receiving waters contaminant trigger levels**.

Table F5 – Receiving waters contaminant trigger levels[1]

Quality Characteristic	Trigger Level	Monitoring Frequency
pH (pH units)	6.5 – 9.0	Daily during the release
Electrical Conductivity (µS/cm)	1,000	
Suspended solids (mg/L)	1,500	
Sulfate (SO_4^{2-}) (mg/L)	250 (Protection of drinking water environmental value)	
Sodium (mg/L)	180	

1. TBA – *the environmental authority holder is required to submit the proposed trigger levels to the administering authority within 24 months of the issue date of the environmental, or prior to mining operations commencing; whichever is earlier.*

Table F6 – Receiving water upstream background sites and downstream monitoring points

Monitoring points	Receiving waters location description	Latitude (GDA94)	Longitude (GDA94)
Upstream background monitoring points			
MP1	Taroborah Creek, approximately 2.6km upstream of RP1	592460	7394520
MP2	Tributary south of Taroborah Creek, approximately 3.7km upstream of RP1 and RP2	593875	7392625
MP3	Retreat Creek	594555	7402037
Downstream monitoring points			
MP4	Taroborah Creek	595695	7394650
MP5	Retreat Creek	597840	7402650
MP6	Retreat Creek	600070	7402480
MP7	Taroborah Creek	5986585	7391555

F18 If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table F5 – Receiving waters contaminant trigger levels** during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and:

a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no action is to be taken; or

b) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining:

i) details of the investigations carried out; and

ii) actions taken to prevent environmental harm.

*Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with **F19 b)** of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.*

F19 All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

Receiving environment monitoring program (REMP)

F20 The environmental authority holder must develop and implement a Receiving Environment Monitoring Program (REMP) to monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows due to the authorised mining activity. This must include monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions) and while mine affected water is being discharged from the site. For the purposes of the REMP, the receiving environment is the waters of Retreat Creek and Taroborah Creek and connected or surrounding waterways within 10km* downstream of the release. The REMP should encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity that will potentially be directly affected by an authorised release of mine affected water.

*Note: *may be updated / revised based on the REMP Design Document submitted as per condition F21 and the release point coordinates as per* **Table F1 – Mine affected water release points, sources and receiving waters.**

F21 A REMP Design Document that addresses the requirements of the REMP must be prepared and be submitted to the administrating authority by <insert date that is 3 months after the issue of the environmental authority>.

Note: The REMP Design Document must also be made available to the administering authority at any time upon request.

F22 A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared annually and made available on request to the administrating authority. This must include an assessment of background reference water quality, the condition of downstream water quality compared against water quality objectives, and the suitability of current discharge limits to protect downstream environmental values.

Water reuse

F23 Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, or used directly at properties owned by the environmental authority holder or a third party (with the consent of the third party).

Annual water monitoring reporting

F24 The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format:

a) the date on which the sample was taken;

b) the time at which the sample was taken;

c) the monitoring point at which the sample was taken;

d) the measured or estimated daily quantity of mine affected water released from all release points;

e) the release flow rate at the time of sampling for each release point;

f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority; and

g) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.

Temporary interference with waterways

F25 Destroying native vegetation, excavating, or placing fill in a watercourse, lake or spring necessary for and associated with mining operations must be undertaken in accordance with Department of Natural Resources and Mines (or its successor) *Guideline – Activities in a Watercourse, Lake or Spring associated with Mining Activities*.

Water management plan

F26 A Water Management Plan must be developed by an appropriately qualified person and implemented.

Stormwater and water sediment controls

F27 An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.

F28 Stormwater, other than mine affected water, is permitted to be released to waters from:

a) erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition **F27**; and

b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition **F26**, for the purpose of ensuring water does not become mine affected water.

Schedule G – Sewage treatment

G1 The only contaminant permitted to be released to land is treated sewage effluent in compliance with the release limits stated in **Table G1 – Contaminant release limits to land.**

Table G1 – Contaminant release limits to land

Contaminant	Unit	Release limit	Limit type	Frequency
5 day Biochemical oxygen demand (BOD)1	mg/L	20	Maximum	Monthly
Total suspended solids	mg/L	30	Maximum	Monthly
Nitrogen	mg/L	30	Maximum	Monthly
Phosphorus	mg/L	15	Maximum	Monthly
E-coli	Organisms/100ml	1000	Maximum	Monthly
pH	pH units	6.0 – 9.0.	Range	Monthly

G2 The application of treated effluent to land must be carried out in a manner such that:

a) vegetation is not damaged;

b) there is no surface ponding of effluent; and

c) there is no run-off of effluent.

G3 If areas irrigated with effluent are accessible to employees or the general public, prominent signage must be provided advising that effluent is present and care should be taken to avoid consuming or otherwise coming into unprotected contact with the effluent.

G4 All sewage effluent released to land must be monitored at the frequency and for the parameters specified in **Table G1 – Contaminant release limits to land**.

G5 The daily volume of effluent release to land must be measured and records kept of the volumes of effluent released.

G6 When circumstances prevent the irrigation or beneficial reuse of treated sewage effluent such as during or following rain events, waters must be directed to a wet weather storage or alternative measures must be taken to store/lawfully dispose of effluent.

G7 Treated sewage effluent must only be supplied to another person or organisation that has a written plan detailing how the user of the treated sewage effluent will comply with their general environmental duty under section 319 of the *Environmental Protection Act 1994* whilst using the treated sewage effluent.

Schedule H – Land and rehabilitation

H1 Land disturbed by mining must be rehabilitated in accordance with **Attachment 5 – Rehabilitation requirements**.

H2 Rehabilitation must commence progressively in accordance with the plan of operations.

Contaminated Land

H3 Before applying for surrender of a mining lease, the holder must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the mining lease which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use.

H4 Before applying for progressive rehabilitation certification for an area, the holder must (if applicable) provide to the administering authority a site investigation report under the *Environmental Protection Act 1994*, in relation to any part of the area the subject of the application which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use under condition **H1**.

Subsidence Management Plan

H5 A subsidence management plan must be developed and implemented by the holder of this environmental authority prior to the commencement of activities that result in subsidence of a watercourse that provides for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of this environmental authority.

H6 The subsidence management plan must be developed to the satisfaction of the administering authority in accordance with the departmental guideline *Watercourse Subsidence – Central Queensland Mining Industry* or any subsequent versions and must include at least the following components:

1) the condition of the existing watercourse (including a baseline assessment);

2) the proposed impacts of subsidence on the watercourse and floodplain including but not limited to:

   a) physical condition of surface drainages:

i) erosion;

ii) areas susceptible to higher levels of erosion such as watercourse confluences;

iii) incision processes;

iv) stream widening;

v) tension cracking;

vi) lowering of bed and banks;

vii) creation of in stream waterholes;

viii) changes to local drainage patterns; and

b) overland flow:

i) capture of overland flow by subsided long-wall panels;

ii) increased overbank flows due to lowering of high bank of watercourses;

iii) the portion of local and large scale catchment likely to be captured by subsided long-wall panels and the associated impacts on downstream users; and

c) water quality:

i) surface water;

ii) groundwater;

iii) overland flow water detained in subsided long-wall panels; and

d) land condition:

i) current land condition to be impacted by subsidence; and

e) infrastructure:

i) detail of existing infrastructure (pipelines, railway, power lines and haul roads) should be identified where there is a potential impact from effects of land subsidence; and

3) proposed options for mitigating any impacts associated with subsidence and how these mitigation methods will be implemented;

4) a risk assessment;

5) a monitoring, evaluation and maintenance program;

6) cumulative impacts on watercourse or catchments; and

7) impacts on groundwater.

H7 The holder of this environmental authority must not commence subsidence of a longwall panel unless:

a) the holder has submitted a subsidence management plan to the administering authority, together with certification by a suitably qualified and experienced person that the plan is compliant in all respects with this environmental authority; and

b) at least **28 days** has passed since the submission of the subsidence management plan.

Annual Inspection (Subsidence)

H8 The holder of this environmental authority must arrange for each subsided longwall panel to be inspected within the bed and banks of the watercourse annually by a suitably qualified and experienced person, in accordance with conditions **H9 to H12**.

H9 The annual inspection must be conducted prior to **1 November** each year.

H10 At each annual inspection, the condition of each subsided longwall panel must be assessed, including the structural, geotechnical and hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the subsidence management plan.

H11 For each inspection, a report certified by a suitably qualified and experienced person, including any recommendations must be provided to the administering authority within 28 days of the inspection.

H12 The report must detail any remedial works that have been undertaken and the outcomes of these works.

Remedial Works (Subsidence)

H14 The holder of the Environmental Authority, if directed by the administering authority, shall carry out any remedial works that are deemed necessary to minimise impacts on the physical integrity of the watercourse from subsidence.

Biodiversity offsets

H15 The authority holder must deliver an environmental offset for the activity's impacts on prescribed environmental matters, with the total extent of impact on prescribed environmental matters to not exceed:

a) Regional Ecosystem – 11.9.1 – 2.76ha in extent*

b) Regional Ecosystem 11.8.11 – 149.43ha in extent*

c) watercourse vegetation – 4.3ha in extent.

Note – * a) and b) are values that require offsets under the EPBC and therefore will also be condition by the Commonwealth.

H16 Before the authority holder starts any part of the prescribed activity mentioned in **condition F31**, the holder must:

a) elect, by notice in the approved form given to the administering agency, to deliver the offset condition by:

i) a proponent-driven offset; or
ii) a financial settlement offset; or
iii) a combination of a proponent-drives offset and a financial settlement offset; and

b) agree with the administering agency about the delivery of the offset condition though both parties endorsing an 'agreed delivery arrangement'.

H17 To the extent that the notice of election under condition **H16** involves a proponent-driven offset, the notice must be accompanied by an offset delivery plan that meets the requirements of s18 of the *Environmental Offsets Act 2014*.

H18 To the extent that the 'agreed delivery arrangement':

a) requires the authority holder to deliver a proponent-driven offset, the authority holder must comply with the agreed delivery arrangement, including the agreed offset delivery plan; and

b) required the authority holder to deliver a financial settlement offset, the authority holder must pay the amount:

i) required by, and in the way stated in, the agreed delivery arrangement to the department; and

ii) before the authority holder starts any part of the prescribed activity to which the offset condition relates.

H19 Within six (6) months of issue of the environmental authority, the authority holder must:

a) use the Australian Groundwater Dependent Ecosystem Toolbox evaluation framework to identify the ecological water requirements of potential groundwater dependent ecosystems (GDEs) located within the predicted zone of groundwater depressurisation (as identified in the Taroborah Coal

Project EIS dated November 2014). The survey area should include land on the project site (including regional ecosystems, RE11.3.25 and RE11.3.3a), and off-site within or adjacent to publicly accessible land, and any other land where access can be obtained;

b) complete a baseline assessment of the condition (using the BioCondition methodology[1]) and extent (in hectares) of all potentially impacted GDEs identified in the surveys required above;

c) assess the likely causes and extent of potential impacts on the identified GDEs, and propose mitigation measures, and offsets for any predicted residual impacts;

d) establish groundwater monitoring bores in the location of all potentially impacted GDEs and monitor groundwater depth and quality in accordance with the groundwater monitoring methodology in Schedule E of this authority.

H20 During groundwater dewatering associated with open-cut and underground mining, the authority holder must monitor the health of all potentially impacted GDEs for such changes as vegetation dieback, or a significant change in species diversity. The monitoring program should include trigger values for monitored parameters that would prompt corrective action to be taken to avoid and minimise impacts, or offset residual impacts.

H21 Offset actions that could be undertaken for residual impacts should be included in a revised biodiversity offset strategy.

Schedule J – Regulated Structures

Assessment of consequence category

J1 The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635) at the following times:

a) prior to the design and construction of the structure, if it is not an existing structure; or

b) if it is an existing structure, prior to the adoption of this schedule; or

c) prior to any change in its purpose or the nature of its stored contents.

J2 A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.

J3 Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

Design and construction[2] of a regulated structure

J4 Conditions **J5** to **J9** inclusive do not apply to existing structures.

J5 All regulated structures must be designed by, and constructed[3] under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

J6 Construction of a regulated structure is prohibited unless the holder has submitted a consequence category assessment report and certification to the administering authority has been certified by a suitably qualified and experienced person for the design and design plan and the associated operating procedures in compliance with the relevant condition of this authority.

[1] BioCondition: a condition assessment framework for terrestrial biodiversity in Queensland: assessment manual. T.J. Eyre [et al.] Ver 2.2 (2015) (or later versions).

[2] Construction of a dam includes modification of an existing dam — refer to the definitions.

[3] Certification of design and construction may be undertaken by different persons.

J7 Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, and must be recorded in the Regulated Structures register.

J8 Regulated structures must:

a) be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635);*

b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of:

i) floodwaters from entering the regulated dam from any watercourse or drainage line; and

ii) wall failure due to erosion by floodwaters arising from any watercourse or drainage line.

c) for regulated dams that are dams associated with a failure to contain – seepage: have the floor and sides of the dam designed and constructed to prevent or minimise the passage of the wetting front and any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam.

J9 Certification by the suitably qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure, and state that:

a) the 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure; and

b) construction of the regulated structure is in accordance with the design plan.

J10 Operation of a regulated structure**,** except for an existing structure, is prohibited unless:

a) the holder has submitted to the administering authority:

i) one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition **J7**;

ii) a set of 'as constructed' drawings and specifications;

iii) certification of those 'as constructed drawings and specifications' in accordance with condition **J9**;

iv) where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan;

v) the requirements of this authority relating to the construction of the regulated structure have been met;

vi) the holder has entered the details required under this authority, into a Register of Regulated Structures; and

vii) there is a current operational plan for the regulated structures.

J11 Each regulated structure must be maintained and operated, for the duration of its operational life until decommissioned and rehabilitated, in a manner that is consistent with the current operational plan and, if applicable, the current design plan and associated certified 'as constructed' drawings.

Mandatory reporting level

J12 Conditions **J13 to J16** inclusive only apply to regulated structures which have not been certified as low consequence category for 'failure to contain – overtopping'.

J13 The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.

J14 The holder must, as soon as practical and within **forty-eight (48) hours** of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.

J15 The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.

J16 The holder must record any changes to the MRL in the Register of Regulated Structures.

Design storage allowance

J17 The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken **prior to 1 July** of each year.

J18 By **1 November** of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume), to meet **the Design Storage Allowance (DSA) volume for the dam** (or network of linked containment systems).

J19 The holder must, as soon as possible and within **forty-eight (48) hours** of becoming aware that the regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on **1 November** of any year, notify the administering authority.

J20 The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on **1 November** of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.

Annual inspection report

J21 Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.

J22 At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure**.**

J23 The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

J24 The holder must:

a) Within **20 business days** of receipt of the annual inspection report, provide to the administering authority:

   i) The recommendations section of the annual inspection report; and

   ii) If applicable, any actions being taken in response to those recommendations; and

b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this to the administering authority within **10 business days** of receipt of the request.

Transfer arrangements

J25 The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.

Decommissioning and rehabilitation

J26 Dams must not be abandoned but be either:

a) decommissioned and rehabilitated to achieve compliance with condition **J27**; or

b) be left in-situ for a beneficial use(s) provided that:

i) it no longer contains contaminants that will migrate into the environment;

ii) it contains water of a quality that is demonstrated to be suitable for its intended beneficial use(s); and

iii) the administering authority, the holder of the environmental authority and the landholder agree in writing that the dam will be used by the landholder following the cessation of the environmentally relevant activity(ies).

J27 After decommissioning, all significantly disturbed land caused by the carrying out of the environmentally relevant activity(ies) must be rehabilitated to meet the following final acceptance criteria:

a) the landform is safe for humans and fauna;

b) the landform is stable with no subsidence or erosion gullies for at least **three (3) years**;

c) any contaminated land (e.g. contaminated soils) is remediated and rehabilitated;

d) not allowing for acid mine drainage;

e) there is no ongoing contamination to waters (including groundwater);

f) rehabilitation is undertaken in a manner such that any actual or potential acid sulfate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the *Instructions for the treatment and management of acid sulfate soils* (2001);

g) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class; and

h) for land that is not being cultivated by the landholder:

i) groundcover, that is not a declared pest species is established and self-sustaining; and

ii) vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining.

Register of Regulated Structures

J28 A Register of Regulated Structures must be established and maintained by the holder for each regulated structure.

J29 The holder must provisionally enter the required information in the Register of Regulated Structures when a design plan for a regulated dam is submitted to the administering authority.

J30 The holder must make a final entry of the required information in the Register of Regulated Structures once compliance with condition **J10 and J11** has been achieved.

J31 The holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.

J32 All entries in the Register of Regulated Structures must be approved by the chief executive officer for the holder of this authority, or their delegate, as being accurate and correct.

J33 The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Structures, in the electronic format required by the administering authority.

Definitions

Key terms and/or phrases used in this document are defined in this section. Applicants should note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

'acid rock drainage' means any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions, when geological strata is disturbed and exposed to oxygen and moisture.

'administering authority' is the agency that administers the environmental authority provisions under the *Environmental Protection Act 1994*.

'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 (dBL).

'annual exceedance probability' or **'AEP'** the probability that at least one event in excess of a particular magnitude will occur in any given year.

'annual inspection report' means an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan);

a) against recommendations contained in previous annual inspections reports;

b) against recognised dam safety deficiency indicators;

c) for changes in circumstances potentially leading to a change in consequence category;

d) for conformance with the conditions of this authority;

e) for conformance with the 'as constructed' drawings;

f) for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of accumulated sediment, state of the containment barrier and the level of liquids in the **dam** (or network of linked containment systems); and

g) for evidence of conformance with the current operational plan.

'appropriately qualified person' means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature.

'assessed or assessment' by a suitably qualified and experienced person in relation to a consequence assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit of the assessment:

a) exactly what has been assessed and the precise nature of that determination;

b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;

c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and

d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

'associated works' in relation to a dam, means:

a) operations of any kind and all things constructed, erected or installed for that dam; and

b) any land used for those operations.

'background', with reference to the water schedule means the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

'blasting' means the use of explosive materials to fracture:

a) rock, coal and other minerals for later recovery, or

b) structural components or other items to facilitate removal from a site or for reuse.

'certified', with respect to watercourse diversions, means assessed and approved by a suitably qualified and experienced person. In relation to 'as constructed' drawings and specifications, the certification must be by the suitably qualified person who supervised the construction of the watercourse diversion, or re-establishment of the watercourse.

'certification' means assessment and approval must be undertaken by a suitably qualified and experienced person in relation to any assessment or documentation required by the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*, including design plans, 'as constructed' drawings and specifications, construction, operation or an annual report regarding regulated structures, undertaken in accordance with the Board of Professional Engineers of Queensland Policy Certification by RPEQs (ID: 1.4 (2A)).

'certifying', '**certify' or 'certified'** have a corresponding meaning as 'certification'.

'chemical' means:

a) an agricultural chemical product or veterinary chemical product within the meaning of the Agricultural and *Veterinary Chemicals Code Act 1994* (Commonwealth); or

b) a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council; or

c) a lead hazardous substance within the meaning of the *Workplace Health and Safety Regulation 1997*; or

d) a drug or poison in the Standard for the Uniform Scheduling of Drugs and Poisons prepared by the Australian Health Ministers' Advisory Council and published by the Commonwealth; or

e) any substance used as, or intended for use as:

   i) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product; or

   ii) a surface active agent, including, for example, soap or related detergent; or

   iii) a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide; or

   iv) a fertiliser for agricultural, horticultural or garden use; or

   v) a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or

   vi) manufacture of plastic or synthetic rubber.

