

**Environmental Impact Statement (EIS)  
Assessment Report under the  
*Environmental Protection Act 1994***

Boundary Hill South project proposed by Anglo Coal  
(Callide Management) Pty Ltd, a wholly owned  
subsidiary of Anglo American Metallurgical Coal Pty Ltd

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

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# 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 Boundary Hill South project proposed by Anglo Coal (Callide Management) Pty Ltd.

The Department of Environment and Heritage Protection (EHP) coordinated the EIS process as the administering authority of the EP Act. This 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 the EIS assessment report. The criteria are:

- a. the final terms of reference (TOR) for the EIS
- b. the submitted EIS (refer to section 3.3.6)
- c. all properly made submissions and any submissions accepted by the chief executive (refer to section 3.3.7)
- d. the standard criteria (refer to section 3.3.8)
- e. another matter prescribed under a regulation

For criterion a, the final TOR were issued to the proponent on 18 October 2012, and have been considered when preparing this EIS assessment report (refer to section 4).

For criterion e, 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 (this is addressed in section 4 of this report)
- b. address the adequacy of any environmental management plan (EM plan)
- c. make recommendations about the suitability of the project (this is addressed in section 6 of this report)
- d. recommend any conditions on which any approval required for the project may be given (this is addressed in section 7 and Appendix A of this report)
- e. contain another matter prescribed under a regulation

For item b, as the amendment application for the project's environmental authority was made before commencement of the Greentape Reduction legislation, a satisfactory EM plan is required to be prepared for the project that meets the content requirements of section 203 of the EP Act as it applied before 31 March 2013. Section 5 of this report addresses the EM plan's adequacy.

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 submissions

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 and the places affected by the project. Appendix B of this report describes MNES likely to be affected by the project, and also provides a summary of feasible alternatives to the project and their likely impact on MNES. The project's relevant impacts and feasible mitigation measures or changes to the project are discussed throughout section 4 of this report. The Commonwealth 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 Boundary Hill South project under section 60 of the EP Act.

## **2 Project details**

### **2.1 Project description**

The proponent for the project is Anglo Coal (Callide Management) Pty Ltd, a wholly owned subsidiary of Anglo American Metallurgical Coal Pty Ltd (Anglo American).

The proponent operates the Callide Mine, located in the Callide Basin of Central Queensland, approximately 20km north of Biloela and 85km south-west of Gladstone. The Callide Mine consists of two mining areas: the Southern pits and the Boundary Hill pit. The existing Boundary Hill pit is located about 500m north of the proposed Boundary Hill South area, while the Southern pits are located about 6km to the south east.

The existing Boundary Hill pit has a limited life with resources expected to be exhausted by about 2016. The project would enable the continuation of the current mining rate of approximately 2.9 million tonnes a year (Mt/y) of run of mine (ROM) coal, which would contribute to the Callide Mine total output of about 8.5Mt/y of ROM coal.

The project would be situated on land adjacent to the current pit described as: Part Lot 1 SP231268, Part Lot 94 RN1524; and Part Lot 134 RN417. The project is located within mining lease application (MLA) 80186 and comprises an area of 630 hectares (ha). Approximately 477ha of MLA80186 would be subject to disturbance by mining operations, including topsoil storage, pits and overburden emplacements.

A 275kV high voltage transmission line and associated easement (approximately 120m wide) adjoins the eastern boundary of the proposed mining lease. The Callide Timber Reserve area (TR170 on plan FTY1843), which is located north east of the project area and adjoins the power easement, is a Timber Reserve under the *Forestry Act 1959*. The southern limit of the proposed mining operations would be located approximately 1.2km to the north of the Kilburnie Homestead on Argoon Road.

Construction would occur over approximately six months, involving approximately 25 contractors for the realignment of Inverness Road, the development of the central box cut and the construction of additional temporary mine infrastructure. Open cut operations would progress east and west of the boxcut. The pit is expected to operate for 20 years.

The operational workforce would not increase with the project, as employees would be moved from existing operations to commence construction and operation of the project. The operational workforce would average approximately 180 permanent employees per year.

The proposed project would be mined by conventional open-cut methods using a walking dragline supported by a hydraulic excavator and truck pre-strip fleet. Overburden removal would involve the use of multiple draglines and truck and shovel pre-stripping. Initial overburden would be stored at Boundary Hill pit in the first few years, in order to set up dumping cycles at the project site. As the open cut pit develops and progresses, overburden would be placed in the western extent of the pit.