'commercial place' means a workplace 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.

'consequence' in relation to a structure as defined, means the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.

'consequence category' means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

'construction' or **'constructed'** in relation to a regulated structure includes building a new regulated structure and lifting or otherwise modifying an existing regulated structure, but does not include investigations and testing necessary for the purpose of preparing a design plan.

'construction' or 'constructed', in relation to watercourse diversions, is the process of building, or modifying an existing diversion, but does not include investigations and testing necessary for the purpose of preparing a design plan.

'contaminant' – a contaminant can be:

a) a gas, liquid or solid; or

b) an odour; or

c) an organism (whether alive or dead), including a virus; or

d) energy, including noise, heat, radioactivity and electromagnetic radiation; or

e) a combination of contaminants.

'dam' means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works.

'dam crest volume' means the volume of material (liquids and/or solids) that could be within the walls of a dam at any time when the upper level of that material is at the crest level of that dam. That is, the instantaneous maximum volume within the walls, without regard to flows entering or leaving (for example, via spillway).

'design plan' is a document setting out how all identified consequence scenarios are addressed in the planned design and operation of a regulated structure.

'design storage allowance' or **'DSA'** means an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority, must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an **annual exceedance probability** (AEP) specified in that Manual.

'designer' for the purposes of a regulated dam, means the certifier of the design plan for the regulated dam.

'disturbance' of land includes:

a) compacting, removing, covering, exposing or stockpiling of earth;

b) removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion;

c) carrying out mining within a watercourse, waterway, wetland or lake;

d) the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls;

e) temporary infrastructure, including any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after the mining activity has ceased; or

f) releasing of contaminants into the soil, or underlying geological strata.

However, the following areas are not included when calculating areas of 'disturbance':

a) areas off lease (e.g. roads or tracks which provide access to the mining lease);

b) areas previously disturbed which have achieved the rehabilitation outcomes;

c) by agreement with the administering authority, areas previously disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions);

d) areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be left by agreement with the landowner; or

e) disturbance that pre-existed the grant of the tenure.

'EC' means electrical conductivity.

'effluent' treated waste water released from sewage treatment plants.

'emergency action plan' means documentation forming part of the operational plan held by the holder or a nominated responsible officer, that identifies emergency conditions that sets out procedures and actions that will be followed and taken by the dam owner and operating personnel in the event of an emergency. The actions are to minimise the risk and consequences of failure, and ensure timely warning to downstream communities and the implementation of protection measures. The plan must require dam owners to annually update contact.

'equilibrium' means a state where 'balance' is achieved despite changing variables.

'existing structure' means a structure that was in existence prior to the adoption of this schedule of conditions under the authority.

'flowable substance' means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.

'functional design' is a document that contains 'conceptual' information about the design, operation and revegetation criteria of a watercourse diversion that addresses the outcomes stated in the conditions on the environmental authority relating to the diversion. The document should include, but not be limited to:

a) geomorphic and vegetation assessment of the existing watercourse;

b) hydrologic conditions of the existing watercourse;

c) the proposed watercourse diversion route; and

d) results from hydrologic, hydraulic and sediment transportation modelling used in the design of the diversion.

'functionality': the purpose that something is designed or expected to fulfil.

'holder', for a mining tenement, means a holder of the tenement under the *Mineral Resources Act 1989*, and the holder of the associated environmental authority under the *Environmental Protection Act 1994.*

'hydraulic performance' means the capacity of a regulated dam to contain or safely pass flowable substances based on the design criteria specified for the relevant consequence category in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

'infrastructure' means water storage dams, levees,, roads and tracks, buildings and other structures built for the purpose of the mining activity.

'land' in the 'land schedule' of this document means land excluding waters and the atmosphere, that is, the term has a different meaning from the term as defined in the *Environmental Protection Act 1994*. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term 'land' in this environmental authority relates to physical land and not to interests in land.

'land use' means the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

'leachate' means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

'levee' means an embankment that only provides for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of water or flowable substances at any other times.

'licensed place' means the mining activities carried out at the mining tenements detailed on page 1 of this environmental authority.

'low consequence dam' means any dam that is not a high or significant consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.**'mandatory reporting level'** or **'MRL'** means a warning and reporting level determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

'manual' means the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

'measures' includes any measures to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.

'mine affected water':

a) means the following types of water:

   i) pit water, tailings dam water, processing plant water;

   ii) water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2008 if it had not formed part of the mining activity;

   iii) rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such runoff,

provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water;

iv) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated;

v) groundwater from the mine's dewatering activities; or

vi) a mix of mine affected water (under any of paragraphs i)-v) and other water;

b) does not include surface water runoff which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with:

i) land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success; or

ii) land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which the water has been in contact does not cause environmental harm to waters or groundwater, for example:

a. areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site;

b. evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water runoff, or

iii) both.

'minimise' is to reduce to the smallest possible amount or degree.

'modification' or **'modifying'** (see definition of 'construction')

'NATA' means National Association of Testing Authorities, Australia.

'natural flow' means the flow of water through waters caused by nature.

'non-polluting' means having no adverse impacts upon the receiving environment.

'operational plan includes:

a) normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance);

b) contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.

'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 (mm/s).

'permanent watercourse diversion' is a man-made structure that incorporates the geomorphologic, hydraulic, hydrologic and ecological components of a local watercourse and is designed, constructed, operated and maintained according to an engineering standard that ultimately achieves a self-sustaining watercourse able to function without features or characteristics that rely on ongoing maintenance or that impose a financial or other burden on the proponent, government or the community.

'pre-existing watercourse' is the section of watercourse from which the flow of water will be diverted as a result of the construction and operation of a watercourse diversion.

'prescribed activity' has the same meaning as defined in the *Environmental Offsets Act 2014.*

'prescribed environmental matter' has the same meaning as defined in the *Environmental Offsets Act 2014.*

'protected area' means – a protected area under the *Nature Conservation Act 1992*, or

a) a marine park under the *Marine Parks Act 1992*, or

b) a World Heritage Area.

'receiving environment' in relation to an activity that causes or may cause environmental harm, means the part

of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

a) a watercourse;

b) groundwater; or

c) an area of land that is not specified as “surface rights areas” in Appendix 1 – Authorised disturbance areas of this environmental authority.

‘receiving waters’ means the waters into which this environmental authority authorises releases of mine affected water.

‘Register of Regulated Structures’ includes**:**

a) date of entry in the register;

b) name of the dam, its purpose and intended/actual contents;

c) the consequence category of the dam as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (EM635);

d) dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam;

e) name and qualifications of the suitably qualified and experienced person who certified the design plan and 'as constructed' drawings;

f) for the regulated dam, other than in relation to any levees –

i) The dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam;

ii) Coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area

iii) Dam crest volume (megalitres);

iv) Spillway crest level (metres AHD).

v) Maximum operating level (metres AHD);

vi) Storage rating table of stored volume versus level (metres AHD);

vii) Design storage allowance (megalitres) and associated level of the dam (metres AHD);

viii) Mandatory reporting level (metres AHD);

g) the design plan title and reference relevant to the dam;

h) the date construction was certified as compliant with the design plan;

i) the name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan;

j) details of the composition and construction of any liner;

k) the system for the detection of any leakage through the floor and sides of the dam;

l) dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year;

m) dates when recommendations and actions arising from the annual inspection were provided to the administering authority;

n) dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.

‘regulated dam’ means any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

’regulated structure’ includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity.

'rehabilitation' the process of reshaping and revegetating land to restore it to a stable landform.

'release event' means a surface water discharge from mine affected water storages or contaminated areas on the licensed place.

'representative' means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

'revegetation' is the re-establishment of vegetation[4] of a species and density of cover similar to surrounding undisturbed areas or the landform that existed before mining activities on soil surfaces associated with the construction or rehabilitation of a watercourse diversion.

'RL' means reduced level, relative to mean sea level as distinct from depths to water.

'saline drainage' The movement of waters, contaminated with salts, as a result of the mining activity.

'self-sustaining' means not requiring on-going intervention and maintenance to maintain functional riverine processes and characteristics

'sensitive place' means:

a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or

b) a motel, hotel or hostel; or

c) an educational institution; or

d) a medical centre or hospital; or

e) a protected area under the *Nature Conservation Act 1992*, the *Marine Parks Act 1992* or a World Heritage Area; or

f) a public park or gardens.

Note: The definition of 'sensitive place' and 'commercial place' is based on Schedule 1 of EPP Noise. That is, a sensitive place is inside or outside on a dwelling, library and educational institution, childcare or kindergarten, school or playground, hospital, surgery or other medical institution, commercial & retail activity, protected area or an area identified under a conservation plan under Nature Conservation Act 1992 *as a critical habitat or an area of major interest, marine park under* Marine Parks Act 2004*, park or garden that is outside of the mining lease and open to the public for the use other than for sport or organised entertainment. A commercial place is inside or outside a commercial or retail activity.*

A mining camp (i.e., accommodation and ancillary facilities for mine employees or contractors or both, associated with the mine the subject of the environmental authority) is not a sensitive place for that mine or mining project, whether or not the mining camp is located within a mining tenement that is part of the mining project the subject of the environmental authority. For example, the mining camp might be located on neighbouring land owned or leased by the same company as one of the holders of the environmental authority for the mining project, or a related company. Accommodation for mine employees or contractors is a sensitive place if the land is held by a mining company or related company, and if occupation is restricted to the employees, contractors and their families for the particular mine or mines which are held by the same company or a related company.

For example, a township (occupied by the mine employees, contractors and their families for multiple mines that are held by different companies) would be a sensitive place, even if part or all of the township is constructed on land owned by one or more of the companies.

'spillway' means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges form the dam, normally under flood conditions or in anticipation of flood conditions.

'structure' means dam or levee.

'suitably qualified and experienced person' in relation to **regulated structures** means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 2002*, and has demonstrated competency and relevant experience:

[4] Not including a species declared under the Land Protection (Pest and Stock Route Management) Regulation 2003 as a category class 1 pest, category class 2 pest or category class 3 pest.

a) for regulated dams: an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design.

b) for regulated levees: an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments.

Note: It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology.

"suitably qualified and experienced person" in relation to **watercourse subsidence** means one who holds relevant professional qualifications to the satisfaction of the administering authority; AND the administering authority is satisfied that person has knowledge, suitable experience and demonstrated expertise in relevant fields, as set out below:

a) knowledge of engineering principles related to the structures, hydrology, hydraulics and environmental impact of watercourse subsidence; and

b) a total of five years of suitable experience and demonstrated expertise in the following categories:

i) hydrology with particular reference to flooding, estimation of extreme storms or water management;

ii) hydraulics with particular reference to sediment transport and deposition and erosion control; and

iii) hydrogeology with particular reference to seepage, groundwater.

'system design plan' means a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.

'temporary watercourse diversion' is a man-made structure that may incorporate geomorphologic, hydraulic, hydrologic and ecological components of a local watercourse and is designed, constructed, operated and maintained to an engineering standard that ensures the diversion does not compromise the equilibrium and performance of the diversion and adjoining watercourses. A temporary diversion is replaced by a permanent diversion, or the re-establishment of the pre-existing watercourse, within the timeframe specified in the design plan.

'the Act' means the *Environmental Protection Act 1994*.

'µS/cm' means micro siemens per centimetre.

'void' means any constructed, open excavation in the ground.

'water' is defined under Schedule 4 of the *Water Act 2000.*

'water year' means the 12-month period from 1 July to 30 June.

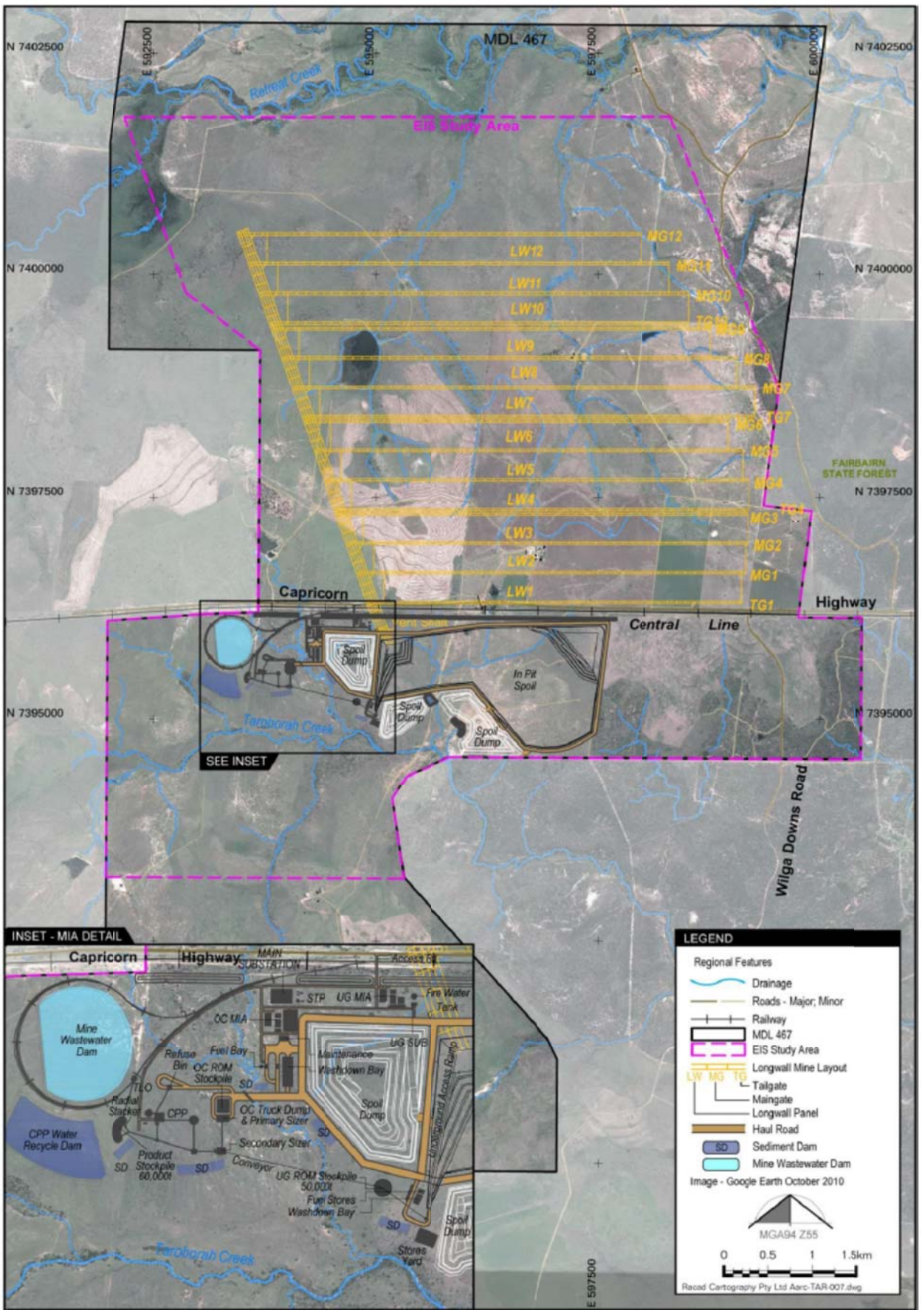
'watercourse' has the same meaning given in the *Water Act 2000*.

'water quality' means the chemical, physical and biological condition of water.

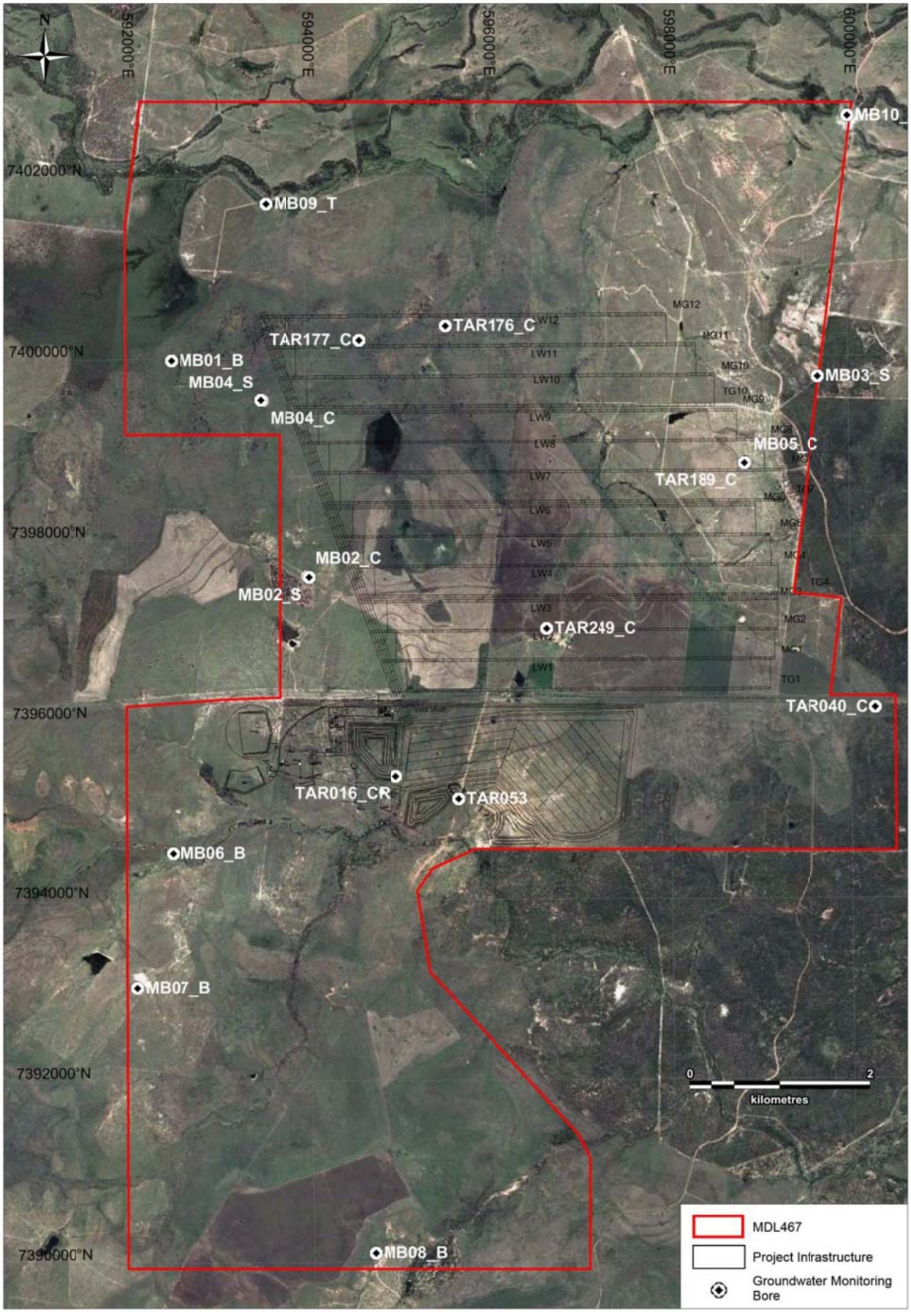
'waters' includes river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined natural or artificial watercourse, bed and bank of any waters, dams, non-tidal or tidal waters (including the sea), storm water channel, storm water drain, and groundwater and any part thereof.

'wet season' means the time of year, covering one or more months, when most of the average annual rainfall in a region occurs. For the purposes of DSA determination this time of year is deemed to extend from 1 November in one year to 31 May in the following year inclusive.

Attachment 1 – Authorised disturbance footprint



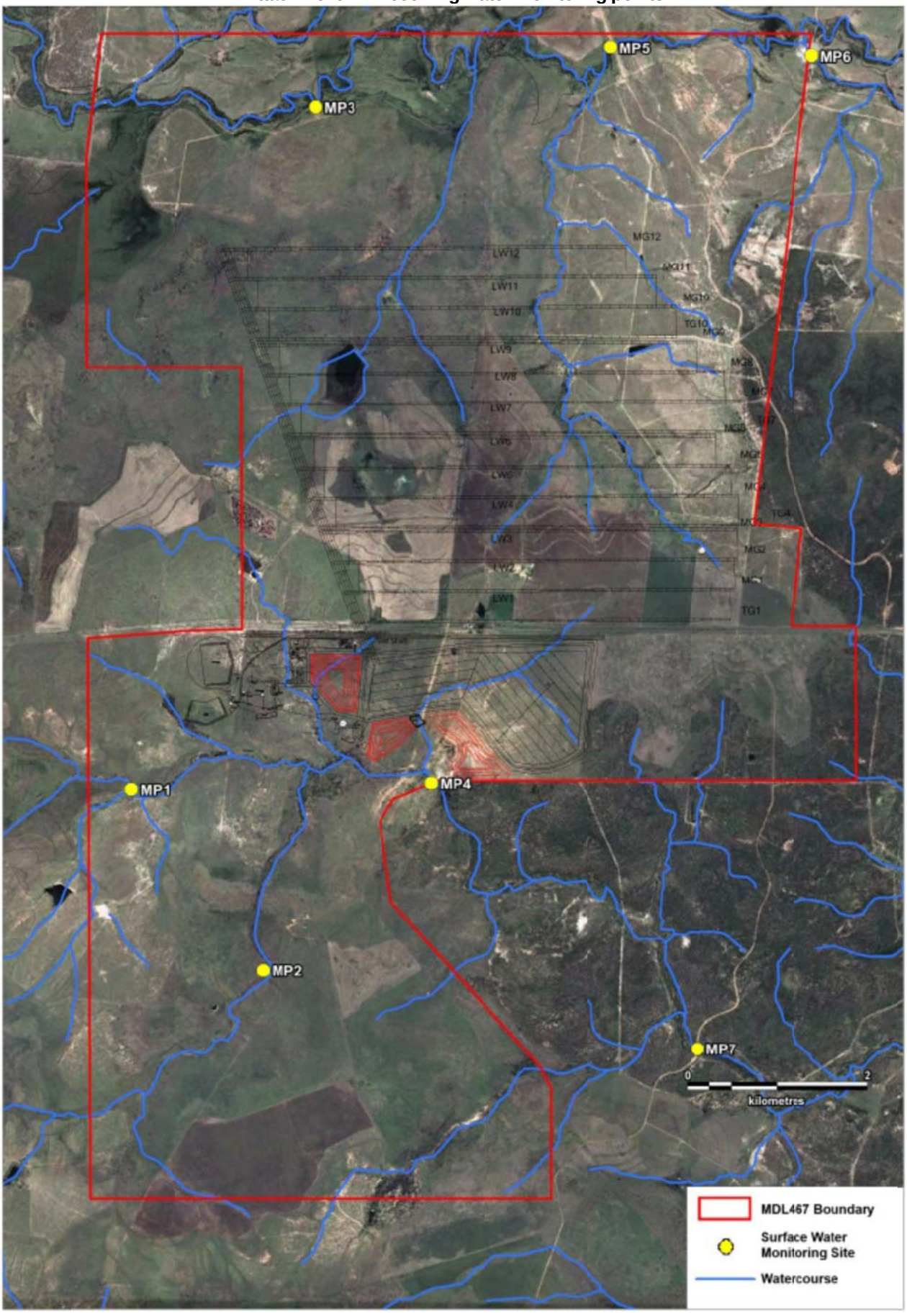
Attachment 2 – Groundwater Monitoring Locations



Attachment 3 – Mine affected water release points

Note: The environmental authority holder is required to submit this figure to the administering authority within 24 months of the issue date of the environmental, or prior to mining operations commencing; whichever is earlier.

Attachment 4 – Receiving water monitoring points



Attachment 5 – Rehabilitation requirements

Mine domain	Mine feature name	Rehabilitation goal	Rehabilitation objectives	Indicators	Completion criteria
TBA	TBA	TBA	TBA	TBA	TBA

Appendix 2

Assessment of matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999*

for the Taroborah Coal Project

proposed by Shenhuo International Group Pty Ltd

Table of Contents

1 Matters of national environmental significance

The submitted EIS included an assessment of the potential impacts of the Taroborah Coal Project on matters of national environmental significance (MNES) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This appendix (Appendix 2) has been written as a stand-alone component of the EIS assessment report and has been prepared in accordance with section 59 of the *Environmental Protection Act 1994*. It addresses the requirements of the Queensland Government's assessment as specified by Schedule 1 of the bilateral agreement between the Australian Government and the Queensland Government relating to environmental assessment and section 9 of the Environmental Protection Regulation 2008.

1.1 Controlling provisions and assessment approach

On 18 January 2012, IMC Mining Group Pty Ltd, on behalf of the proponent, Shenhuo International Group Pty Ltd, referred the Taroborah Coal Project to the Commonwealth Environment Minister for a determination as to whether the project would constitute a controlled action with respect to potential impacts on MNES.

On 20 February 2012, the delegate of the Commonwealth Environment Minister decided under sections 75 of the EPBC Act that the project is a controlled action for the relevant controlling provisions of listed threatened species and communities (sections 18 and 18A) and listed migratory species (sections 20 and 20A). On 17 October 2013, the delegate also decided that a water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E) is also a controlling provision and that the project required assessment and approval under the EPBC Act before it could proceed.

The EIS process under Chapter 3, Part 1 of the EP Act for the Taroborah Coal Project was accredited for the assessment of the project's impacts on the controlling provisions under An Agreement Between the Australian Government and the State of Queensland under Section 45 of the Australian Government EPBC Act relating to environmental assessment (commonly called the Bilateral Agreement). The EIS process under the EP Act is administered by the Queensland Department of Environment and Heritage Protection (EHP).

The evaluation of potential impacts of the Taroborah Coal Project on MNES presented in this report is based on information contained in the submitted EIS, which consists of the following documentation:

- the EIS (Volumes 1 to 4) that was available for public comment from 15 May to 26 June 2014
- the response to submissions and the amended EIS received by EHP on 24 November 2014.

The Australian Government Department of the Environment (DOTE) has been consulted in relation to the assessment of potential impacts on MNES and proposed mitigation measures, and on the adequacy of information provided by the proponent, throughout the EIS process and during the preparation of this report, in accordance with the administrative arrangements for the Bilateral Agreement.

An assessment of the potential impacts of the Taroborah Coal Project on the controlling provisions is provided in section 3 of this appendix, specifically:

1. Section 3.1 contains an assessment of the impacts of the project on listed threatened species and communities (sections 18 and 18A of the controlling provisions) and listed migratory species (sections 20 and 20A of the controlling provisions)
2. Section 3.2 contains an assessment of impacts of the project on water resources by large coal mining development (sections 24D and 24E of the controlling provisions), including an evaluation of the proponent's response to the advice on water-related aspects of the project provided by the IESC (see section 1.2 below).

A copy of this report will be given to DOTE to assist the Commonwealth Minister with making a decision about the approval of the Taroborah Coal Project and any conditions that should apply under Part 9 of the EPBC Act.

1.2 Independent Expert Scientific Committee

In regard to the assessment of impacts of the project on water resources, the Australian Government established an Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) in late 2012 through amendment to the EPBC Act. The IESC provides advice to the Commonwealth Environment Minister on research priorities to improve the understanding of potential impacts of coal seam gas and large mining developments on water resources. Federal, state and territory governments can request the IESC to provide advice on water-related aspects of EISs.

The EIS for the project was referred to the IESC on 7 May 2014 by DOTE and EHP. The IESC's advice to the departments dated 12 June 2014 has been considered in the preparation of this assessment report. A summary of the IESC's advice to the departments dated 12 June 2014 and the proponent's response to the issues raised by the

IESC, as well as an evaluation of the adequacy of the proponent's response is provided in section 3.2 of this appendix.

1.3 Feasible alternatives

The matters prescribed in section 9 of the Environmental Protection Regulation 2009 require, amongst other things, that this EIS assessment provide 'to the extent practicable, a summary of feasible alternatives to the project identified in the assessment process and the likely impact of the alternatives on MNES'.

Feasible alternatives do not include an alternative location for the mine due to geological and tenure constraints. Feasible alternatives assessed for the project, and the likely impact of the alternatives on MNES, are addressed in the following sections.

1.3.1 Coal extraction

The coal extraction methods considered for the project included a combination of open-cut and underground longwall mining techniques, and a combination of open-cut and underground bord and pillar mining techniques. Bord and pillar mining involves cutting a network of rooms or panels into the coal seam and leaving behind pillars of coal to support the roof of the mine, reducing coal recoveries to as little as 50%. In comparison, longwall mining involves self-advancing, hydraulic-powered supports which temporarily hold up the roof while the coal is being extracted, recovering up to 75% of the resource. To maximise resource recovery, the preferred coal extraction option for the Taroborah Coal Project was based on open-cut and underground longwall mining techniques. However, the bord and pillar technique does not usually result in subsidence of the land surface, whereas, the longwall technique does. Consequently, it was necessary to consider the potential impacts of subsidence on MNES.

For the Taroborah Coal Project, subsidence of up to 2m is predicted. No threatened ecological communities were identified in the area of predicted subsidence. Furthermore, the changes in surface drainage as a result of subsidence are anticipated to be temporary, and drainage pathways similar to the existing situation would be restored prior to project decommissioning. Subsidence is expected to impact on seven pastoral dams that provide potential habitat for migratory species. Some dams would be impacted negatively (i.e. subsidence would reduce capacity) and some positively (i.e. subsidence would increase capacity). However, any dams negatively impacted would be excavated to restore original capacity. Consequently, available habitat for migratory species would not be reduced as a result of subsidence. Therefore, the difference between impacts of bord and pillar, and longwall mining on MNES, are expected to be negligible.

1.3.2 Product coal transport

The product coal transport alternatives considered for the project were road and rail. The rail alternative would require a new on-site train load-out facility and rail loop to connect the mine to the Central West rail system. However, the new infrastructure would be positioned to minimise any impacts on MNES, and no threatened ecological communities would be cleared as a result of the new infrastructure. The rail alternative would also require upgrades to the Central West rail system. However, the upgrades would be undertaken within the existing rail corridor and no new track alignments would be required. Consequently, any impacts on MNES would be negligible.

The road alternative would be undertaken on the existing road network and no new road alignments would be required. Consequently, any potential impacts on MNES as a result of the road alternative would be negligible.

However, rail transport of the mined coal to port was identified as the most viable alternative due to concerns about road safety and dust and noise nuisance impacts associated with road transport.

1.3.3 Port facilities

The port facility alternatives considered for exporting coal from the project included Barney Point, Hay Point, Abbot Point, Dalrymple Bay and Wiggins Island coal terminals. Barney Point, Hay Point, Abbot Point and Dalrymple Bay would all require the construction of additional infrastructure to cater for the project, which may result in impacts on MNES, including the Great Barrier Reef marine park and migratory species. However, Wiggins Island has sufficient capacity to cater for the project without the construction of any additional infrastructure. Consequently, it was selected as the most viable alternative for the project.

1.3.4 Rejects disposal

The coarse and fine rejects alternatives considered for the project included the confinement of rejects in a purpose-built, above-ground rejects storage facility and co-disposal of rejects within the spoil dumps. Rejects disposal within a rejects storage facility would result in an additional disturbance footprint, which may result in impacts on MNES,

including threatened species and ecological communities. Contaminated run-off, or seepage, from a rejects disposal facility may also result in impacts on MNES, including water resources. Rejects disposal within overburden generated during mining would not require an additional disturbance footprint and any potential contamination would be contained within purpose-built, engineered cells within buried spoil. Co-disposal of rejects within spoil dumps was identified as the most viable alternative for the project.

1.3.5 Conclusion

The preferred project alternatives would result in less, or similar impacts on MNES, compared to alternatives that were not selected.

2 Description of the proposed action

The proposed Taroborah Coal Project would include the construction and operation of an open-cut and underground coal mine on a greenfield site. The project site lies in the Denison Trough of the Bowen Basin approximately 22 kilometres (km) west of Emerald in Central Queensland within the Central Highlands Regional Council local government area (Figure 2-1). The open-cut mining area lies to the south of the Central West rail system and the Capricorn Highway. The underground mining area lies to the north of the Central West rail system and the Capricorn Highway. An indicative project layout is shown in Figure 2-2.

The action area would be on mineral development licence (MDL) 467, covering approximately 7,966 hectares (ha). The disturbance footprint associated with the open-cut and underground operations is estimated to cover 2,568ha. A breakdown of disturbance is provided in Table 2-1.

Table 2-1 A breakdown of the disturbance footprint

Disturbance	Area (ha)
Open-cut mining, including dumps and haul roads	336
Underground (longwall) mining	2,071
CHPP, mine infrastructure and site offices	58
Rail balloon loop, sediment dams, CHPP water recycle dam and mine waste water dam	50
Visual amenity bunds	16
Total:	2,568

Source: Table 3.3 of the EIS

The life of the project would be approximately 22 years, including an initial twelve month construction phase, 20 year production period and a 15 month decommissioning and rehabilitation phase. An additional six month construction phase in preparation for underground mining would occur in parallel with open-cut mining, and would begin in the fifth year of the project.

Mining would target the A and B seams, which range from 0.1 metres (m) to 1.9m thick and 2.3m to 3.0m thick respectively, and lie at depths of 30m to 200m. The project would recover approximately 11.5 million tonnes (Mt) of run-of-mine (ROM) thermal coal from the open-cut pit and 64.3Mt of ROM thermal coal from the underground operation. Initially, 0.5Mt of ROM coal would be mined in the first year. The rate would progressively increase up to 5.75Mt a year (Mt/y) of ROM coal in year 8. Open-cut mining would overlap with underground mining between years 5 to 7. Open cut mining would cease after the seventh year. Between years 8 to 20, underground mining would continue to produce up to 5.75Mt/y of ROM coal.

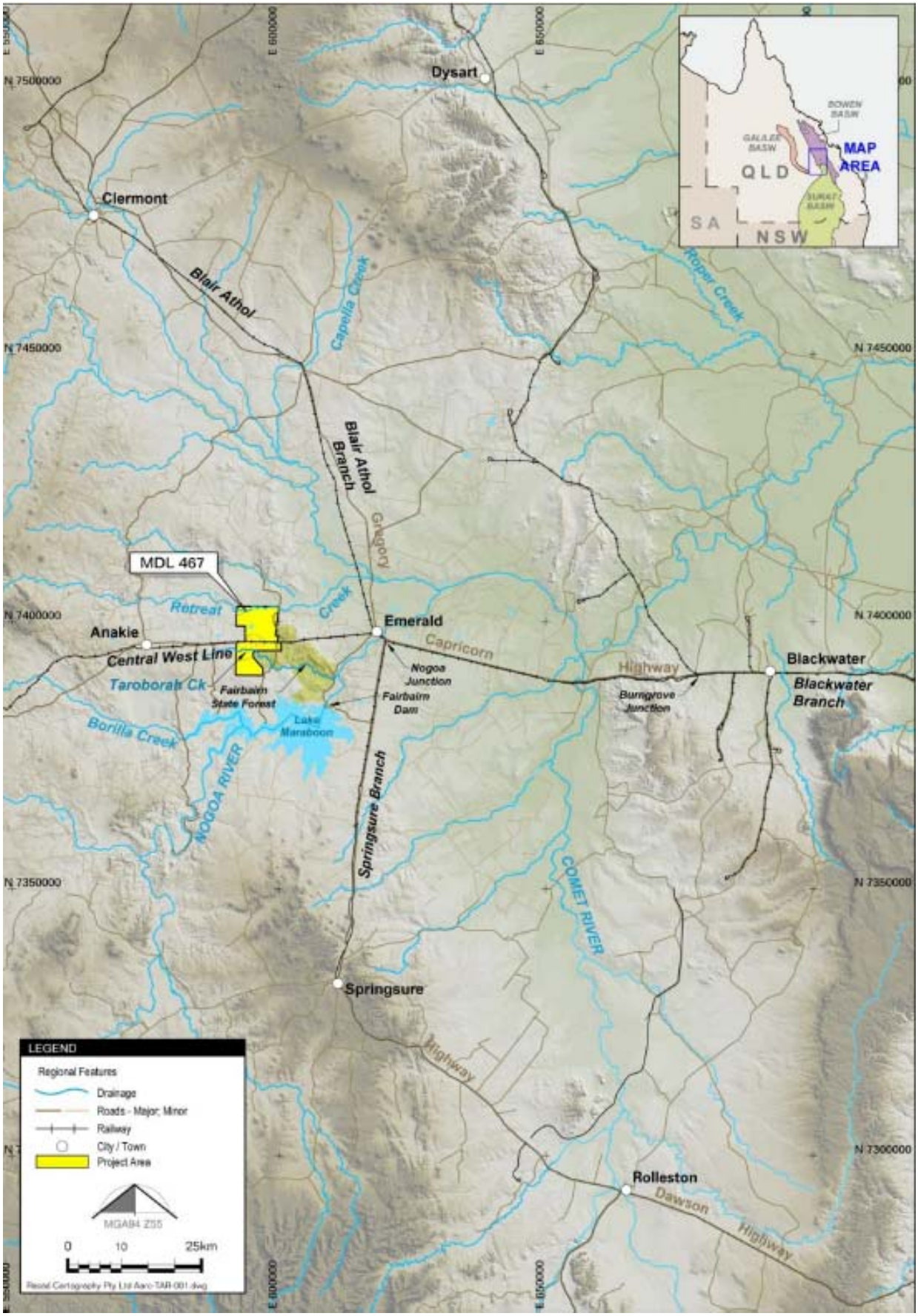
Open-cut mining would be carried out using conventional hydraulic excavators and a fleet of dump trucks to remove overburden and extract the coal resource. ROM coal from the open-cut pit would be loaded onto trucks and hauled to an on-site coal handling and processing plant (CHPP). Overburden would be hauled by truck, initially to out-of-pit spoil dumps adjacent to the open-cut pit. Once mining of the pit sufficiently progresses, spoil would be progressively backfilled in the advancing pit.

Underground mining would be carried out by longwall extraction techniques. ROM coal from the underground operations would be transported by conveyors via the open-cut highwall to the CHPP for processing.