A hydraulic excavator would be used to load coal into rear dump trucks for transport to either the ROM stockpile located adjacent to the Boundary Hill South pit, or to the existing Boundary Hill ROM area. All coal would be crushed and screened at the Boundary Hill coal handling preparation (CHP) area. The product coal does not require washing prior to sale, therefore rejects and tailings would not be produced by the mine. Product coal would continue to be loaded at the rail load out facilities adjacent to the existing Boundary Hill pit, and railed via Aurizon's existing Moura rail system to the Callide and Gladstone power stations for electricity generation, and to the Gladstone Port for export.

Activities associated with the project would include:

- development of open-cut coal mining operations
- construction of a haul road north from the open-cut pit to the existing Boundary Hill residual void and the CHP area
- construction of a new overburden dump area to the west of the pit
- topsoil stockpile situated between two anabranches of Campbell (Gate) Creek, to the north of the pit
- additional temporary mine infrastructure, such as crib rooms and amenities
- realignment of Inverness Road, with a drain diversion and a flood protection levee to the east of the proposed pit and outside the proposed ML
- a flood protection levee to the south west of the pit.

The open cut pit would extend over 390ha and to a depth of approximately 300m at its deepest point along the final highwall. As the open cut mining area progresses along the dip of the target coal seams, it would intersect several geological units including the unsaturated Biloela Formation and the saturated Precipice Sandstone and Callide Coal Measures.

Mining operations would result in the ingress of groundwater, requiring the workings to be pumped out. The water from the pit would be pumped to Lake Gasteen. Dewatering would result in the water table being drawn down to pit floor level and a reduction of water pressure occurring in surrounding rock units beyond the limit of mining excavation.

Disturbed land would be progressively rehabilitated. This would generally involve backfilling mine voids where possible, re-contouring spoil dumps, respreading stockpiled topsoil, and revegetating disturbed areas. At completion of mining, a final void would remain, which is expected to gradually fill up with water, and become a void lake.

### 3 The EIS Process

#### 3.1 Timeline of the EIS process

Table 3.1 outlines the stages, timing and actions undertaken in the EIS assessment process for the project.

**Table 3.1 The key steps undertaken during the Boundary Hill South Project EIS process**

Step in the EIS process	Section of EP Act	Responsibility for taking step	Statutory due date	Date completed
Proponent submitted an application for a voluntary EIS, but not draft terms of reference (TOR), for the proposed Boundary Hill South project.	ss. 70 & 71	Proponent	N/A	18/08/2011
EHP approved the voluntary EIS application for the project, and issued a notice about the decision to the proponent.	s. 72	EHP	15/09/2011	2/09/2011

Step in the EIS process	Section of EP Act	Responsibility for taking step	Statutory due date	Date completed
The Australian Government declared the project to be a controlled action under the <i>Environment Protection and Biodiversity Conservation Act 1999</i> .	N/A	Australian Government	N/A	23/05/12
EIS process commenced when the proponent submitted draft TOR for the project, accompanied by the fee prescribed under the EP Reg.	ss. 41(1) & 41(2)	Proponent	N/A	25/05/12
Proponent submitted an environmental authority (EA) amendment application to incorporate the proposed ML80186 into the existing EA for the Callide Mine.	s. 238	Proponent	N/A	8/06/2012
EHP gave the TOR notice to the proponent, which set the comment period at 30 business days.	ss. 42(1) & 42(2)	EHP	18/06/12	18/06/12
EHP published the TOR notice in The Central Telegraph, The Courier Mail, and The Australian, to meet statutory publishing requirements.	s. 43(1)	EHP	23/06/12	22/06/12
EHP decided that an EIS was required for the EA amendment application. This decision effectively replaced the voluntary EIS decision.	s. 248	EHP	27/07/12	27/07/12
The draft TOR comment period started on 25 June 2012 and ended on 3 August 2012.	s. 42(3)	N/A	25/06/2012 to 3/08/12	3/08/12
EHP gave the proponent eighteen sets of comments received during the comment period, including comments from EHP and the Australian Government.	s. 44	EHP	20/08/12	20/08/12
The proponent responded to the comments on the draft TOR. The time to provide a response had been extended by agreement from 17 to 20 September 2012.	s. 45 (and s. 11 of the EP Reg)	Proponent	20/09/12	20/09/12
EHP considered the proponent's response, produced the final TOR, and gave a copy of the final TOR to the proponent on 17 October 2012. The TOR notice was published in The Courier Mail and The Australian on Saturday 20 October 2012, and in the Biloela Central Telegraph on 19 October 2012.	s. 46	EHP	19/10/12	19/10/12
The proponent submitted the EIS to EHP.	s. 47	Proponent	17/10/14	8/11/13
EHP advised the proponent that there were matters the EIS had not adequately addressed. On 5 December 2013, in order to give the proponent time to revise the EIS, the proponent and EHP agreed on a longer period for deciding whether the EIS was suitable to proceed. The new date for the decision was set at 30 April 2014	s. 13 of the EP Reg.	EHP and proponent	5/12/13	5/12/13
The proponent submitted a revised EIS on 3 February 2014. On 28 February 2014, EHP decided that the EIS was suitable to proceed.	ss. 49(1) and 49(2)	EHP	30/04/14	28/02/14
EHP gave the proponent a notice of decision that the EIS was suitable to proceed to public notification, and that the submission period would be 30 business days.	ss. 49(3) to 49(5)	EHP	14/03/2014	28/02/14