Processing at the CHPP would involve crushing, screening and washing of ROM coal in order to separate product coal from coarse and fine reject materials. Fine rejects from the CHPP would be partially dewatered and mixed with

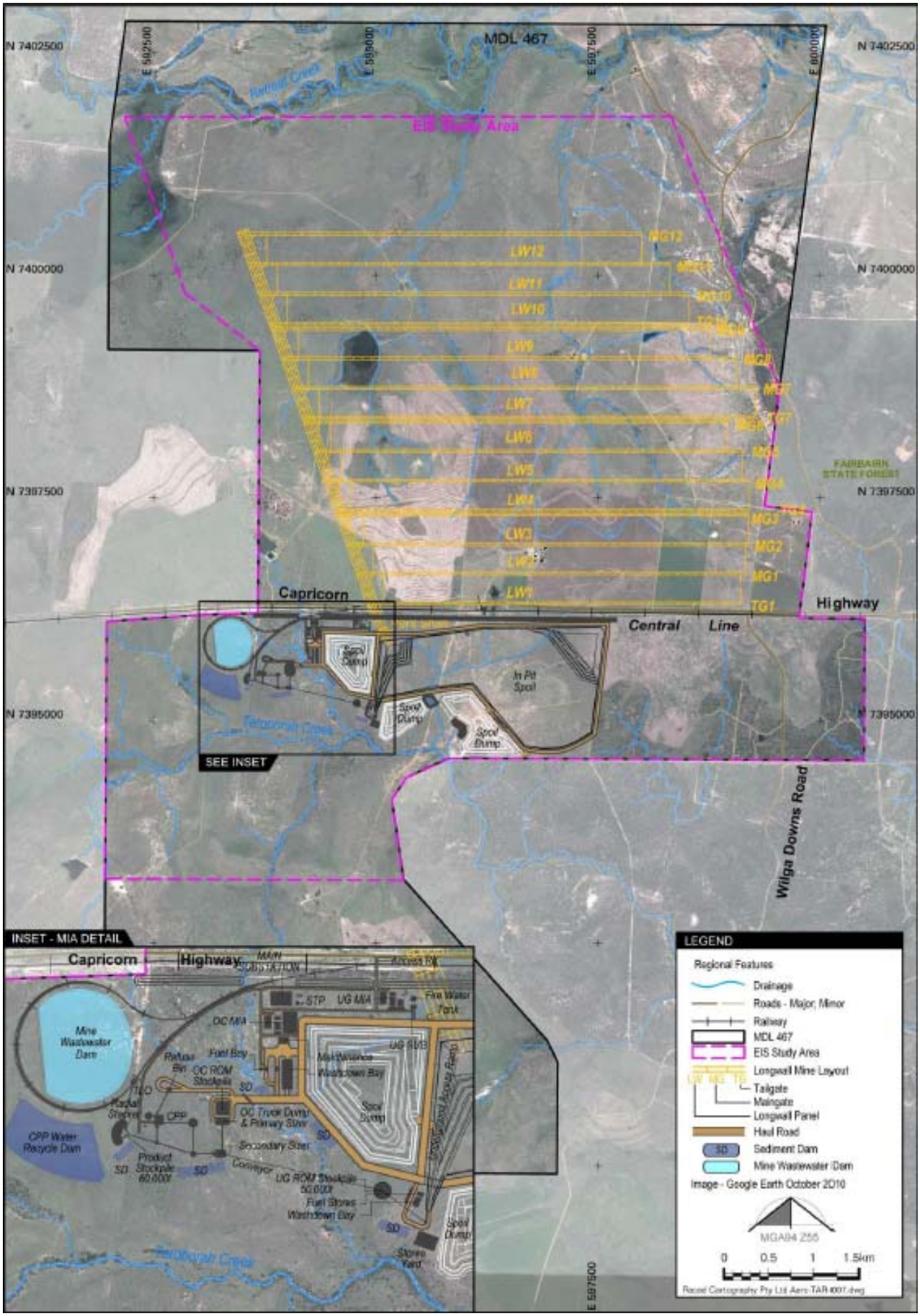
coarse rejects, prior to being hauled and buried in the spoil dumps.

Figure 2-1 Location of the action area for the project



Source: Figure 1.2 of the EIS

Figure 2-2 Proposed project layout



Source: Figure 3.5 of the EIS

Up to 5.73Mt/y of product coal would be transported from the project site via the Queensland Rail (QR) Central West rail system and the Aurizon Blackwater rail system to the Wiggins Island Coal Export Terminal (WICET) at the Port of Gladstone for export. The coal transport option would require the construction of a new on-site train load-out facility and rail loop to connect the mine to the Central West rail system, as well as an upgrade of the Central West rail line.

The real property descriptions of the action area are shown in Table 2-1.

Table 2-1 Real property descriptions underlying the action area

Real property description	Tenure type	Nature of the land
Lot 76 on plan PT372	Freehold	Private agriculture
Lot 12 on plan RP881318	Freehold	Private agriculture
Lot 13 on plan RP881318	Freehold	Private agriculture
Lot 14 on plan RP881318	Freehold	Private agriculture
Lot 15 on plan PLA4029	Freehold	Private agriculture
Lot 126 on plan PT372	Freehold	Private agriculture
Lot 21 on plan DSN29	Freehold	Private agriculture
Lot 201 on plan DN40176	Freehold	Private agriculture
Lot 23 on plan DN40176	Freehold	Private agriculture
Lot 24 on plan DN40201	Freehold	Private agriculture
Lot 20 on plan DSN377	Freehold	Private agriculture
Lot 124 on plan PT367	Leasehold	Private agriculture
Lot 203 on plan DSN377	Freehold	Private agriculture
Lot 4 on plan PT352	Leasehold	Private agriculture
Lot 12 on PT352	Leasehold	Private agriculture
Lot 81 on SP122079	State land	Queensland Rail, railway corridor
Lot 82 on SP122079	State land	Queensland Rail, railway corridor
Lot 101 on SP122080	State land	Queensland Rail, railway corridor
Lot 5 on PT132	State land	Queensland Rail, Capricorn Highway

Source: Table 4.6 of the EIS

Site access by road would be via the Capricorn Highway, which passes east-west through the middle of MDL467.

The construction and operation phases of the project would employ up to 150 and 375 full-time staff respectively. Construction and operational workforces would use a bus-in, bus-out (BIBO) transportation system from Emerald to the project site. While on roster, all staff would live in Emerald or the surrounding townships in either permanent or temporary accommodation.

The annual raw water demand during the 22 year life of the project is estimated to range from 330 megalitres (ML) per year during initial construction up to 2,680ML per year during peak open-cut and underground operations. Water would be sourced from coal seam dewatering and the collection of rainfall run-off in surface water storages. No specific surface water or groundwater allocations from external sources are proposed for the project. At present, a licence to take groundwater will need to be obtained under the provisions of the *Water Act 2000* (Water Act), although this would no longer be necessary once current reforms come into place. The Water Act (through the

Fitzroy Basin Water Resource Plan) also allows the take of all overland flow needed to meet the requirements of an environmental authority issued under the EP Act.

Flood protection bunds would be constructed to a nominal height of 0.5m, and would be designed to protect the open-cut pit and mine infrastructure area (MIA) from local flooding up to a 1-in-1000 year peak flow event.

A 66 kilovolt overhead feeder line running parallel to the Capricorn Highway is proposed to be connected to the Emerald substation located 22km to the east of the project site. It would supply 25 megawatts of electricity per year during peak project operations.

Key features of the conceptual rehabilitated final landform design for the project include:

- two final voids covering approximately 292ha on the southern side of the Capricorn Highway on MDL467
- elevated landforms associated with out-of-pit spoil dumps covering approximately 93ha on the southern side of the Capricorn Highway on MDL467
- landforms at-grade or only slightly below pre-mining topography associated with subsided areas from underground mining, covering approximately 2071ha
- landforms at-grade associated with rehabilitated infrastructure areas covering approximately 69ha.

3 Assessment of the potential impacts of the project on the controlling provisions

An assessment of the potential impacts of the project on listed threatened species and communities (sections 18 and 18A of the controlling provisions) and listed migratory species (sections 20 and 20A of the controlling provisions), and water resources by large coal mining development (sections 24D and 24E of the controlling provisions) is provided in the following subsections.

3.1 Listed threatened species and communities and listed migratory species

Section 5.7.1, 5.7.2 and 5.7.3 of the EIS contained a stand-alone assessment of the impacts of the project on listed threatened species, listed migratory species and threatened ecological communities (TECs) respectively. Additional supporting information about cumulative impacts on listed threatened species and communities was included in section 5.7.5 of the EIS. Measures to mitigate the potential impacts of the project on listed threatened species and communities, and listed migratory species were provided in sections 5.8.1 and 5.8.2 of the EIS. An environmental offsets strategy was provided in Appendix 21 of the EIS.

3.1.1 Existing environmental values

Desktop terrestrial, aquatic flora and fauna studies were undertaken prior to the field surveys to identify the potential ecological values present within and surrounding the project area, particularly values that are protected under state and Commonwealth legislation.

Flora surveys (including secondary and quaternary transects as defined by Neldner et al. 2012) and condition assessments were carried out to verify desktop results. The surveys included targeted searches for threatened flora species, weed infestations, as well as surveys to identify the location, extent and condition of vegetation across the project area using the regional ecosystem framework and threatened ecological community criteria. However, no flora survey sites were carried out within the areas mapped as regional ecosystem 11.8.11, which is analogous to the natural grassland TEC.

Terrestrial flora and fauna surveys were carried out in the dry season from the 8 to 16 September 2011 and in the wet season from 28 February to 5 March 2012. Aquatic flora and fauna surveys were carried out in October 2011 and February 2012. A stygofauna assessment was carried out in September 2011, and a targeted bat survey on the 7 and 8 August 2012. Fauna sampling was conducted primarily along transects established in each of the major fauna habitat types.

The EIS stated that the proposed project area and surrounding landscape was extensively cleared and mostly used for agricultural activities with vegetation often occurring along watercourses.

The EIS identified five threatened ecological communities, six EPBC listed threatened flora species and thirteen EPBC listed threatened fauna species as potentially occurring in the project area based on a desktop assessment.

3.1.1.1 Threatened ecological communities

The following listed TECs where found to occur in the project area during flora surveys conducted on-site:

- brigalow (*Acacia harpophylla* dominant and co-dominant) (brigalow TEC) – endangered
- natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin – endangered.

The estimated extent and proposed extent of clearing of each TEC is shown in Table 3-1.

Table 3-1 Estimated extent of TECs and proposed extent of clearing of each TEC

Threatened ecological community (TEC)	EPBC Act status	Total extent within project area	Extent of clearing
Brigalow TEC	Endangered	112.3ha	2.76ha
Natural grasslands TEC	Endangered	163.5ha	149.43ha

Source: Table 4.113 and Table 5.12 of the EIS

3.1.1.2 Threatened flora species

No threatened flora species were identified within the project area during flora surveys conducted on-site.

3.1.1.3 Threatened fauna species

No threatened fauna species were identified within the project area during fauna surveys conducted on-site.

3.1.1.4 Listed migratory species

Three EPBC listed migratory species were located within the project area:

- cattle egret (*Ardea ibis*)
- Latham's snipe (*Gallinago hardwickii*)
- glossy ibis (*Plegadis falcinellus*).

3.1.2 Potential impacts on TECs and listed migratory species

Potential impacts on TECs and migratory species would include:

- land clearance, resulting in the loss and fragmentation of extant vegetation
- habitat removal
- edge effects, such as the introduction and establishment of weeds (weed invasion); alteration to microclimatic conditions (such as greater light intensity, more wind penetration, lower humidity due to vegetation removal); and a reduction in plant health through loss of photosynthetic potential (such as due to dust cover from vehicle movement on unsealed tracks)
- a reduction in the natural regeneration of brigalow regrowth due to continuous livestock grazing and pasture management
- indirect impacts on listed flora, reptiles and mammals due to changes in frequencies and extent of ecological processes (e.g. the squatter pigeon could be indirectly impacted by changed fire regimes)
- increased numbers of pest fauna and flora species due to increased availability of food sources once the project is operational
- potential impacts on EPBC listed koalas include: habitat loss and fragmentation; mortality from dog bites and vehicle strikes; and declines in isolated populations caused by disease and myrtle rust.

Further information about the profile of each of the following threatened ecological communities and listed migratory species likely to be significantly impacted by the proposed action and the nature of the potential impacts of the action to each of those MNES is provided in the attachment to this appendix:

- brigalow TEC
- natural grasslands TEC
- cattle egret
- Latham's snipe
- glossy ibis.

3.1.3 Cumulative impacts on TECs

The proponent considered that there was a potential for cumulative impacts on the brigalow TEC, including:

- clearing from multiple projects would reduce the existing remnant vegetation within the Brigalow Belt bioregion
- clearing has the potential to increase fragmentation and edge effects by creating smaller patches which would be less sustainable for flora and fauna that use these habitats. Species that rely on these habitats could be impacted such as the ornamental snake (*Denisonia maculata*) and Dunmall's snake (*Furina dunmalli*)
- drawdown of groundwater level could modify factors necessary for the Brigalow TEC to persist in the

surrounding landscape.

3.1.4 Proposed mitigation measures

To reduce adverse impacts, the proponent proposed the following measures:

- minimising the disturbance footprint and retaining tracts of vegetation, where possible
- managing non-impacted brigalow TEC (e.g. south of the rail line) to be free from anthropogenic disturbance, so it can contribute to the production of viable seed
- periodic monitoring of isolated remnant vegetation to ensure that species richness does not decline during the life of the project
- non-impacted brigalow regrowth areas within the project area would be allowed to regenerate naturally to increase the overall area of the brigalow community
- clearing of brigalow TEC would only be conducted after the area has been clearly delineated and identified to equipment operators and supervisors and appropriate erosion and sediment control structures are in place
- rehabilitation and revegetation works within the project area would use the most appropriate species for the regeneration of the brigalow community
- developing a weed monitoring program to minimise the establishment and spread of declared pest species
- staff induction would include information about the conservation values within the project area
- a rehabilitation strategy would be developed and include provisions for monitoring rehabilitation progress over the life of the project.

Mitigation measures to minimise project impacts to migratory species include:

- minimising the project footprint to retain intrinsic values of local vegetation and associated fauna habitat
- minimal interference with the movement of any fauna species located during pre-clearing surveys
- staff or contractors carrying out clearing would be made aware of the possible presence of migratory species
- staff induction would include information about migratory species and their management requirements
- final rehabilitation would include restoration of wetland habitat, to support the cattle egret, Latham's snipe and glossy ibis, that may have been impacted by project actions.

3.1.5 Offsets proposed for residual impacts on MNES

The proponent has committed to providing offsets after project approval, but before commencement of project activities. The proponent's preferred option to meet regulatory requirements is to provide a land-based offset via an agreement with an offset broker or provider for the provision of an offset area. The proponent has not quantified the impacts of subsidence to either MNES or MSES values and should any impacts occur to any values within the subsidence area, these would need to be offset accordingly. The proponent is committed to providing the following offsets for significant impacts on MNES:

- 2.76ha of brigalow TEC for which the proponent is prepared to provide an offset of 11.04ha
- 149.43ha of natural grassland TEC for which the proponent is prepared to provide an offset of 587.72ha.

3.1.6 Major issues raised in submissions

In its submission on the EIS, EHP commented that the Queensland Herbarium regional ecosystem mapping indicated there were areas of the natural grasslands TEC mapped within the project area, but the proponent had not undertaken a flora survey at any sites within these mapped areas. Furthermore, during a site visit undertaken during the EIS submission period, an EHP officer sighted key natural grassland species. EHP recommended that the proponent should conduct flora surveys within the natural grassland mapped areas to confirm the extent of the TEC. In response to this issue, the proponent acknowledged that natural grassland areas existed within the project area and agreed that further field surveys would be prudent to identify the extent of the natural grasslands TEC. The proponent committed to conducting the assessment prior to the project development, and to offsetting the full extent of the mapped natural grassland TEC. EHP was satisfied that this would be an acceptable mitigation measure.

3.1.7 Conclusions and recommendations

With the exception of natural grassland TEC, the EIS used adequate studies, survey methods and effort to assess and quantify the potential impacts on threatened species and communities and listed migratory species. The flora surveys within the mapped natural grassland TEC were not adequate. However, the proponent's commitment to offset the impacts to this community satisfactorily addressed any potential impacts of the project on this community.

The following recommendations address the key outstanding issues in relation to threatened species and communities:

Recommendation 1

The proponent should finalise the biodiversity offset strategy consistent with the EPBC Act offsets policy and offset assessment guide. This would include field surveys to confirm the presence of the natural grasslands TEC within the project area and field surveys to confirm that brigalow TEC and natural grassland TEC are present at proposed offset locations and to confirm that the condition and extent of the proposed offset area(s) is sufficient to offset the residual impact to 2.76ha of brigalow and 149.43ha of natural grassland respectively.

Recommendation 2

In line with commitments made by the proponent, EHP recommends that it be a condition of approval that the person(s) undertaking the action for the project must not clear more than:

- 2.76ha of brigalow TEC
- 149.43ha of natural grassland TEC.

Recommendation 3

In order to achieve the best possible conservation outcomes for MNES within the project area, the proponent should communicate the presence of MNES values to background landholders with the purpose of involving them and encouraging management of these values in a manner not inconsistent with the conservation advice, recovery plan and threat abatement plans relevant to each MNES value.

Recommendation 4

It should be a condition of approval that the proponent completes flora surveys before any disturbance for construction of the mine at the site to ensure that impacts on MNES are as described in the EIS and/or as summarised in this report. The surveys should cover areas that would be affected by underground mining as well as open-cut mining, including the associated infrastructure. It should also be a condition of approval that the proponent provides offsets for any residual impacts on species or ecological communities that are covered by the controlling provisions. Before any disturbance for construction, the proponent should report the results of pre-clearing surveys to the Department of the Environment, and state the extent of, and mechanism for delivering, the necessary offsets for residual impacts.

3.2 Water resources

Section 5.7.4 of the EIS contained a stand-alone assessment of the impacts of the project on water resources in relation to sections 24D and 24E of the controlling provisions under the EPBC Act. An assessment of the significance of the potential project impacts on water resources in accordance with the Draft Significant Impact Guidelines: Coal seam gas and large coal mining developments—impacts on water resources (Department of Environment 2013a) was provided in Appendix 26 of the EIS. Additional supporting information about cumulative impacts on water resources was included in section 5.7.5 of the EIS. Measures to mitigate the potential impacts of the project on water resources are outlined in section 5.8.3 of the EIS. Additional supporting information was provided in Appendix 13, Surface water management plan, and Appendix 14, Groundwater impact assessment.