Step in the EIS process	Section of EP Act	Responsibility for taking step	Statutory due date	Date completed
The proponent gave a copy of the EIS notice to interested and affected persons.	s. 51(2)(a)	Proponent	28/03/14	11/03/14
The proponent published the EIS notice in The Australian, The Courier- Mail and the Biloela Central Telegraph. EHP published the notice on the department's website.	s. 51(2)(b), (and s. 8 of the EP Reg.)	Proponent	28/03/14	14/03/14
The proponent gave EHP a declaration of compliance stating that a copy of the EIS notice had been given to interested and affected persons, and that the EIS notice had been published in appropriate newspapers.	s. 53	Proponent	31/03/2014	27/03/2014
The EIS submission period started on 17 March 2014 and ended on 30 April 2014.	s. 52(2)	N/A	17/03/2014 to 30/04/2014	30/04/2014
EHP forwarded to the proponent 30 submissions about the submitted EIS that were received and accepted during the submission period. EHP also provided a submission on the EIS to the proponent.	ss. 55 & 56(1)	EHP	14/05/2014	12/05/2014
On the 5 June 2014, the proponent and EHP agreed a longer period for submitting a response to submissions. On 12 September 2014, they agreed a further extension until 20 March 2015. On 25 February 2015, the proponent submitted a response to submissions and EIS Addendum. EHP gave a copy of the documents to those government agencies and landholders who provided a submission on the EIS.	ss. 56(2) & 56(3)	Proponent	20/03/2014	25/02/2015
On 25 March 2015, EHP advised the proponent that there were matters the EIS had not adequately addressed. Consequently, on 25 March 2015, 29 May 2015, 31 July 2015, 8 September 2015 and 8 October 2015, the proponent requested extensions to the period for making the s. 56A decision, so that they could provide the outstanding information. EHP agreed to all requests for extensions, and the last date for making the s. 56A decision was agreed to be 6 November 2015.	ss. 56A(2) & 555	Proponent	28/10/15	8/10/2015
The proponent revised their response to submissions and EIS Addendum, and submitted them to EHP on 9 October 2015. EHP gave the revised document to relevant government agencies and landholders for their review and comment.	ss. 56A(2)	Proponent	6/11/15	9/10/2015
On 5 November 2015, EHP advised the proponent that there were outstanding issues that the EIS still needed to address. That day, the proponent requested an extension until 4 December 2015 of the period for making the s. 56A decision, then again on 1 December 2015 they requested a further extension until 11 December 2015, and finally on 10 December 2015 they requested another extension until 4 March 2016. EHP agreed to all the requests for extensions.	ss. 56A(2) & 555	Proponent	11/12/15	10/12/15

Step in the EIS process	Section of EP Act	Responsibility for taking step	Statutory due date	Date completed
On the 18 December 2015, the proponent submitted a partially revised response to submissions and EIS Addendum, which did not address outstanding issues related to ecology. Then on 25 February 2016, they completed their response to submissions with a report that addressed ecological matters of national environmental significance.	ss. 56A(2)	Proponent	4/03/16	25/02/16
EHP considered the submitted EIS and the proponent's response to submissions and decided to allow the EIS to proceed under division 5 (EIS assessment report) and division 6 (completion of process).	ss. 56A(1) to 56A(3)	EHP	4/03/16	4/03/16
EHP issued to the proponent a notice of the decision to proceed.	s. 56(A)(4)	EHP	18/03/16	10/03/16
EHP completed the EIS assessment report and gave a copy to the proponent completing the EIS process	ss. 57 to 60	EHP	26/04/16	20/04/16

## 3.2 Approvals

The necessary approvals for the project are summarised in Table 3.2.