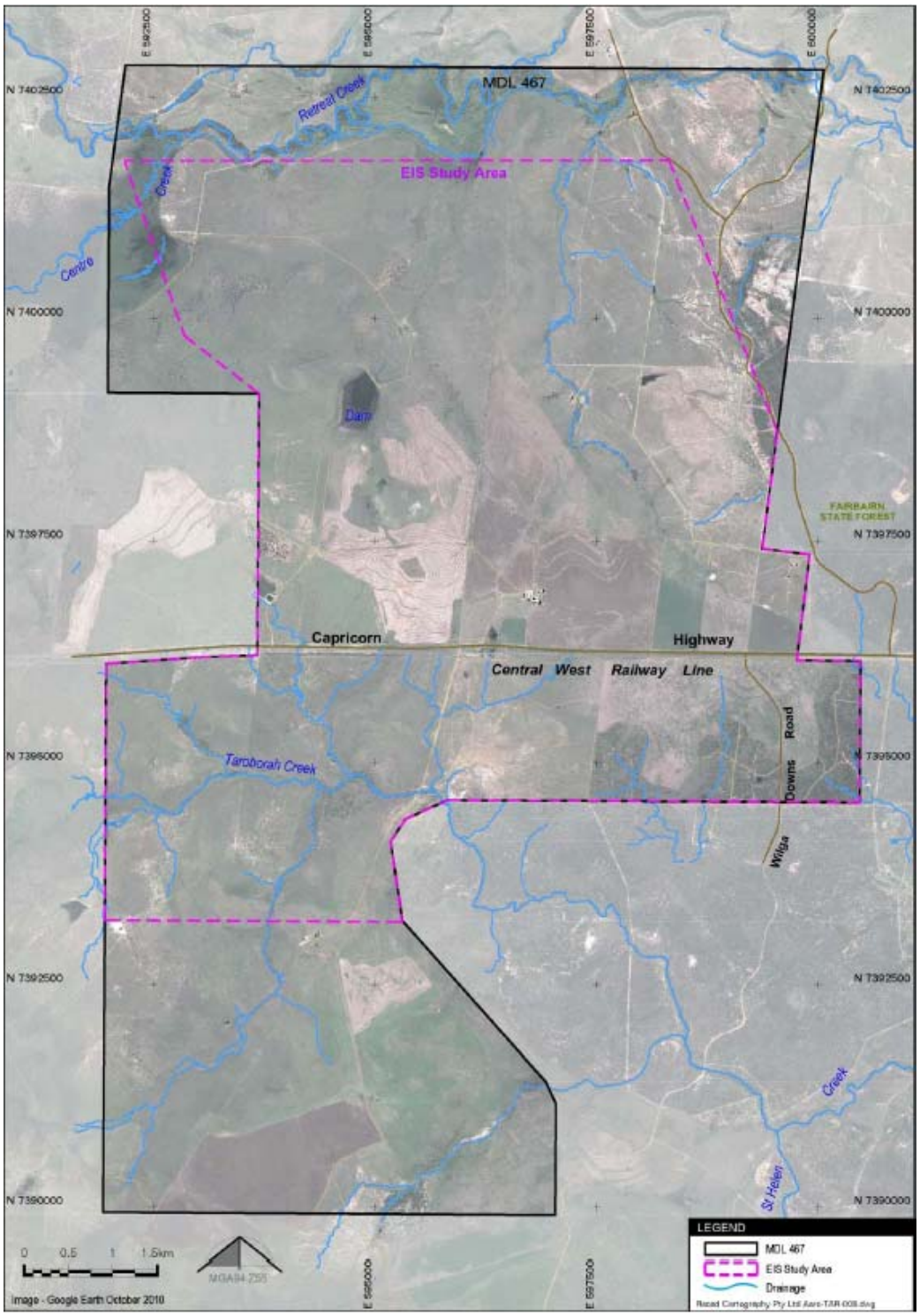
3.2.1 Existing surface water hydrology

The Taroborah Coal Project is located within the Fitzroy River Basin, which has a total catchment area of approximately 142,600km^2. The Taroborah Coal Project is located in the lower Nogoa and Theresa Creek sub-basin. The major drainage features within the project site that are defined as watercourses under the *Water Act 2000* are identified in Figure 3-1 and include the following:

- Retreat Creek, which flows west to east across the north of the project site into Theresa Creek, before joining the Nogoa River
- Centre Creek, which originates to the west of MDL467 and discharges into Retreat Creek in the north-west corner of the project site
- Taroborah Creek, which is located in the south of the project site and flows in an east to south-easterly direction into St. Helens Creek, which then flows into the Nogoa River.

Lake Maraboon and Fairbairn Dam are located 5km to the south of the project site. Lake Maraboon is on the Nogoa River and provides water to approximately 300 irrigators who farm in the Emerald area. However, the Taroborah Coal Project is located downstream of the catchment area for Lake Maraboon, and will not impact on it.

Figure 3-1 Surface water drainage features on the project site



Source: Figure 4.61 of the EIS

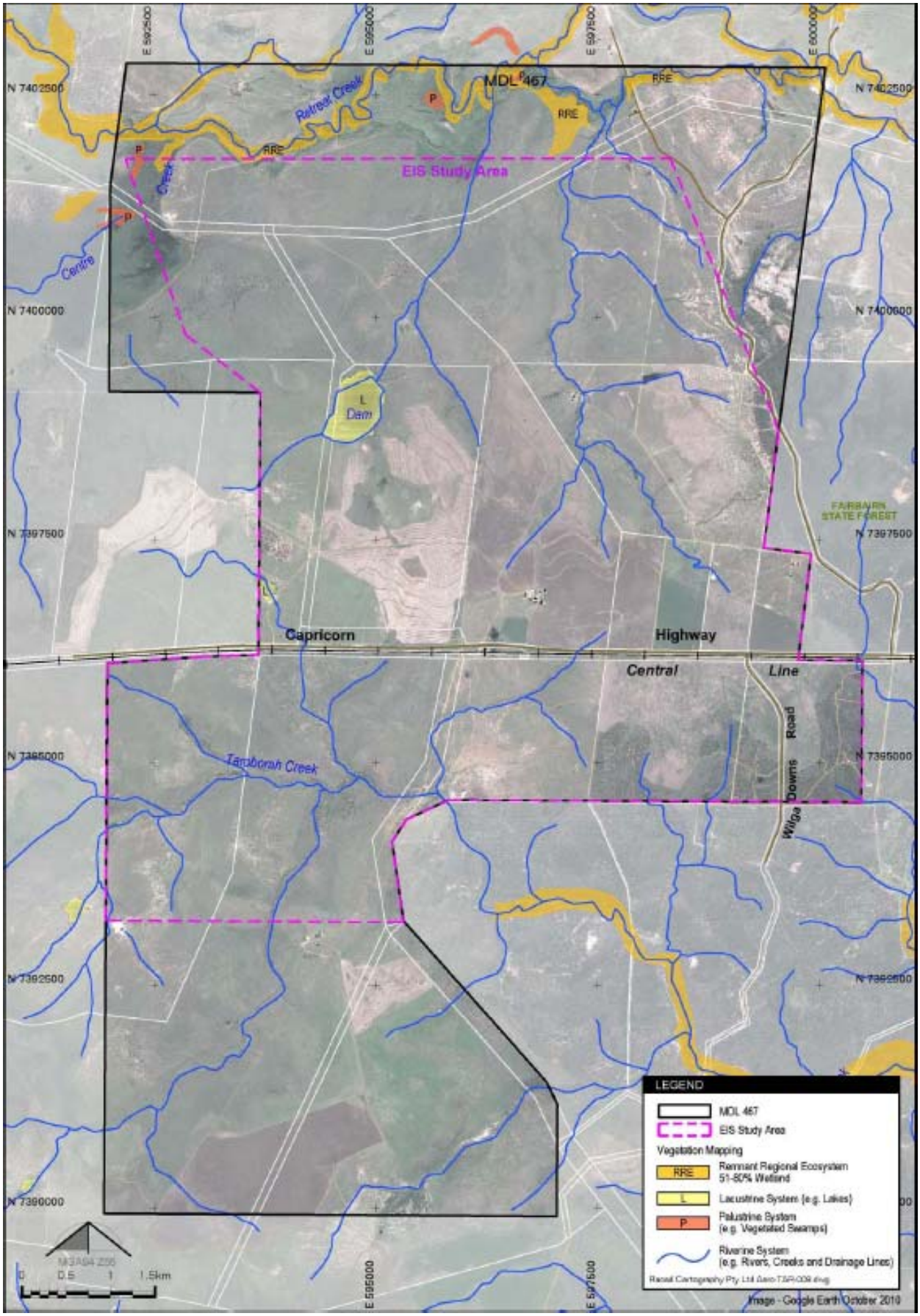
3.2.2 Wetlands

The major wetland features within the project site are highlighted in Figure 3-2 and include the following:

- remnant regional ecosystem (RE) consisting of 51% to 80% wetland along Retreat Creek
- lacustrine dam located in the west central portion of the project site
- limited areas of palustrine wetlands to the north and north-west of the project site.

Wetland systems on the site were assessed to have moderate to good aquatic habitat quality, and were considered to be important as permanent and semi-permanent water sources in a region characterised by ephemeral watercourses.

Figure 3-2 Wetland features of the Taroborah Coal Project site



Source: Figure 4.62 of the EIS

3.2.2.1 Lacustrine wetlands

Two lacustrine wetlands artificially created by dams were identified on the project site. The larger dam in the central west of the project site is the only source of permanent water on-site and is used for agricultural purposes. The dam was found to support substantial and complex habitat for fauna, with little evidence of erosion due to an abundance of vegetation both in and surrounding the dam. This dam was scored as medium under the Aquatic Conservation Assessment (ACA). The smaller dam is located on a drainage line of Taroborah Creek near the Capricorn Highway. This dam was mapped during the field survey, but does not have permanent water and was not scored under the ACA.

3.2.2.2 Palustrine wetlands

One large, ephemeral palustrine wetland was identified in the north-west of the project site, incorporating two smaller palustrine wetlands. The two small palustrine wetlands were scored as medium under the ACA. During the dry season survey, only a small quantity of water was evident. However, the wetland was found to support good aquatic habitat, evidenced by the variation in substrate and cover elements. The banks of the wetland were dominated by grass species.

3.2.2.3 Regional ecosystems associated with wetlands

Some vegetation communities on the project site were noted for their potential to use groundwater. A close association was noted between palustrine wetlands and REs along Retreat Creek in the north of the project site. These REs are considered to be 51%–80% wetland, and typically consists of 190.1ha of river red gum riparian woodland (RE11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines) and 26.2ha of river teatree riparian woodland (RE 11.3.3a riverine wetland or fringing riverine wetland and *Melaleuca bracteata* woodland on alluvial plains). About 117ha of RE11.3.3a in the riparian area of Taroborah Creek was also mapped during the field survey.

While Retreat and Taroborah Creeks are not considered likely to receive surface expressions of groundwater, measured groundwater levels along Retreat and Taroborah Creeks range between 6m–10m below ground level. That depth is shallow enough for deep-rooted vegetation species, such as eucalypt species of RE11.3.25 and RE11.3.3a, to have the potential to access and use the sub-surface groundwater.

3.2.3 Groundwater regime

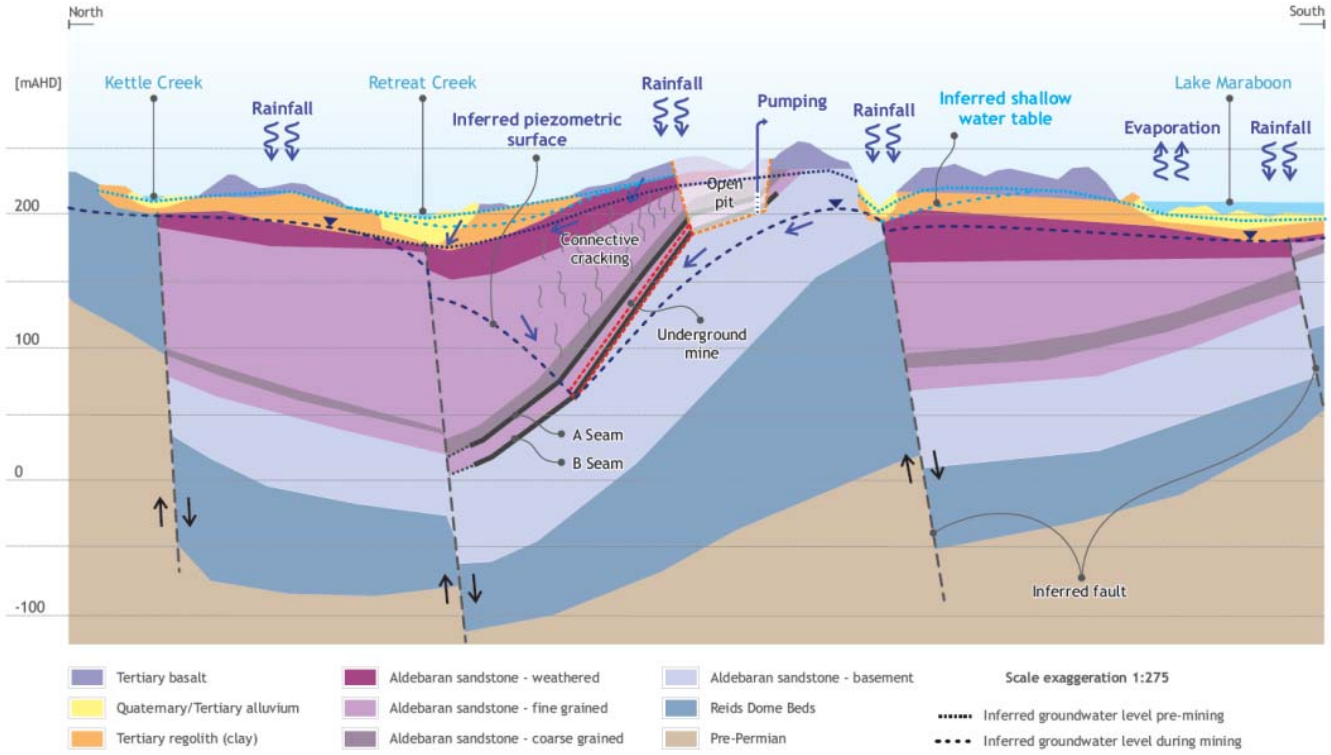
The three major geological units and their characteristics within the project area are described below:

1. Quaternary alluvium consists of a cover, less than 30m thick, of alluvial and colluvial sediments deposited across much of the western and northern portions of the project area. The alluvial cover, where encountered, generally comprises less than 25m of poorly consolidated clays, silts, sands and gravels. The alluvial deposits unconformably overlie Tertiary basalt and sediments. Where the Tertiary geology is absent, the Quaternary alluvium and colluvium directly overlie the Permian Aldebaran sandstone. The typical depth of groundwater in the alluvium is generally less than 10m below ground level. However, no users of alluviual groundwater were identified in the project area. The alluvium is generally a losing system and stored water is likely to discharge as leakage to nearby sub-cropping tertiary and permian units
2. Tertiary basalt and sediments outcrop throughout much of the middle and southern portions of the project area. The occurrence of fresh basalt is sporadic, and where encountered, is generally less than 30m thick. Fresh basalt is generally underlain by highly weathered tertiary clays and sands, and occasional by silts and gravels that range in thickness from 30m to 90m. Furthermore, the weathered clays and sands progressively grade into weathered Permian deposits beneath. Fractured rock aquifers in Tertiary basalts are predominantly used by landholders located to the west of the project area and by one landholder within the project area. Tertiary units are likely to be confined and hydraulically disconnected from the underlying Aldebaran Sandstone. Groundwater flow within the Tertiary is towards the east and north-east within the project area and surrounds, which suggests that the main source of recharge to the Tertiary is from rainfall percolation in the sub-crop areas to the west and south-west of the project area. Discharge from Tertiary sediments is likely to occur as lateral flow down-gradient of the project area. Leakage to underlying units may also occur where impermeable Tertiary clays are absent in the geological profile.
3. Permian Aldebaran sandstone sub-crops throughout the central and northern areas of the project area and is predominantly composed of quartzose sandstone deposited during cyclic marine to fluvial-deltaic environments, and is interbedded with conglomerate, shale, siltstone and coal. Below the base of weathering, strata are dominated by fine to very fine grained sandstones with occasional medium grained horizons deposited during a marine transgression. This fine grained sandstone is up to 150m thick in the northern portion of the project area, but has been removed by erosion in the south, where outcropping granite is present. Groundwater appears to be present under confined conditions throughout the Aldebaran Sandstone. A total of six of the 22 landholder bores identified within 10km of the project area target groundwater within the Aldebaran Sandstone. The main water bearing unit within the project area is the pebbly, coarse grained sandstone that lies directly on top of the

'A' coal seam. Recharge predominantly occurs through more permeable zones within the regolith and tertiary basalt, as well as downward percolation from quaternary alluvium associated with Retreat Creek.

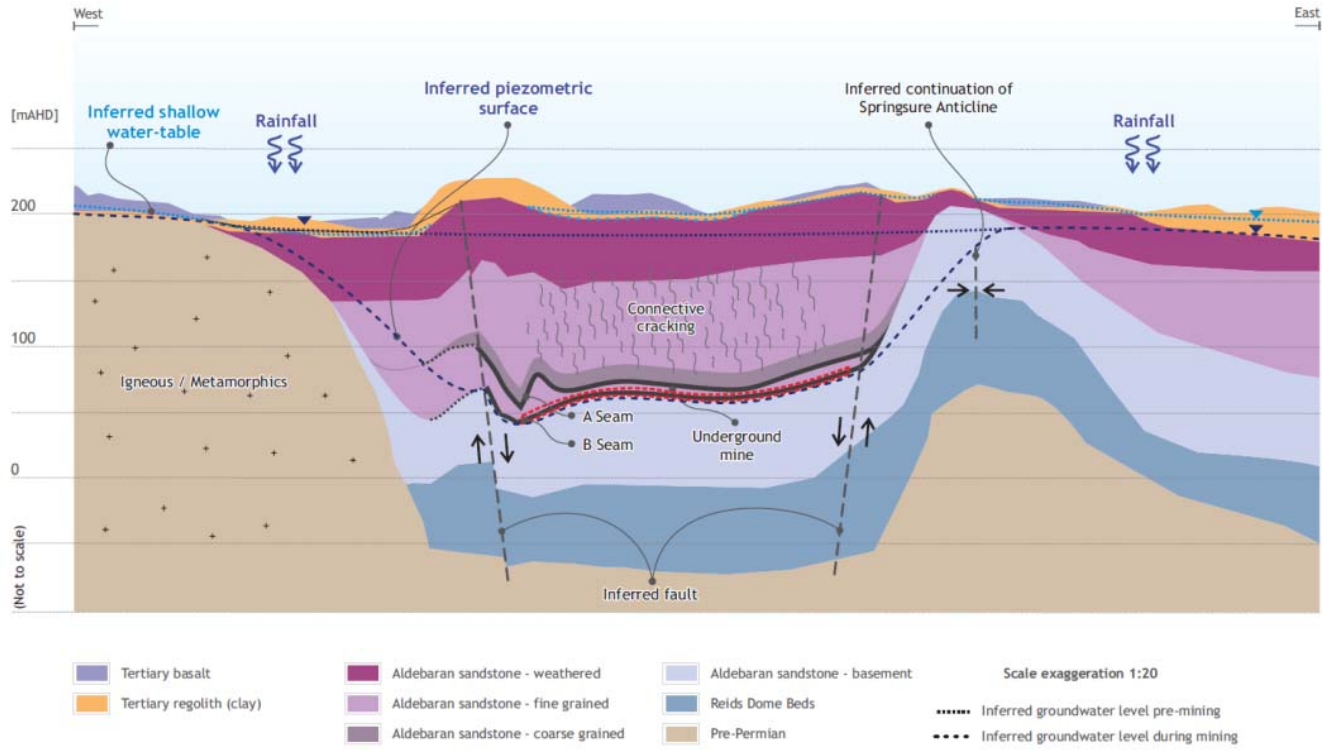
A geological conceptualisation of the groundwater regime in the vicinity of the project is shown in Figures 3-3 and 3-4 below.

Figure 3-3 Conceptual north to south geological cross-section of the project site



Source: Figure 16 of Appendix 14 of the EIS

Figure 3-4 Conceptual west to east geological cross-section of the project site



Source: Figure 17 of Appendix 14 of the EIS

3.2.4 Water quality

3.2.4.1 Surface water quality

Background surface water quality at some locations around the project site was not always below applicable water quality objectives or trigger values.

With regard to salinity levels in Retreat Creek and its tributaries, the average water quality results ranged from 768µS/cm to 2,302µS/cm. With regard to salinity levels in Taroborah Creek and its tributaries, the average water quality results ranged from 988µS/cm to 2,285µS/cm. All salinity results at all sites in Retreat and Taroborah Creeks exceeded the base flow salinity aquatic ecosystem protection water quality objective (WQO) of 340µS/cm for the Lower Nogoa and Theresa Creek sub-basin specified in the Queensland Water Quality Guidelines.