**Table 3.2 Approvals required for the Boundary Hill South 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.	EPBC Act (Department of the Environment (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)	The project will require an amendment of the existing environmental authority.
Grant of mining lease	<i>Mineral Resources Act 1989</i> (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.
Dewatering of groundwater from the pit will require a water licence in accordance with the Water Resource (Fitzroy Basin) Plan 2011.	<i>Water Act 2000</i> (DNRM)	Following completion of the EIS process, the proponent would apply to DNRM for a water licence, and/or a water permit.
Clearing permit	<i>Nature Conservation Act 1992</i> (EHP)	Where the project is clearing any listed plants protected under the <i>Nature Conservation Act 1992</i> .
Operational works permit for the realignment of Inverness Road	<i>Sustainable Planning Act 2009</i> (Banana Shire Council)	An operational works development permit for the road realignment outside the mining lease has been approved by Council in May 2015.

Approval	Legislation (Administering Authority)	Detail
Waterway barrier permit	<i>Fisheries Act 1994</i> (DAF)	Any waterway barrier works outside the mining lease will require an approval.
Cultural heritage management plan (CHMP)	<i>Aboriginal Cultural Heritage Act 2003</i> (EHP)	A CHMP has been approved by EHP on 2 August 2011.

### 3.2.1 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 63-2(b)(ii) - Sewage treatment
- ERA 31-2(b) - Mineral processing

## 3.3 Consultation program

### 3.3.1 Public consultation

In addition to the statutory requirements for advertising of the TOR and EIS notices and the mailing of the notices to interested and affected parties, the proponent undertook community consultation with members of the public and other stakeholders during the public submission period of the EIS.

### 3.3.2 Advisory Body

EHP invited the following organisations to assist in the development of the TOR and assessment of the EIS by participating as members of the advisory body for the project:

- Aurizon Holdings Limited
- Banana Shire Council
- Capricorn Conservation Council
- the former Department of Aboriginal and Torres Strait Islander and Multicultural Affairs, now the Department of Aboriginal and Torres Strait Islander Partnerships
- the former Department of Agriculture, Fisheries and Forestry, now the Department of Agriculture and Fisheries
- Department of Communities, Child Safety and Disability Services
- the former Department of Education, Training and Employment, now the Department of Education and Training
- Department of Energy and Water Supply
- Department of Housing and Public Works
- Department of Justice and Attorney-General
- Department of Local Government, Community Recovery and Resilience
- the former Department of National Parks, Recreation, Sport and Racing, now the Department of National Parks, Sport and Racing
- Department of Natural Resources and Mines
- the former Department of Science, Information Technology, Innovation and the Arts, now the Department of Science, Information Technology and Innovation

- the former Department of State Development, Infrastructure and Planning, now the Department of State Development and the Department of Infrastructure, Local Government and Planning
- Commonwealth Department of the Environment
- Department of Tourism, Major Events, Small Business and the Commonwealth Games
- Department of Transport and Main Roads
- Fitzroy Basin Association
- Powerlink Queensland
- Queensland Ambulance Service
- Queensland Health
- Queensland Police Service
- Queensland Treasury and Trade

An advisory body briefing for the project was held in Brisbane on Friday 4 April 2014, and a site visit was held on 8 April 2014 during the EIS public submission period.

### **3.3.3 Public notification**

In accordance with the statutory requirements, advertisements were placed in The Courier Mail, The Australian and the Biloela Central Telegraph Newspaper to notify the availability of the draft TOR and EIS for review and public comment as stated in section 3.1 of this EIS assessment report. In addition, EHP's website displayed notices advising the availability of the draft TOR and submitted EIS for public comment.

The draft TOR and submitted EIS were placed on public display at the following locations during their respective public comment and submission periods:

- EHP website (draft TOR only)
- EHP office, level 2, 209 Bolsover Street, Rockhampton
- Banana Shire Library, 71 Grevillea Street, Biloela
- Anglo American Metallurgical Coal Pty Ltd, website and Ground floor, 201 Charlotte Street, Brisbane.

### **3.3.4 Matters considered in the EIS assessment report**

Section 58 of the EP Act requires, when preparing this EIS assessment report, the consideration of the following matters:

- the final TOR for the EIS
- the submitted EIS
- all properly made submissions and any other submissions accepted by the chief executive
- the standard criteria
- another matter prescribed under a regulation.

These matters are addressed in the following subsections.

### **3.3.5 The final TOR**

The final TOR document, issued on 18 October 2012, was considered when preparing this EIS assessment report. While the TOR were written to include all the major issues associated with the project that were required to be addressed in the EIS, they were not exhaustive, nor were they intended to exclude all other matters from consideration.

Where matters outside of those listed in the final TOR were addressed in the EIS, those matters have been considered when preparing this EIS assessment report.

### **3.3.6 The submitted EIS**

The “submitted EIS” was considered when preparing this EIS assessment report. The “submitted EIS” comprised:

- the EIS that was made available for public submissions from 17 March to 30 April 2014
- the Response to Public Submissions and EIS Addendum, received by EHP on 25 February 2015
- the Response to Public Submission and an EIS Addendum - Round 2, received by EHP on 9 October 2015
- the Response to Public Submission and an EIS Addendum - Round 3, received by EHP on 18 December 2015
- Round 3 Response to EHP’s and DOTE’s submissions on Matters of National Environmental Significance Fauna Species, received by EHP on 25 February 2016.

### **3.3.7 Properly made submissions**

EHP received 29 submissions on the submitted EIS within the submission period and one submission after the submission period ended. All 30 of the submissions were accepted under section 55 of the EP Act. Those 30 submissions were received from 11 members of the public and the following stakeholders:

- Aurizon
- Banana Shire Council
- Capricorn Conservation Council
- Department Aboriginal and Torres Strait Islander Partnerships
- Department of Agriculture and Fisheries
- Department of Education and Training
- Department of Energy and Water Supply
- Department of Housing and Public Works
- Department of National Parks, Sport and Racing
- Department of Natural Resources and Mines
- Department of the Environment
- Department of Tourism, Major Events, Small Business and the Commonwealth Games
- Department of Transport and Main Roads
- Ergon Energy
- Independent Expert Scientific Committee
- Powerlink
- Queensland Ambulance Service
- Queensland Police Service
- Department of State Development

EHP provided its own submission on the EIS to the proponent.

In addition, there has been correspondence from stakeholders regarding the proponent’s response to submissions on the EIS and supplementary information. All submissions and other comments made by stakeholders on the EIS documents were considered when preparing this EIS assessment report.

### **3.3.8 The standard criteria**

Section 58 of the EP Act requires that, among other matters, the standard criteria listed in Schedule 4 of the EP Act must be considered when preparing an EIS assessment report. EHP has considered the standard criteria when preparing this report.

### **3.3.9 *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)***

The project was referred to the Commonwealth Environment Minister for a decision on whether assessment and approval is required under the Australian Government *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). On 23 May 2012 the delegate of the Commonwealth Environment Minister determined the project to be a controlled action pursuant to section 75 of the EPBC Act. The relevant controlling provisions for the project are:

- sections 18 and 18A (Listed threatened species and ecological communities)
- sections 20 and 20A (Listed migratory species).

On 12 October 2012, a variation to the referral was made to amend the project name from 'Boundary Hill extension project' to 'Boundary Hill South project'. Also, the variation was to amend the reference to the mining lease application for the project from MLA80121 to the smaller MLA80186. On 20 November 2012 the delegate of the Commonwealth Environment Minister accepted the variation to the proposal in accordance with section 156B of the EPBC Act.

In June 2013, the EPBC Act was amended to include a new matter of national environmental significance in relation to impacts of coal seam gas development and large coal mining development on water resources (the water trigger) under sections 24D and 24E. As a result of this amendment, the Commonwealth Environment Minister determined on 17 October 2013 that the water trigger was also a controlling provision for the Boundary Hill South project.

The EIS process for the project was accredited under the 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).

Appendix A of this EIS assessment report includes an assessment of MNES. 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.



## 4 Adequacy of the EIS in addressing the final TOR

Table 4.1 lists the main aspects of the project addressed in the submitted EIS and highlights the significant issues associated with those aspects. The table notes whether the submitted EIS adequately addressed the matters described in the final TOR. The subsections of this chapter enlarge on some of those significant issues, discuss the findings of the EIS in regard to them and outline the environmental protection commitments made by the proponent.

**Table 4.1 Summary of the adequacy of the submitted EIS in addressing the final TOR**

Matters included in the final TOR	Significant issues	Were issues adequately addressed in the submitted EIS?
Introduction	Overview of the project, its objectives and scope. Outline of the necessary approvals and their assessment processes.	Yes to all
Project need and alternatives	Project justification and any alternatives.	Yes
Project description	Location of the project in the regional and local contexts. Description of the construction phase of the project. Description of the operational phase of the project.	Yes to all
Climate	Climatic conditions at the site	Yes
Land	Topography Land use Geology & geomorphology Coal and other resources Soils and land suitability Land disturbance Land contamination Landscape character and visual amenity.	Yes to all
Transport	Description of existing infrastructure & values Potential impacts & mitigation measures	Yes to all
Waste	Waste rock Regulated and other waste	Yes to all
Water resources	Surface watercourses and overland flow Groundwater	Yes to all
Air quality	Dust Greenhouse gases Other air emissions	Yes to all
Noise and vibration	Noise at sensitive receptors Vibration due to blasting	Yes to all