With regard to other physio-chemical parameters in Retreat Creek, the mean pH at one site (9.04) and dissolved oxygen at three sites (74.73%, 57.15% and 72.2%) fell outside the ranges of both the Lower Nogoa and Theresa Creek trigger values and the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of pH 6.5 to 8.5 and 85% to 110% dissolved oxygen. Mean measurements of turbidity (476NTU, 907NTU, 419NTU and 1430NTU) at four sites exceeded the Lower Nogoa and Theresa Creek trigger values of 50NTU. The mean of 1430NTU at one site in Retreat Creek also exceeded the ANZECC (2000) Livestock Drinking Water Guidelines of 1000 NTU. Mean concentrations of total phosphorus (0.17mg/L, 0.31mg/L, 0.19mg/L and 0.11mg/L) at four sites, sulfate at one site (54mg/L), and nitrate at a different site (0.12mg/L) exceeded the Lower Nogoa and Theresa Creek trigger values of 0.05mg/L, 25mg/L and 0.06mg/L respectively.

With regard to heavy metals in Retreat Creek, mean dissolved concentrations of copper (0.002mg/L and 0.003mg/L) and silver (0.00010mg/L and 0.0004mg/L) at two sites, and zinc (0.009mg/L) at one site, exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of 0.0014mg/L, 0.00005mg/L and 0.008mg/L respectively.

With regard to other physio-chemical parameters in Taroborah Creek, the mean pH (8.66 and 8.89) and dissolved oxygen (67.40% and 140.16%) at two sites, fell outside the ranges of both the Lower Nogoa and Theresa Creek trigger values and the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of pH 6.5 to 8.5 and 85% to 110% dissolved oxygen. Mean measurements of turbidity (432NTU and 918.5NTU), nitrite (0.18mg/L and 0.07mg/L), nitrate (1.71mg/L and 0.35mg/L), total nitrogen (0.7mg/L and 4.07mg/L) and total phosphorus (0.10mg/L and 0.75mg/L) at two sites, exceeded the Lower Nogoa and Theresa Creek trigger values of 50NTU, 0.06mg/L, 0.06mg/L, 0.5mg/L and 0.05mg/L respectively. The mean concentration of total phosphorus (0.75mg/L) at one site also exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQO of 0.5mg/L. The mean concentration of sulfate (30.1mg/L) at one site also exceeded the Lower Nogoa and Theresa Creek trigger value of 25mg/L.

With regard to heavy metals in Taroborah Creek, mean dissolved concentrations of copper (0.002mg/L and 0.005mg/L) at two sites, and silver (0.0004mg/L) at one site exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of 0.0014mg/L and 0.00005mg/L respectively.

3.2.4.2 Groundwater quality

Groundwater at the site is slightly brackish. The average recorded values for salinity (measured as conductance) in the Aldebaran sandstone geology are 1,435µS/cm in the course-grained sandstone, 1,765µS/cm in the fine-grained sandstone, and 2,301µS/cm in the coal measures. The average recorded values for salinity in the Tertiary geology are 2,059µS/cm and 1,354µS/cm in the Tertiary regolith and Tertiary basalt respectively. The average recorded values for salinity in the alluvium is 1,430µS/cm. Salinity of the coal seams is comparatively low for the Bowen Basin, which typically ranges from 5,000µS/cm to 50,000µS/cm. The lower salinity in the coal seams is likely related to leakage of fresher groundwater from the immediately overlying pebbly coarse sandstone unit, and from rainfall infiltration where it sub-crops to the south.

A significant number of salinity samples exceeded the 80th percentile limit specified for deep (>30m) groundwater quality objectives for the Nogoa River and all waters of the Nogoa River sub-basin listed under the Environmental Protection (Water) Policy 2009. Major ion exceedences included sodium, calcium, magnesium, bicarbonate, chloride and sulfate. A number of minor ions and metals also exceed the groundwater quality objectives.

Comparison of the data against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000) for irrigation indicates that groundwater collected from most of the monitoring bores is suitable for short term irrigation.

Comparison of the data against the Australian Drinking Water Guidelines 2011 (NRMMC, 2011) (ADWG) show that in general all of the groundwater tested is not suitable for human consumption because it exceeds either the aesthetic or health guidelines. All bores exceeded the ADWG health guidelines for at least two criteria, including total dissolved solids, pH, total hardness, chloride, sodium, sulfate, aluminium, iron, and manganese. All bores exceeded the ADWG aesthetic guidelines for smell, taste, and appearance.

3.2.5 Potential impacts

3.2.5.1 Surface water impacts

The potential impacts of the project on surface water would include the following:

- aquifer dewatering associated with open-cut and underground coal mining activities, thereby creating groundwater drawdown and affecting groundwater and surface water interactions
- permanent alteration (e.g. due to final void and out-of-pit spoil dumps) of the direction and quantity of surface drainage south of the Capricorn Highway
- temporary alteration of the direction and quantity of surface drainage north of the Capricorn Highway due to subsidence of the land surface associated with underground mining.

3.2.5.2 Cumulative surface water impacts

A study conducted by EHP in 2009 investigated the cumulative impacts of mining activities on water quality in the Fitzroy River Basin. The study determined that salinity presents the most significant risk to water quality in the Fitzroy Basin due to discharges from coal mines. The proponent referred to the EHP study in the EIS for the Taroborah Coal Project and concluded that the project would not pose a significant cumulative impact from controlled or uncontrolled releases due to the following reasons:

- the EHP investigation of cumulative surface water impacts found that a number of mines in the northern Isaac-Connors sub-catchment posed the greatest risk of cumulative impacts in the Fitzroy Basin
- the investigation found that all of the mines (with the exception of Ensham mine) in the southern sub-catchments (i.e. Dawson, Nogoa and Mackenzie river systems) posed a low risk to cumulative water quality impacts
- the Taroborah Coal Project would be located in the Nogoa River sub-catchment, which was found by the EHP study to be in a low risk catchment for cumulative surface water impacts
- no operating mines exist upstream of the project and the nearest downstream operating mine is Ensham, which is located 60km to the east
- the EHP's Fitzroy Basin model water conditions would be applied to the environmental authority for the project, and those conditions were specifically developed to prevent the cumulative impacts of multiple mine discharges on the downstream surface water environment
- the Taroborah Coal Project is expected to require controlled discharges of less than 100ML/y with a salinity concentration below 2,500µS/cm.
- discharges would be undertaken in accordance with the model water conditions, which would include minimum flow requirements, discharge limits, and trigger investigation levels developed with regard to the spatial location of the project within the sub-catchment.

3.2.5.3 Groundwater impacts

A three-dimensional numerical simulation of groundwater flow for the project was run for the 21 year life of the mine to, amongst other things, predict the zone of depressurisation in alluvial and other aquifers, and predict changes in the groundwater regime. The model predicts that the Taroborah Coal Project would result in the following impacts:

- an average groundwater inflow rate to mine workings of 2.6 megalitres per day (ML/day), peaking at 5.7ML/day around year 19
- groundwater level drawdown of up to 5m within the alluvium around Retreat Creek
- groundwater level drawdown of up to 30m within the alluvium around Taroborah Creek, with a cone of depression extending up to 3.5km east of the MDL467 boundary
- potential die back of 190.1ha of river red gum riparian woodland (RE11.3.25 *Eucalyptus tereticornis* or *E. cambaldulensis* woodland on fringing drainage lines) in riparian areas of Retreat Creek and 143ha of river teatree riparian woodland (RE11.3.3a riverine wetland or fringing riverine wetland and *Melaleuca bacteata* woodland on alluvial plains) in the riparian areas of Retreat and Taroborah Creeks
- groundwater level drawdown of up to 8.5m in the Tertiary basalt extending up to 3km south of the boundary of MDL467, resulting in a reduction in available drawdown on two known bores of up to 30%
- groundwater level drawdown of up to 30m in the Aldebaran sandstone extending up to 3.5km east of the MDL467 boundary, resulting in a reduction in available drawdown between 3% and 48% on five known bores
- groundwater level recovery of about 70% within 100 years of stopping mine dewatering.

3.2.5.4 Cumulative groundwater impacts

With regard to potential cumulative groundwater impacts, the nearest proposed coal mine is the Teresa Coal Project, which if developed would be located approximately 19km to the north of the Taroborah Coal Project MDL467 boundary. Based on the findings of the EIS for the Teresa Coal Project, the worst-case modelled drawdown is predicted to extend 2.5km to the north and west of the project boundary and 10km to the south and

south-east of the project boundary. Groundwater drawdown for the Taroborah Coal Project is predicted to extend up to 3.5km outside of the project boundary. Given the two project boundaries are approximately 19km apart, there should be no overlap of impacts, and the Teresa and Taroborah Coal Projects may each be considered in isolation rather than having a cumulative impact on the groundwater aquifers.

The Taroborah Coal Project is unlikely to have significant cumulative impact in conjunction with other projects on the ecological integrity of Taroborah or Retreat Creeks. Both of these waterways are ephemeral, flow in an easterly direction and ultimately flow into the Nogoa River, downstream of Fairbairn Dam or Lake Maraboon. The project does not propose water to be dammed, extracted or diverted from these watercourses, and only minimal overland flow that drains to these waterways during the wet season will be temporarily captured in ponds created by subsidence.

3.2.6 Mitigation measures

Measures proposed to mitigate the impacts of the project on surface and groundwater resources include:

- construction activities that affect stormwater flow paths would commence only after suitable stormwater management infrastructure has been established
- clearing of vegetation would be undertaken in a staged manner to minimise the disturbance footprint at any one time
- stabilisation of disturbed areas would be undertaken as soon as practicable after disturbance
- the majority of the current surface water drainage patterns disturbed in open-cut areas would be rehabilitated
- deepening or replacing affected landholder bores, or supplementing landholders with an alternative water supply
- ongoing surface and groundwater monitoring in accordance with the requirements specified in the water management plan for the project.

3.2.7 Independent Expert Scientific Committee (IESC)

When considering the IESC advice, EHP sought assistance from other government departments, including the Department of Natural Resources and Mines (DNRM) and the Department of Science, Information Technology, Innovation and the Arts. The IESC advice on the EIS for the Taroborah Coal Project is available on the IESC website (www.iesc.environment.gov.au/advice/proposals.html). The proponent responded to this advice in the response to submissions, and made amendments to the EIS, including: section 4.5, Water; Appendix 13, Surface water management plan; and Appendix 14, Groundwater impact assessment. The major issues raised in the IESC's advice and the proponent's response to the advice are summarised below.

IESC Issue 1

The extent of groundwater drawdown as a result of the project is uncertain based on the groundwater model conceptualisation presented in the EIS.

Proponent's response to Issue 1

In response to Issue 1, the proponent explained that a conservative approach for developing the groundwater model was used by assuming local continuity of groundwater flow, rather than representing impermeable faults in the model domain. The proponent provided further information about the groundwater conceptualisation that was used to develop the groundwater model and make groundwater drawdown predictions, including the following key points:

- the numerical groundwater model used regional scale faults and structural domains based on referenced and publicly available reports and mapping to provide the basis for the model extent
- a graben (fault bounded) structure in which the coal measures are to be mined was identified during project specific seismic data, detailed exploration drilling, and state government drilling and mapping
- the graben structure was simulated in the groundwater model as a drape feature with hydraulic conductivity on either side of the faults, rather than defining linear fault features as impermeable barriers
- the coal seams were simulated in the model to end where the strata gets shallower to the east and west, based on regional drilling data (see Figure 3-4 above)
- existing transient groundwater level data shows minimal seasonal variation
- once mining commences and mine inflow data from the open-cut pit is available, it will be coupled with transient water level data to conduct a transient calibration of the groundwater model.

EHP sought advice from DNRM in relation to the groundwater model. DNRM advised that the major issues about the groundwater model conceptualisation raised by the IESC have been adequately addressed. However, DNRM recommended that a peer review of the groundwater model should be undertaken. Furthermore, the hydraulic conductivity values used for the coal seams are lower than field measurements and were estimated using only

three permeability tests. Consequently, DNRM recommends that the groundwater model should be reviewed and recalibrated after three years once additional permeability information is available. Refer to the recommendations in section 3.2.9 below.

IESC Issue 2

The representation of subsidence induced fracturing and deformations in the groundwater model are likely to underestimate groundwater flow, groundwater recharge and mine water inflows.

Proponent's response to Issue 2

In response to Issue 2, the proponent provided further information regarding the assumptions made about the vertical extent of fracturing above subsided mine workings, including the likelihood of fracturing within the Tertiary clay/mud units, which were assumed in the groundwater model to act as an aquitard between the Tertiary basalt and Aldebaran sandstone geological units at the Taroborah site. The proponent referred to a number of Australian and overseas studies that support the proponent's height of fracturing assumptions used in the model, including that:

- apart from the typically recognised fractured zone of deformation above subsided mine workings, there also exists an overlying dilated zone, where the strata bend and are subject to bed separation, with limited vertical cracking that does not provide an effective vertical connection to the lower strata (Figure 3-5)
- the dilated zone results in an increase in horizontal permeability and storage capacity of the strata in that zone, but with no resultant increase in vertical permeability
- the filling of the increased storage created in the dilated zone results in only a temporary drawdown of overlying groundwater and pre-mining levels return once the increased storage is filled
- the typical heights of the fractured and dilated zones referred to in relevant studies supports the fracturing height assumptions used in the Taroborah groundwater model
- subsurface fracturing in weak sediments (i.e. mudstones, claystones and weathered siltstones) and clays do not generally form continuous open fractures due to their plasticity and ability to strain without fracturing, and because fractures that do form tend to be self-healing due to swelling from moisture over a relatively short period of time
- the weak Tertiary strata and weathered Permian strata, which include layers of clay and weathered claystone north near Retreat Creek, are not expected to be highly fractured from subsidence where they occur more than 60m to 70m above the mine workings, and will continue to act as an aquiclude to the overlying groundwater and surface waters.

The proponent also conducted a sensitivity analysis, which indicated that the modelling was robust and the areal extent of the 1m drawdown contour does not substantially increase in response to the likely range of input parameters. DNRM was satisfied that the issue raised by the IESC has been adequately addressed.

IESC Issue 3

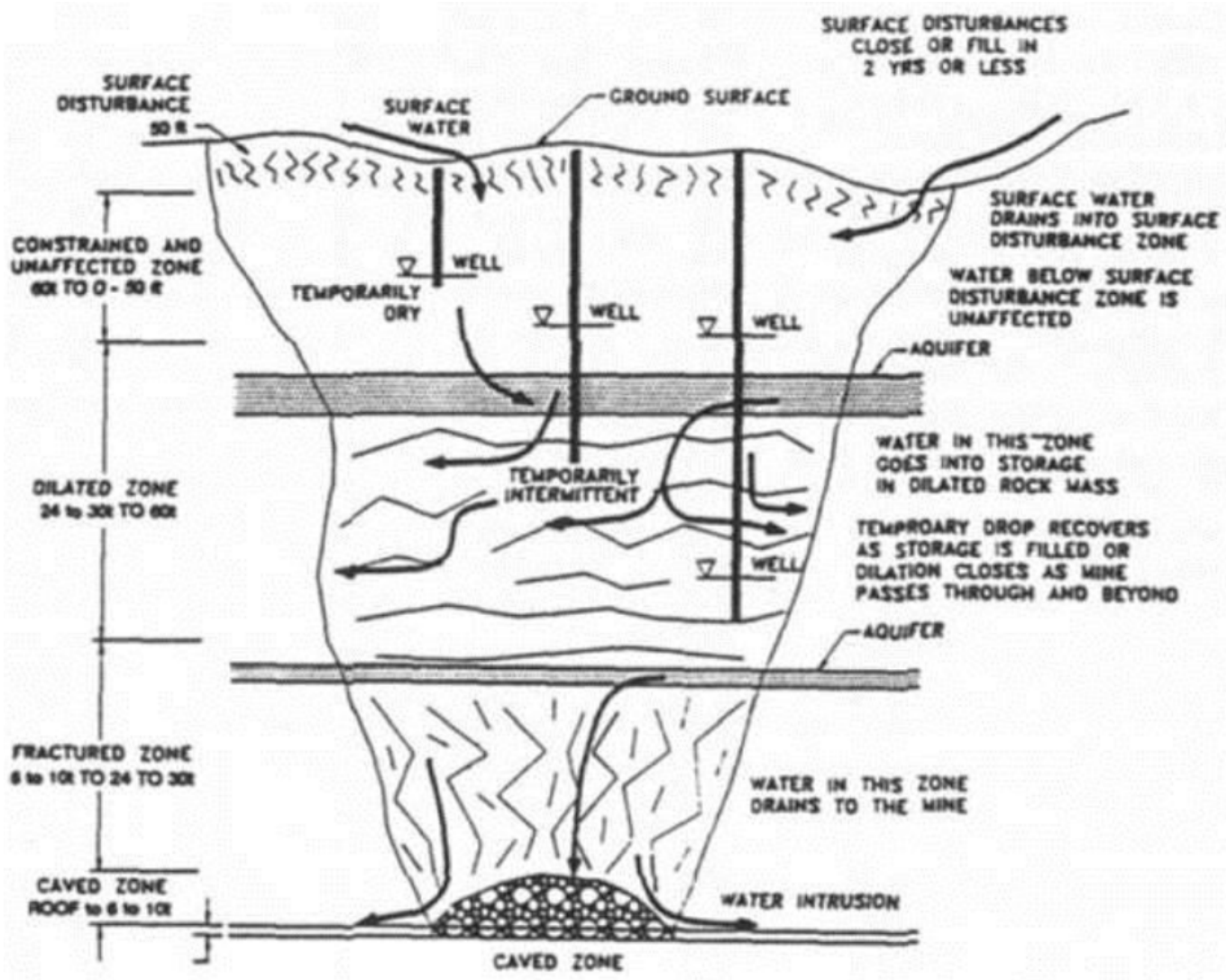
The degree of interaction between surface water and groundwater having regard to seasonal variations is uncertain.

Proponent's response to Issue 3

In response to Issue 3, the proponent referred to recent transient water level data for the site, which indicates that there is no seasonal variation in surface water and groundwater interaction. Therefore, converting the groundwater model to a transient calibration was determined to be unnecessary. The proponent also clarified that the net change on baseflow in streams as a result of mining is predicted to be negligible, and this is supported by the ephemeral nature of the streams on-site which only flow in response to sustained rainfall.

Nevertheless, DNRM advised EHP that a minimum of 12 consecutive months of groundwater level and quality data would be required to support the proponent’s conclusions. Consequently, it would be useful for the proponent to conduct an ongoing transient calibration of the groundwater model, using seasonal groundwater data gathered from recently installed monitoring bores. The calibration would enable the model to predict impacts on, and variations in, seasonal groundwater levels and baseflows to surface water systems. Following commencement of mining, groundwater mine inflow monitoring data should be coupled with transient water level data to conduct a transient calibration of the groundwater model. DNRM recommends that the groundwater model be reviewed and recalibrated no later than 3 years after commencement of dewatering. Refer to the recommendation in section 3.2.9 below.

Figure 3-5 Model of strata behaviour above full-extraction mining panels (Kendorski 1993)



Source: Page 172 of the response to submissions document

IESC Issue 4

The proposed surface water and groundwater monitoring programs are insufficient to provide suitable baseline data.