Matters included in the final TOR	Significant issues	Were issues adequately addressed in the submitted EIS?
Nature conservation	Terrestrial plants Terrestrial animals Aquatic ecology Groundwater dependent ecosystems	Yes to all
Cultural heritage	Indigenous cultural heritage Non-indigenous cultural heritage	Yes to all
Social issues	Impacts on local community, housing and services	Yes
Health and safety	Air and water emissions. Road haulage and traffic regimes	Yes to all
Economy	Alienation of grazing land Effects on the local and regional economy Effects on the state economy	Yes to all
Hazard and risk	Unplanned discharges to air, water or land Transportation, storage and use of hazardous substances Emergency response	Yes to all
Matters of national environmental significance	Assess direct and indirect impacts on matters covered by controlling provisions Mitigation measures	Yes to all
Rehabilitation and decommissioning	Rehabilitation of areas affected by mining activities	Yes to all

## 4.1 Introduction

The EIS provided an adequate introduction to the project, its objectives and scope. It adequately identified the necessary approvals required for the project and outlined the assessment and approval processes.

## 4.2 Project need and alternatives

The project aims to extend mining operations at Callide Mine, which supplies coal to the Callide Power Station. Continued operations would in turn extend the mine's contribution to the local, regional, state and national economies through royalties, taxes, charges and wages. In addition, the project would help sustain employment and create opportunities for small business, regional development and investment.

The EIS adequately discussed alternatives for the project, including:

- Alternative coal extraction methods:** underground coal mining was not considered feasible for extracting coal in seams shallower than 100m below surface level due to poor ground stability and the economics of underground mining. Also, alternative open cut mining methods were considered. These included different pit location and orientation, alternative pit geometrics (strip width) and mining sequence, and mining of the target seams using various combinations of excavators, haul truck and dragline. However, the geology and existing equipment fleet at Boundary Hill operation are advantageous to the mining methods chosen for the project.

- **Mine layout:** a number of design options were considered for the project. The preferred mine layout in the proposed mining lease has been designed to consider the potential impacts from the mining activity to surrounding sensitive receptors and reduce impacts to MNES, including:
  - revising the proposed mining lease boundary to include a one kilometre setback from the Argoon Kilburnie Road to minimise potential impacts to sensitive receptors
  - removing the Timber Reserve area situated north of the powerline easement from the proposed mining lease, as it is habitat for the threatened species listed under EPBC Act
  - maximising the use of adjacent infrastructure, and using mostly existing haul roads to minimise impacts on vegetation communities
  - reducing the total mine footprint to disturb the minimum amount of ecological communities found in and adjacent to the mining lease, while still making coal extraction feasible.
- **Rehabilitation:** out-of-pit dumping of spoil would be minimised by maximising in-pit dumping.

### 4.3 Project description

The EIS adequately described the location, scope and phases of the project. An outline of the project is provided in section 2 of this report.

### 4.4 Climate

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

The project area has a hot to warm subhumid climate. Rainfall occurs predominantly during summer, and the averaged medium rainfall is 489mm per year. The highest average maximum daily temperature is 33.6°C in summer, and the lowest average minimum daily temperature is 5.5°C in winter.

Prevailing winds are east and south east between January and April, moving to the south and south east between May and August, then north and north east from September to December.

### 4.5 Land

The EIS adequately described those aspects of the site and project related to the existing and proposed qualities and characteristics of the land. The following subsections address those qualities and characteristics in more detail.

#### 4.5.1 Topography

The project area has a gently undulating topography that progressively rises to the east. The land immediately to the north has been extensively disturbed and modified by the existing Boundary Hill Mine. The land around the site is undulating to hilly with low ridges associated with a range of hills to the east and north-east.

The project area comprises of approximately 630ha, of which about 485ha would be disturbed by mining. The residual impacts on existing topography would include the following features:

- a final void approximately 1300m long, 1600m wide and 120m deep
- an overburden dump area to the west of the mined area that will be about 2400m long, 110m wide and 80m high
- realignment of Inverness Road (approximately five kilometres long and 25m wide), including a water diversion levee
- construction of the southern extension levee.

Haul roads north from the project area that would be used to transport overburden will be decommissioned when mining is completed.

The mitigation of impacts on topography will include the following measures:

- progressive backfilling behind the advancing open-cut pits to integrate project landforms with the existing topography
- progressive rehabilitation of mining areas, including respreading topsoil, and capping erosion prone spoil
- decommissioning and removing project infrastructure at the end of mine life.

#### **4.5.2 Geology and geomorphology**

The project is located within the Callide Basin, which is a fault bounded synclinal basin of Middle to Upper Triassic age. The Callide Basin is approximately 22km long and 8km wide, and is aligned generally along a north-west to south-east axis.

The geology of the project area includes the following strata:

- Quaternary alluvium associated with creeks
- Biloela Formation
- Precipice Sandstone
- Callide Coal Measures
- Triassic Muncon basement volcanics.

The Callide Coal Measures are the primary resource of economic significance at the Boundary Hill operation.

#### **4.5.3 Resource utilisation**

The Boundary Hill South Pit will mine the seams of the Callide Coal Measures. The EIS estimated the probable reserves at 55Mt of run-of-mine (ROM) coal.

The proponent is continuing exploration and evaluation to further define the resources within the project area.

The seams are relatively shallow, and best mined by open-cut methods rather than underground mining.

No petroleum tenures overlap with the site, and the possibility of future development of petroleum production there is considered negligible.

#### **4.5.4 Land use**

Land uses in and around the project area include:

- the existing Callide Mine
- power generation at Callide Power Station
- cattle grazing on native and improved pastures
- dry land cropping
- native forests
- a local government landfill.

#### **4.5.5 Land suitability**

The EIS undertook an assessment of the land suitability for broadacre or dryland cropping, and cattle grazing on improved pastures, for soils across the project area. The assessment was based on Queensland Government's draft Guideline for agricultural land evaluation in Queensland (2nd edn., 2013). The findings were as follows:

- Cropping: All land situated within the project area is presently unsuitable for broadacre or dryland cropping. Land across the project area has been identified as mostly marginal land that is presently unsuitable for cropping (Class 4), or land that will always be unsuitable for cropping (Class 5)

- Grazing: The project area is predominantly marginal land with severe limitations for grazing (Class 4) with smaller areas of suitable land with moderate limitations (Class 3) mostly near the middle of the site. There are also patches of land that is unsuitable (Class 5) in the north and west of the project area.

Under the Banana Shire Council's Planning Scheme, the majority of the project area is Class C2 pasture land, which is suitable for grazing native pastures with or without the addition of pasture species. In addition, an area of Class B limited crop land extends across Argoon Kilburnie Road into the project area. Under the Planning Scheme, only the Class B land at the project area is good quality agricultural land.

The EIS stated that the project area is not used for cropping, and is not strategic cropping land mapped under the *Regional Planning Interest Act 2014*.

The EIS proposed the following measures to mitigate the project's impacts on land suitability:

- staged exclusion of current grazing activities from the project area, enabling continued grazing to occur in areas not directly impacted by mining
- restricting the clearing of vegetation (including grass cover) to the minimum area required for project work
- slashing grass cover instead of completely removing vegetation cover
- revegetating exposed soils and stockpiles as soon as possible after works have been completed
- implementation of, and adherence to, a rehabilitation management plan
- rehabilitating compacted soils by ripping the top layer of soil material, and then applying layers of subsoil and topsoil as required to establish a suitable plant growth environment
- storing topsoil for the shortest period practicable to be then reused.

#### 4.5.5.1 Major issues raised in submissions

Landholders expressed objections to the agricultural assessment in the EIS. In particular landholders disagreed with the project area being presently unsuitable for large scale cropping, and unsuitable for grazing on improved pastures. Landholders advised that land in the project area should have a higher land classification. Landholders provided the following comments in support of their point of view:

- The project area has been part of an agricultural business since the 1800s, and it has been used for both profitable grazing and dry land cropping.
- Land over most of the project area where the open cut would be located was used for dryland cropping from the 1960s until the mid-1980s before being converted to grazing for business reasons. Also, much of the land within the project area, but outside the proposed open cut pit, has been used for dry land cropping at times, growing peanuts and sorghum.
- The project area is currently being used for fattening cattle, and has a carrying capacity slightly better than 1 beast per 10 acres.

In response to the above issues, the proponent acknowledged that there was historic use of the land for dry cropping, and that cropping could still occur, but said the land does not satisfy criteria under the *Regional Planning Interest Act 2014* for strategic cropping areas. The proponent also updated the Land section, to reflect that the GQAL guidelines (which define Class C1) were repealed in 2012 and replaced with the Queensland Government's draft *Guidelines for agricultural land evaluation in Queensland* (2nd edn., 2103).

The Department of Agriculture and Fisheries (DAF) reviewed the EIS, and advised the proponent to detail its agriculture coexistence policy.

In response to DAF's issues on the project's impacts to agricultural land, the proponent provided the following advice:

- After mining, the majority of the project site would not be suitable for agriculture (cropping or grazing) due to steeper rehabilitation slopes and shallow top soil.