Proponent's response to Issue 4

In response to Issue 4, the proponent revised the surface water and groundwater monitoring programs as follows:

- a new downstream surface water monitoring location on Taroborah Creek
- new surface water monitoring points for the major lacustrine wetland system and associated palustrine wetland system in the central west of the project site
- a new surface water monitoring point for the palustrine wetland in the north-west of the project site, adjacent to Centre Creek
- a new surface water monitoring point for a potential intermittent spring system that may feed a drainage line into Retreat Creek on which 33.2ha of silver-leafed iron bark (RE11.3.6 *Eucalyptus melanophloia* woodland on alluvial plains) occurs in the central area of the project site
- a commitment to install flow metres on Retreat and Taroborah Creeks to measure flows following rainfall events
- the near-pit groundwater monitoring bores will be included in the ongoing groundwater monitoring program to monitor impacts from open-cut mining
- a commitment to maintain surface water and groundwater monitoring for a further twelve months to provide at least 24 months of baseline monitoring data, prior to the commencement of mining activities
- a commitment to establish site specific surface water and groundwater quality trigger investigation levels, prior to the commencement of mining activities.

EHP considers that the revised surface water monitoring program will address the issues raised by the IESC. The

monitoring program would be suitable to determine existing seasonal flow dynamics and baseflow estimates on Retreat and Taroborah Creeks and would improve the overall suitability of baseline surface water quality data for developing site specific surface water quality trigger investigation levels. The groundwater monitoring network would be suitable to identify any potential quality and quantity impacts on private groundwater bores resulting from mining activities. The surface water and groundwater monitoring programs would be required by conditions in the project EA.

IESC Issue 5

Groundwater dependant ecosystems (GDEs), springs and semi-permanent pools within and surrounding the project area have not been clearly identified, and therefore, the full suite of potential ecological impacts cannot be determined.

Proponent's response to Issue 5

In response to Issue 5, the proponent clarified information about the GDEs, springs and semi-permanent pools found in the vicinity of the project, including:

- a local spring supported by shallow groundwater between 6m to 10m below ground level, feeding the deep-rooted vegetation associated with the silver leaved ironbark open woodland community (RE 11.3.6) within the riparian zone of a drainage line of Retreat Creek
- springs associated with the Great Artesian Basin (GAB) in the catchment areas surrounding the site, none of which are in the immediate vicinity of the project site
- semi-permanent pools on a drainage line feeding Taroborah Creek from the south
- inflow dependent lacustrine wetlands in the central west and west of MDL467
- inflow dependent ecosystem RE 11.3.3a (river teatree riparian woodland) fringing Taroborah Creek.

The proponent included additional monitoring sites for these locations in the surface water monitoring program and committed to using the Australian Groundwater Dependent Ecosystem Toolbox to determine the ecological water requirements of the GDE's in the vicinity of the project.

IESC Issue 6

Drawdown associated with the project poses a risk to private groundwater users.

Proponent's response to Issue 6

In response to Issue 6, the proponent proposed to enter into make good agreements with potentially affected landholders, and either, deepen any affected bores, or provide an alternative supply from the mine dewatering scheme. DNRM would manage the take of groundwater through mine dewatering by including conditions in the water licence that would require the tenure holder to enter into agreements with potentially affected landholders to make good any groundwater supply that is predicted to be unduly affected in the future.

IESC Issue 7

Uncertainties about the site water balance may result in uncontrolled discharges from the site and requirements for supplementary water supplies.

Proponent's response to Issue 7

In response to Issue 7, the proponent provided further information about the data inputs to the site water balance and reiterated that there is expected to be a surplus of water during the life of mining, even in the driest conditions. Uncontrolled discharges from the mine site would be prevented by providing excess site water to local landholders impacted by groundwater drawdown, discharging excess water into the Selma irrigation channel system for use by downstream irrigators, and selling excess water to a third party (subject to agreement) proposing to construct a water supply pipeline from Fairbairn Dam to the Galilee Basin. Matters such as that would be regulated under a water licence.

IESC Issue 8

Predicted groundwater drawdown in the water table of Retreat Creek from the Teresa Coal Project extends into the Taroborah groundwater model domain and should be represented in the groundwater model for the Taroborah Coal Project to predict any cumulative impacts.

Proponent's response to Issue 8

In response to Issue 8, the proponent stated that the drawdown in the water table of Retreat Creek from each mine (3.5km to the north-east from the Taroborah mine, and 10km to the south-west from the Teresa mine) will not interact with each other, due to the 19km distance of separation between the two mines. DNRM noted that the Teresa groundwater model predicts 0.1-0.2m drawdown in the water table of Retreat Creek to the north of the proposed Taroborah mining lease boundary. Drawdowns of this low magnitude at the outer extents of a

groundwater model generally have a lower degree of accuracy and are considered negligible in a modelling sense. Therefore, while the groundwater model for the Teresa Project predicts a contribution of an additional 0.1-0.2m drawdown through the alluvium of Retreat Creek, DNRM is satisfied that this would not contribute to significant cumulative groundwater impacts.

IESC Issue 9

The risk of contaminant enrichment within the final void lakes and potential impacts on water resources has not been assessed.

Proponent's response to issue 9

In response to issue 9, the proponent provided the results of pit water quality modelling over a 100 year period. The model predicted that salinity would gradually increase due to saline inflows of groundwater and the concentration effect of evaporative water loss. However, the concentrations of sulfates, cations and trace elements were not predicted to be toxic to livestock. Importantly, the final void was predicted to be a groundwater sink with flows into rather than out of its pond. Consequently, the level of risk to water resources was assessed to be low. The proponent also committed to preparing a final void management plan, which will be required as a condition of the project EA. Furthermore, a requirement for the proponent to prepare a water management plan would also be included as a condition of the EA. The water management plan must include:

1. a study of the source of contaminants
2. a water balance model for the site
3. a water management system for the site
4. measures to manage and prevent saline drainage
5. measures to manage and prevent acid rock drainage
6. contingency procedures for emergencies
7. a program for monitoring and review of the effectiveness of the water management plan.

3.2.8 Major issues raised in submissions

DNRM and SunWater requested the proponent to provide further information about the proposed beneficial use of excess mine water, including the piping and pumping infrastructure required to transfer water from the mine to the proposed release location in the Selma irrigation channel. In response, the proponent stated that a 100kW pumping station would be installed at the mine site and a 250mm diameter water pipeline capable of transferring up to 5ML/day would be constructed parallel to the Central West railway line. DNRM and SunWater were satisfied with the additional information provided by the proponent, subject to pre-approval consultation with the relevant parties (refer to the recommendation in section 3.2.9 below).

DNRM requested the proponent to provide any additional groundwater monitoring data that was collected after April 2013 (i.e. any new data since the EIS was released for public notification) to identify any trends or seasonal variation in groundwater level and quality, and determine whether the groundwater model requires recalibration. In response, the proponent provided additional data collected in May and September 2014. The proponent's analysis of the data indicated that there were no significant changes in groundwater levels recorded between April 2013 and September 2014, and water quality was generally within 10% of the April 2013 dataset. The proponent concluded that the additional monitoring results indicate that there is little seasonal variation in the groundwater regime, which validates the assumptions used in the groundwater model. However, groundwater quality and levels would continue to be monitored in accordance with the proposed groundwater monitoring program. DNRM did not raise any additional questions in regard to this issue. However, the groundwater model should be reviewed and recalibrated, as discussed in the recommendation in section 3.2.9 of this report.

DNRM requested the proponent to outline any mitigation measures to address the potential impacts of the project on neighbouring groundwater bores. In response, the proponent proposed to enter into make good agreements with potentially affected landholders, and either deepen any affected bores, or provide an alternative supply from the mine dewatering scheme. EHP is of the opinion that the proposed mitigation measures are adequate and are consistent with typical measures to mitigate impacts on neighbouring groundwater users.

3.2.9 Conclusions and recommended conditions

The EIS used adequate studies, survey methodology, and survey effort to assess potential impacts on water resources (sections 24D and 24E of the controlling provisions). The mitigation and management measures proposed by the proponent are considered adequate to manage potential impacts during the life of the project. The proponent’s commitments in the EIS to undertake ongoing monitoring programs during the life of the Taroborah Coal Project are reflected in the recommended draft EA conditions included in Appendix 1 of this report.

The state generally agrees that the water resources issues raised by the IESC are relevant, but is of the opinion that the proponent’s response to the advice adequately addresses the key issues raised by the IESC. The surface

and groundwater monitoring programs proposed to be carried out by the proponent during the life of the project are considered adequate to identify the potential impacts of the project on the surface and groundwater resources. The state's draft EA conditions for the project provided in Appendix 1 of this report include conditions about the ongoing requirements of these monitoring programs. The IESC raised some concerns about the groundwater model conceptualisation and the level of certainty associated with the extent of groundwater drawdown predicted by the model. Consequently, the proponent should be required to commission a peer review of the groundwater model. Furthermore, an ongoing review and recalibration of the groundwater model would increase the level of certainty of the drawdown predictions and help identify groundwater impacts and any indirect impacts on groundwater dependent vegetation communities as mine dewatering progresses. The state's draft EA conditions for the project provided in Appendix 1 of this report include conditions about the peer review and ongoing review and recalibration of the groundwater model. Consequently, there are no additional recommendations for the Commonwealth approval under the EPBC Act with regard to water resources for the project. The potential impacts of the project on GDEs located on and off the project site were not adequately identified in the EIS. Consequently, the state's draft EA conditions for the project provided in Appendix 1 of this report include conditions about identifying the extent of potentially affected GDEs and establishing a monitoring program to identify any impacts. Residual impacts must be offset. Consequently, there are no recommended conditions for water resources.

Attachment

Profile of each threatened ecological community and listed migratory species likely to be significantly impacted by the proposed action

Listed threatened ecological communities (ss. 18 & 18A)

Brigalow (*Acacia harpophylla* dominant and co-dominant)

EPBC Status: Endangered

Recovery Plan: A recovery plan has not been prepared for the Brigalow (*Acacia harpophylla*) dominant and co-dominant ecological community.

Conservation Advice: Approved by the Commonwealth Environment Minister on the 17th December 2013.

Description

The Brigalow ecological community is characterized by the presence of Brigalow (*Acacia harpohylla*) as one of the three most abundance tree species. Brigalow is usually dominant in the tree layer or co-dominant with other species such as *Casuarina cristata (Belah)*, other species of Acacia, or species of Eucalyptus. Occasionally Belah, or species of Acacia or Eucalyptus, may be more common than Brigalow within the broad matrix of Brigalow vegetation. The structure of the vegetation ranges from open forest to open woodland. The height of the tree layer varies from about 9m in low rainfall areas (averaging around 500mm per annum) to around 25m in higher rainfall areas (averaging around 750mm per annum). A prominent shrub layer is usually present.

Brigalow flowers spasmodically and seeds generally remain viable for less than a year with germination and establishment requiring good rainfall during what is traditionally the driest time of the year. Brigalow trees sucker easily from their roots and re-sprout after damage as long as the root stocks remain intact. Brigalow and many of the shrub and tree species associated with Brigalow are capable of re-sprouting after low to moderate intensity fire damage. Brigalow and Belah are tolerant of saline conditions and Brigalow is extremely drought tolerant.

Animal species associated with the Brigalow ecological community rely on a range of attributes in the vegetation for habitat. These include litter and woody debris on the forest floor (especially important for reptiles), tree hollows and pockets under the bark of large trees (roost sites for various birds and mammals, including bats), and mistletoes and other sources of nectar and fruit (food for birds, including Belah seed for the Vulnerable Glossy Black-cockatoo).

Distribution

The Brigalow community has undergone a severe decline in extent due to clearing for agricultural use. At the time of listing under the EPBC Act (April 2001), information supporting the nomination estimated an original extent of 7,324, 560 hectares (7,020,360ha in Queensland and 304,200ha in New South Wales) with approximately 804,264ha (661.314ha in Queensland and 142,950ha in New South Wales) remaining (approximately 10% of original extent).

Listing criteria

The national ecological community is limited to patches that meet the following key diagnostic characteristics and condition thresholds:

The patch must have the following diagnostic characteristics to be considered a Brigalow ecological community:

1. the presence of *Acacia harpophylla* as one of the most abundant tree species in the patch. *A. harpophylla* is either dominant in the tree layer, or co-dominant with other species

And

2. in the Brigalow Belt, meets the description of one of 16 regional ecosystems – Res 11.3.1, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.5.16, 11.9.1, 11.9.6, 11.11.14 and 11.12.21

And/or

3. the vegetation in the patch is brigalow regrowth with species composition and structural elements broadly typical of one of the identified regional ecosystems and at least 15 years since last comprehensively cleared.

With the condition threshold:

1. the patch is 0.5ha or more in size

And

2. the exotic perennial plants comprise less than 50% of the total vegetation cover of the patch, as assessed over a minimum sample area of 0.5ha, representative of the patch.

Conservation Advice Priority recovery and threat abatement actions as stated in the conservation advice approved by the Commonwealth Environment Minister on 17/12/13.

Threat reduction/control

- protect and conserve remnant and regrowth areas of the ecological community. Prevent clearance of this endangered ecological community and of nearby native vegetation including buffer zones and connecting corridors
- where further clearance is unavoidable:
  - mitigate the severity of impacts (e.g. avoid higher quality areas, avoid dissection of patches, act to minimise hydrological disruption and the spread of weeds)
  - offsetting should consider the location and emulate qualities of affected patches.
- manage areas of brigalow to reduce threats, including through:
  - fire management that considers brigalow conservation, protection and ecological heterogeneity; and,
  - targeted weed and feral animal control with a particular focus on high biomass exotic grasses (buffel grass, Rhodes grass, green panic grass) and feral pigs
- manage all weeds appropriately within and close to the Brigalow ecological community; e.g. spot application of herbicides, rather than aerial spraying; avoid fertiliser application; minimise tree thinning and soil disturbance
- manage foxes and cats (as well as feral pigs) using a coordinated approach, preferably among groups of neighbours and across regions
- help woodland birds to avoid aggression from noisy miners by: encouraging and protection shrubby understorey; managing grazing pressure so that it does not degrade native vegetation; and retaining dense stands of trees and regrowth.

Land management

- encourage landholders to balance primary production and the conservation of native flora and fauna within and close to the ecological community. Examples of this are:
  - managing stocking rates Managing stocking rates, paddock numbers/sizes, grazing practices and livestock camp sites to avoid damage to woodland understorey and ground cover – this may include adopting rotational or cell grazing regimes; or, excluding grazing entirely from intact stands of brigalow where appropriate (e.g. unless managing fuel loads through grazing)
  - leaving trees, or clumps of regrowth, in paddocks to maintain connections between patches of native flora and fauna habitat
  - connecting shade-lines to one another and keeping them as wide as possible (ideally more than 100m)
  - avoiding the application of fertiliser, or the aerial/broadscale spraying of herbicides
  - leaving dead trees standing and allowing dead timber and leaf litter to rot where it falls on the ground
- undertake regeneration of high value regrowth sites and revegetation of degraded sites
- increase the area of brigalow ecological community managed for conservation, such as through the reservation of high quality/large areas of remnant or regrowth and by facilitating conservation agreements with landholders
- establish adequate buffer zones to protect remnants
- devise and implement water management, sediment erosion and pollution control and monitoring plans.

Management for wildlife

- undertake management actions that help to increase the diversity of species and their abundance; this requires thinking about habitat use at multiples scales. General management actions that benefit many fauna species include:
  - retaining fallen timber and leaf litter for small mammals and reptiles
  - retaining standing dead trees or old trees with hollow limbs for nesting sites for birds, mammals and reptiles
  - re-introducing microhabitat features (e.g. rocks, logs and other woody debris) to sites disturbed during proposed works
  - discouraging species like noisy miners and introduced predators by maintaining large patches of woodland with complex structure
  - avoiding clearing remnant vegetation; and retaining areas of brigalow regrowth
- encourage woodland regeneration close to areas of existing woodland.

Survey requirements and survey effort

EPBC survey requirements/techniques

- there are no specific guidelines for survey requirements, however this species is identifiable at all times of the

year.

Project Survey effort

- several secondary and quaternary sites vegetation sites were undertaken in both dry and wet season within mapped regional ecosystems that are analogous with the Brigalow TEC. The field data was collected using methodology compatible with the Queensland Herbarium CorVeg database as defined in Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner et al. 2005).

EHP is satisfied with the survey method and effort undertaken for the Brigalow TEC.

Occurrence within project area

Within the project area, Brigalow TEC occurs in the form of three vegetation communities:

- brigalow woodland (RE 11.9.1) of which there is 72.6ha within the project area
- Dawson's gum open woodland (RE11.4.8) of which there is 31.2ha within the project area in the north-west portion of the project area
- brigalow/Belah open woodland (RE 11.4.9) of which there is 8.5ha associated with a drainage line of Taroborah creek and was in a highly disturbed state.

Impacts of the proposed action

Potential impacts associated with the proposed project activities include:

- 2.76ha of brigalow TEC out of a total area of 112.3ha within the project would be cleared
- weed invasion associated with edge effects along the interface of the retained brigalow communities and the project disturbance area would be an indirect impact that would need to be managed
- edge effects could also alter the microclimatic conditions (such as greater light intensity, more wind penetration, lower humidity) and a reduction in plant health through loss of photosynthetic potential (as a result of plants being covered by dust generated from vehicle movement on unsealed tracks)
- loss of habitat could result in a loss of biological diversity (with associated removal of leaf litter, hollow bearing trees, fallen timber and resultant changes to soil biota)
- introduction of additional weed species and spread of weeds on the project area via transport of seeds on vehicles and machinery
- Underground mining north of the Capricorn highway. Underground longwall mining would result in surface subsidence (ponding) and tension cracking. Impacts of surface subsidence are detailed below:
  - the drainage profile could experience subtle changes and result in additional ponded areas
  - some areas of remnant vegetation could be impacted by subsidence-induced ponding, if ponded areas have significant depth (i.e. 1m or greater), this could significantly impact remnant vegetation causing vegetation dieback
  - surface cracking could occur in the subsidence impact area, with the worst case scenario predicting cracks less than 5m deep with a maximum width of 0.2 to 0.3m. While tension cracking itself would not necessarily impact on vegetation, the rehabilitation of cracks would involve remedial earthworks which could impact on vegetation.

Avoidance and mitigation measures

Key mitigation measures proposed by the proponent to address potential impacts to the brigalow TEC include:

- through project planning and design phases, the boundaries of the project area have been redefined since the dry season survey to include a 50m buffer to minimise the area of impact and avoid disturbance to Fairbairn State Forest and the brigalow TEC areas
- ongoing opportunities to further avoid impacts at a local scale through the detailed design process
- vegetation clearing within the project area would be minimised to only those areas required for the project operation
- areas to be cleared would be clearly delineated and identified to equipment operators and supervisors
- weed control measures such as vehicle wash downs would be implemented to prevent the spread of weed species along riparian corridors
- appropriate erosion and sediment-control structures would be put in place
- approval for clearing from environmental staff would be obtained
- suitable sediment and erosion control measures would be implemented to prevent sediment deposition in adjacent retained habitats. Retained vegetation would be protected and maintained throughout the project life to ensure seed availability for mine rehabilitation works
- groundwater reductions could impact the deep-rooted eucalypt trees that grow along both Retreat creek and Taroborah creek in terms of availability of local groundwater for these trees

- subsidence impacts would be mitigated in accordance with a Subsidence Management Plan with mitigation measures to include:
  - subsidence-induced ponding would be mitigated by completion of minor remedial drainage earthworks to re-establish free drainage
  - exact locations of tension cracks confirmed by monitoring with surface cracks rehabilitated using remedial earthworks and use of sealants if required. Rehabilitation of cracks would be managed appropriately to avoid impacts on vegetation. A crack rehabilitation plan would be prepared to guide remediation works on tension cracks whilst minimising impacts on surrounding vegetation. The crack rehabilitation program would be designed to ensure vegetation communities disturbed during repairs to tension cracks would be returned to pre-disturbance condition
- rehabilitation flora species (from species lists of dominant flora of each community) should be appropriate to the landscape elements of the project area. The rehabilitation strategy would include provision for monitoring the progress of rehabilitation progress over the life of the project. Areas to be rehabilitated/stabilised in stages as soon as possible after disturbance to minimise soil erosion. Rehabilitation would aim to restore the impacted vegetation communities and revegetate with local native species to achieve a similar pre-disturbance condition in order to maintain the current regional ecosystem conservation status
- rehabilitated landforms created as a result of the project would be contoured to resemble the original topography – flat to undulating plain.

Residual impact

A residual impact of 2.76ha of brigalow TEC would occur within the project area.

Offset

The proponent has proposed to provide an 11.04ha offset to acquit their impacts on brigalow TEC. The proponent's preferred option for offset delivery is to undertake a proponent-driven offset via an agreement with an offset broker/provider for the provision of the offset area. A desktop assessment by the proponent has indicated that there is 1,625,900ha of suitable offset areas within the brigalow belt bioregion.

Conclusion

The proponent has proposed a number of mitigation and management measures to reduce the level of impact to brigalow TEC and has committed to the disturbance limits for the project, which are reflected in the recommendations for conditions. The proponent must offset the residual impact to the TEC in accordance with the EPBC Act Offsets Policy and this is reflected in the recommendations at the end of the MNES chapter. EHP considers the proposed offset area to be of an adequate size to acquit their offset obligations, however the proponent must demonstrate that a conservation outcome would be achieved.

Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin

EPBC Status: Endangered

Recovery Plan: A recovery plan has not been prepared for this community

Conservation Advice: Approved by the Commonwealth Environment Minister on 15/12/08

Description

The Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin threatened ecological community (Natural grasslands TEC) are native grasslands typically composed of perennial native grasses. The grasslands usually occur on flat ground or gently undulating rises with fine-grained, cracking clay soils that are often deep and dark in colour, although soils may be shallower on ridges or sloping land. The soils are derived from basalt or fine-grained sedimentary rocks, or where this material has been transported to form extensive alluvial plains along ancient and flood-prone watercourses.

The Natural grasslands TEC is mostly dominated by bluegrass (*Dichanthium sericeum*). Tropical three-awned grasses (*Aristida* species) and panic grasses (*Panicum* species) are also a major part of the grasslands. Drier sites may have more Mitchell grasses (*Astrebla* species). Native perennial grass indicator species for this community are *Aristida leptopoda*, *Astrebla elymoides*, *Astrebla squarrosa*, *Eriochloa crebra*, *Panicum queenslandicum*, *Thellungia advena*, *Aristida latifolia*, *Astrebla lappacea*, *Bothriocloa erianthoides*, *Dichanthium sericeum*, *Panicum decompositum* and *Paspalidium globoideum*. Shrubs are typically sparse. However, in some areas the cover of shrubs, (such as sally wattle (*Acacia salicina*) and mimosa (*Acacia farnesiana*)) can be more extensive.

These tussock grasslands are considered to be one of the most threatened ecosystems in Australia. They continue to be threatened by conversion of native pastures to improved pastures, cropping and overgrazing by stock. The grasslands provide habitat for threatened species such as king bluegrass (*Dichanthium queenslandicum*).

Distribution

This ecological community occurs entirely within Queensland within the Brigalow Belt North and Brigalow Belt South IBRA bioregions and within the Fitzroy Basin, Burdekin, South West Qld, Border Rivers Maranoa-Balonne and Desert Channels Natural Resource Management regions. It extends from Collinsville in the north to Carnarvon National Park in the south.

Listing criteria

For a grassland community to qualify as the listed community, it has to contain the following key diagnostics and meet certain condition thresholds:

- the grassland has to occur in one of the following subregions of the northern Brigalow Belt bioregion, namely the Northern Bowen Basin, the Anakie Inlier, the Basalt Downs, the Isaac-Comet Downs, the Nebo-Connors Range and the South Drummond Basin
- trees need to be absent or sparse such that the projective foliage cover of trees is less than 10%
- to be of best quality, the grassland patch size must be at least 1ha, there must be at least 4 perennial native grass indicator species present, the total projective foliage cover of shrubs must be less than 30%, and perennial non-woody introduced species must make up less than 5% of the total perennial projective foliage cover
- for the ecological community to be present and considered to be of good quality, the patch size needs to be at least 5ha, there needs to be at least 3 perennial native grass indicator species present, the total projective cover of shrubs less than 50%, and the perennial non-woody introduced species must make up less than 30% of the total perennial projective foliage cover.

Conservation advice priority actions

The priority recovery and threat abatement actions required for the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin ecological community (as stated in the conservation advice approved by the Commonwealth Environment Minister on 15/12/08) are identified below:

Habitat loss, disturbance and modification

- monitor known occurrences to identify key threats or the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary
- identify occurrences of high conservation priority
- undertake survey work in potential habitat to locate remnants
- avoid mowing and slashing during peak flowering season from spring to summer
- ensure chemicals or other mechanisms used to eradicate weeds do not have a significant adverse impact on the ecological community
- ensure road widening and maintenance activities (or other infrastructure or development activities) in areas where the ecological community occurs minimise adverse impacts on known sites
- investigate and implement formal conservation arrangements such as the use of covenants, conservation agreements or inclusion in reserve tenure.

Invasive weeds

- develop and implement management plans for the eradication of weeds such as Parthenium (*Parthenium hysterophorus*), Parkinsonia (*Parkinsonia aculeata*), Prickly Acacia (*Acacia nilotica subsp. indica*) and Buffel Grass (*Cenchrus ciliaris*)
- manage sites to prevent introduction of invasive weeds, which could become a threat to the ecological community, using appropriate methods
- observe appropriate State protocols to avoid the spread of weeds. Implement good hygiene measures for mowing and grading equipment and take appropriate steps to avoid dispersing seeds when moving stock
- maintaining a good cover of native perennial grasses and spelling the grasslands from grazing are reliable methods of managing the risk of weed invasion.

Trampling, browsing or grazing

- grazing management should focus on maintaining a good cover of perennial grasses and legumes, especially the most palatable species and carrying vegetation cover through the driest years
- develop and implement a stock management plan for roadside verges and travelling stock routes
- manage known sites on private property to ensure appropriate cattle and sheep grazing regimes are conducted outside the growing season, i.e. when plants are not fertile
- provide and/or promote incentives for good management
- where possible, use an intermittent grazing regime in preference to burning. Avoid burning (or grazing or slashing) during peak flowering season (spring to summer).

Animal predation or competition

- develop and implement management plans for the control of the House Mouse (*Mus spp*.).

Survey requirements and survey effort

EPBC survey requirements/techniques

- sites must be assessed during a good season, within two months of cessation of disturbance (fire/grazing/mowing/slashing) and within two months of effective rainfall.

Project survey effort

- several secondary and quaternary sites vegetation sites were undertaken in both dry and wet season within mapped regional ecosystems that are analogous with the Natural Grasslands TEC. The field data was collected using methodology compatible with the Queensland Herbarium CorVeg database as defined in Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Neldner et al. 2005).

EHP is satisfied with the survey methodology, however noted that no survey was undertaken in an area of RE11.8.11 within the proposed mine pit area.

Occurrence within the project area

678.1ha of RE 11.8.11 which is analogous to the Natural Grassland TEC is mapped within the project area (as per the Queensland Herbarium certified regional ecosystem mapping). Some of this area is within the subsidence are and some within the area that coincides with the proposed open-cut pit and infrastructure area. Insufficient ground-truthing of the natural grassland TEC areas was undertaken during vegetation surveys to determine whether it meet the threshold conditions to be deemed Natural Grassland TEC.

Impacts of the proposed action

Potential impacts associated with the proposed project activities include:

- the majority of the natural grassland (RE11.8.11), located in the western portion of the open-cut pit and spoil pile area, will be impacted as a result of construction of these facilities. An area of 149.43ha of natural grassland TEC will be impacted
- edge effect resulting from proposed works could include the introduction and establishment of weeds, alteration of microclimatic conditions (such as greater light intensity, more wind penetration, lower humidity) and a reduction in plant health through loss of photosynthetic potential (as a result of plants being covered by dust generated from vehicle movement on unsealed tracks
- loss of habitat could result in a loss of biological diversity (associated with removal of leaf litter, hollow bearing trees, fallen timber and resultant changes to soil biota)
- land clearing could increase soil erosion, inadvertently causing silting or sedimentation of riverine habitats and waterholes downstream. Soil erosion could also trigger a loss of nutrients to one area, with disruption of natural nutrient cycling
- introduction of additional weed species and spread of weeds within the project area via transport of weeds on vehicles and machinery
- underground mining north of the Capricorn highway. Underground longwall mining would result in surface subsidence (ponding) and tension cracking within natural grassland areas in the subsidence area. Impacts of surface subsidence are detailed below:
  - the drainage profile could experience subtle changes and result in additional ponded areas
  - some areas of remnant vegetation could be impacted by subsidence-induced ponding, if ponded areas have significant depth (i.e. 1m or greater), this could significantly impact remnant vegetation causing vegetation dieback
  - surface cracking could occur in the subsidence impact area, with the worst case scenario predicting cracks less than 5m deep with a maximum width of 0.2 to 0.3m. While tension cracking itself would not necessarily impact on vegetation, the rehabilitation of cracks would involve remedial earthworks which could impact on vegetation.

Avoidance and mitigation measures

Key mitigation measures proposed by the proponent to address potential impacts to the Natural Grassland TEC include:

- vegetation clearing within the project area would be minimised so that only the areas required for the operation of the project are disturbed
- native vegetation removal would only occur after:
  - clearing areas would be clearly delineated and identified to equipment operators and supervisors

  - weed control measures such as vehicle wash-down would be implemented to prevent weed species spreading along riparian corridors
  - appropriate erosion and sediment-control structures would be in place
  - clearing permission attained from environmental staff
- suitable sediment and erosion control measures would be implemented to prevent sediment deposition in adjacent retained habitats. All retained areas of remnant vegetation would be protected and maintained for the life of the project to ensure seed availability for mine rehabilitation works
- flora species used for rehabilitation would be appropriate to the landscape of the project area and consistent with community descriptions
- landforms would be created and contoured to resemble the original local topography
- staff induction program would incorporate information on the conservation values of the project area and its surrounding areas to increase staff awareness. This information would include photographs, descriptions and the management requirements for known conservation values
- progressive rehabilitation of disturbed areas would occur as soon as possible to minimise soil erosion and the length of time land is altered from its pre-mining condition. Rehabilitation aims to restore native vegetation so that it is capable of supporting low intensity cattle grazing
- subsidence impacts would be mitigated in accordance with a Subsidence Management Plan with mitigation measures to include:
- subsidence-induced ponding would be mitigated by completion of minor remedial drainage earthworks to re-establish free drainage
- exact locations of tension cracks confirmed by monitoring with surface cracks rehabilitated using remedial earthworks and use of sealants if required. Rehabilitation of cracks would be managed appropriately to avoid impacts on vegetation. A crack rehabilitation plan would be prepared to guide remediation works on tension cracks whilst minimising impacts on surrounding vegetation. The crack rehabilitation program would be designed to ensure vegetation communities disturbed during repairs to tension cracks would be returned to pre-disturbance condition.

Residual impact

A residual impact of 149.43 ha of natural grassland TEC would impacted by the proposed action.

Offset

While the proponent has not ground-truthed the area of natural grassland TEC to be impacted, they are prepared to offset this area should its threshold condition not be verified in the field. In the Environmental Offset Strategy presented as part of the SEIS the proponent presents 597.72ha of natural grassland offset area (the impact area x relevant multiplier (4) as per the Queensland EOA) and from a desktop assessment has detailed that 219,688ha of suitable offset areas are available within the Brigalow Belt bioregion. The proponent's preferred offset delivery option is to undertake a proponent-driven offset via an agreement with an offset broker/provider, for the provision of an offset area.

Conclusion

The proponent has proposed a number of mitigation and management measures to reduce the level of impact to the ecological community Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin and committed to disturbance limits for the project, reflected in the recommendations below. The proponent must offset residual significant impacts to the natural grassland TEC in accordance with the EPBC Act Offsets Policy; this is reflected in the recommendations for conditions.

EHP is of the view that the proposed action will not have an unacceptable impact on the listed threatened ecological community Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin.

Ultimately the threshold condition of the natural grassland TEC area to be impacted needs to be assessed as to its ecological condition, firstly to establish whether it is necessary to offset and then to input this condition value into the EPBC offsets calculator. EHP supports the provision of an offset four times the area of impact as suitable to acquit the offset requirements should an offset be required.

Listed migratory species (sections 20 & 20A)

Australia provides critical non-breeding habitat for millions of migratory waterbirds each year. To ensure their conservation, the Australian Government has fostered international cooperation through a range of important agreements, including the Ramsar Convention and the Convention on Migratory Species, bilateral agreements with Japan, China and the Republic of Korea, and through the recently launched East Asian — Australasian Flyway Partnership. A range of important activities have also been undertaken within Australia to conserve migratory waterbird populations and their habitats.

Migratory waterbirds include species such as plovers, sandpipers, stints, curlews and snipe. These birds make round trip migrations of up to 26,000 km each year between their breeding grounds in the northern hemisphere and their non-breeding areas in the south. These trips are made in several weeks, with brief stops at staging sites along the way to rest and refuel for the next leg of their journey.

The corridor through which these waterbirds migrate is known as the East Asian - Australasian Flyway (the Flyway). It extends from within the Arctic Circle, through East and South-east Asia, to Australia and New Zealand. Stretching across 22 countries, it is one of eight major waterbird flyways recognised around the globe.

Wetland habitat loss and degradation is a significant threat to migratory waterbirds, and the conservation of important sites across the Flyway is essential to their survival. Many pressures are contributing to this degradation, of which population growth and economic development in East and South East Asia are of particular concern.

The proponent identified the following migratory species as potentially present within the project area:

- magpie goose (*Aneseranas semipalmata*)
- fork-tailed swift (*Apus pacificus*)
- great egret (*Ardea alba*)
- cattle egret (*Adrea ibis*)
- Latham's snipe (*Gallinago hardwickii*)
- white-bellied sea eagle (*Haliaeetus leucogaster*)
- white-throated needletail (*Hiraundapus caudacutus*)
- rainbow bee-eater (*Merops ornatus*)
- black-faced monarch (*Monarcha melanopsis*)
- satin flycatcher (*Myiagra cyanoleuca*)
- Australian cotton pygmy-goose (*Nettapus coromandelianus albipennis*)
- Australian painted snipe (*Rostratula australis*).

The following migratory bird species, were observed or had been recorded previously within the project area:

- cattle egret (*Adrea ibis*)
- Latham's snipe (*Gallinago hardwickii*)
- glossy ibis (*Plegadis falcinellus*)
- Australian painted snipe (*Rostratula australis*).

Migratory wetland birds

The cattle egret, Latham's snipe, Australian painted snipe and glossy ibis inhabit permanent and ephemeral wetlands throughout the majority of Australia. These species utilises habitat which includes freshwater wetlands with dense vegetation such as swamps, flooded grasslands or heathlands. These species are known to inhabit broader habitat range which include disturbed habitat such as farm dams, agricultural lands and sewage treatment ponds.

Distribution

The cattle egret, Latham's Snipe, Australian painted snipe and glossy ibis inhabit permanent and ephemeral wetlands throughout the majority of Australia. Cattle egret is widespread and common. Latham's snipe is mainly confined to eastern Australia. The Australian painted snipe is most common in eastern Australia, where it has been recorded at scattered locations throughout much of Queensland. The glossy ibis is known to breed in the Channel Country.

Survey requirements and survey effort

EPBC Act survey requirements/techniques

Wetland birds vary in their conspicuousness depending on lifestyle and time of the year. Generally, species that frequent open water will be conspicuous and easily detected throughout the day. Others that inhabit dense vegetation in wetlands and on the margins of water-bodies will often be difficult to sight, and detection will usually rely on call recognition or flushing. In general, calls will be most frequent in the early morning but are also strongly dependent on time of year. Currently, three wetland species are listed as threatened under the EPBC Act.

Broadcast surveys in suitable habitat for solicited call responses and sightings. Broadcast stations may be established at wetland edges to avoid damage to wetland vegetation. Stations should usually be at least 250m apart.

Observations of targeted foraging habitat within wetlands in the early morning or early evening are recommended. Wetland birds are detected by sightings and unsolicited calls.

Area searches in suitable habitat for sightings, nests, indicative footprints and feathers.

Project survey effort

A dedicated search for diurnal birds was conducted visually and aurally on mornings and afternoons of the survey in the immediate vicinity of each fauna transect. Additionally, opportunistic diurnal searches were conducted in areas considered likely to have high avian diversity such as vegetated creek lines and dams.

Occurrence within the project area

Both Latham's snipe and the glossy ibis were located during aquatic field survey at a large lacustrine dam within the project area, but the dam is not considered important habitat for either species due to the widespread distribution of the species and alternative suitable habitat throughout Australia. The cattle egret was located at fauna survey site four located in the north-western corner of the project area.

Impacts of the proposed action

Potential impacts associated with the proposed project activities include:

- habitat loss and habitat degradation. Where habitat is retained, degradation from adjacent works could result in a loss of habitat quality through secondary effects such as sedimentation
- edge effects such as the introduction of pest and weed species could result in the degradation of habitat. Additionally, noise and light may result in the displacement of individuals
- land clearing activities could increase soil erosion, inadvertently causing silting or sedimentation of riverine habitats and waterholes downstream. Soil erosion could trigger a loss of nutrients to one area, causing a disruption of natural nutrient cycling
- processing and mining activities in the project area could contaminate riverine habitats and waterholes downstream.

Avoidance and mitigation measures

Key mitigation measures proposed by the proponent to address potential impacts to the listed migratory birds include:

- minimisation of the proposed disturbance footprint in order to retain the intrinsic values of local native vegetation and associated fauna habitat
- prior to disturbance, vegetation would be surveyed to identify any fauna that may be present in order to minimise impacts on fauna communities. If any fauna is present, the fauna would be given the opportunity to move away naturally prior to clearing. Staff or contractors responsible for land clearing would be made aware of the possible presence of migratory species
- staff induction programme would contain information on the project area's conservation values in order to increase staff awareness of the potential presence of the migratory species;
- photographs, descriptions and the management requirements for any migratory species encountered within the project area would be developed as part of the conservation induction package
- final rehabilitation would include the restoration of wetland habitat to support cattle egret, Latham's snipe and glossy ibis, which may have been impacted by project actions.

Conclusion

The proponent has concluded that given the protection of potential habitat for listed migratory species through the project's minimisation of impact to wetland habitat and proposed pre-clearance surveys, the project is unlikely to have a significant impact on any important populations of listed migratory species.

The migratory species that have been detected on site are all highly mobile species which may visit periodically. The project footprint does not include significant or locally uncommon habitat values and these species are therefore unlikely to utilise the site for breeding purposes. While individuals may occasionally visit the project site, it is considered unlikely that the habitat on-site would represent important habitat; or that a population would be dependent on the project area.

EHP is of the view that the proposed action is unlikely to have a significant impact on any population of listed migratory species.