- The areas of the project site with flatter grades could be used for grazing once mining is complete, with transition to a native ecosystem suitable for local flora and fauna where the slopes steepen.

#### 4.5.6 Soils

Soil surveys of the project area were conducted in 2003 and 2012. Soil classification was based on the soil classification system described in *The Australian soil classification* (Isbell, 1996).

The EIS described the following soil types within the project area:

- upper slope positions
  - skeletal soils supporting narrow leaved ironbark and peppermint gum
  - red earths
- mid to lower slope positions
  - duplex and gradational soils supporting lemon scented gum and narrow leaved ironbark
  - swampy areas
- lower slope positions associated with drainage lines
  - gradational soils on relict alluvial levees
  - duplex soils on relict alluvial levees
  - duplex and non-cracking clay soils associated with breakaway areas
  - alluvial soils in stream bed areas.

The four soil types that would be disturbed as a result of the project are as follows:

- red earths
- gradational soils on relict alluvial levees
- swampy areas
- duplex and gradational soils supporting lemon scented gum and narrow leaved ironbark.

The EIS discussed the erosion susceptibility of each soil type in the project area. The EIS stated that the duplex and gradational soils supporting lemon scented gum and narrow leaved ironbark would have a significant risk of erosion when disturbed. Consequently, there is the potential for soil erosion to cause impacts on and off the site. However, those impacts can be mitigated through the implementation of erosion control measures and stockpiling techniques. The current Callide Mine erosion and sediment control plan would be updated to include the project area.

The EIS proposed the following erosion and sediment control measures:

- All disturbed areas and exposed soils, including stockpiles, will be revegetated, or covered with material that has low erosion potential, to minimise soil loss as soon as practical.
- Eroded areas would be remediated as soon as practicable. This may include levelling the eroded area, capping with non-dispersive topsoil, sowing with seed, and applying erosion control measures to prevent further erosion impacts.
- The unnecessary exposure of alkaline or sodic subsoils will be avoided, and any necessary exposure will be minimised to the shortest practicable exposure time.
- Clearing of vegetation (including grass cover) will be limited to the minimum area required for project works.
- Where grass cover needs to be short it will be slashed instead of being completely removed.
- Drainage measures and appropriate erosion control measures will be installed prior to, or as soon as possible following, the removal of vegetation.
- Stormwater will be prevented from flowing over cleared land within the project area.

- Stormwater will be directed around stockpiled material (e.g. topsoil, spoil, etc.) using diversion drains, contour banks, and catch drains as appropriate.

#### 4.5.6.1 Major issues raised in submissions

DNRM advised the proponent that the soil classification and soil mapping in the EIS is not in accordance with the revised edition of *The Australian soil classification* (Isbell, 2002).

In the EIS Addendum—Round 1, the proponent amended the EIS by updating descriptions for all soil units across the project area in accordance with the revised edition of *The Australian soil classification* (Isbell, 2002).

DNRM advised that they were satisfied with the proponent's response.

#### 4.5.7 Land contamination

The EIS stated that searches of the environmental management register (EMR) and contaminated land register (CLR) were completed in 2012 for properties within the project area. No properties within the project area were found to be listed on the CLR. One property (Lot 170 on FTY1843) located north-east of the project area, was reported as being included on the EMR for two notifiable activities, which are 'Gun, Pistol or Rifle Range' and 'Livestock Dip or Spray Race'. However, that property is outside the project boundary, and would not be disturbed by project activities. Therefore, no part of the project site is on either the EMR or CLR.

Nevertheless, a visual field assessment will be carried out by personnel trained in identifying potential signs of contamination prior to the removal of any vegetation, and a preliminary site investigation would be undertaken if previous contamination is identified.

The EIS proposed the following mitigation measures to reduce the potential for land contamination:

- Spills and leaks will be managed in accordance with existing spills management procedures.
- Storage of potentially hazardous waste products (including sludges and residues) will be contained within weatherproofed, sealed and bunded areas with warning signs, prior to disposal to a suitable location in accordance with the existing Callide Mine's procedure.
- The storage, handling and use of chemicals will adhere to the provisions outlined in the relevant material safety data sheets.
- All identified hazardous materials will be transported in accordance with the Australian Code for the Transportation of Dangerous Goods by Road and Rail Code.
- Monitoring of environmental practices across the project will be undertaken in accordance with existing Callide Mine practice. Environmental sampling and monitoring may be required to identify the level of contamination present, or used to track decontamination progress.
- Facilities for containing potential contamination will be located away from existing watercourses and overland flow catchment areas.
- Regular maintenance and testing will be scheduled for equipment to ensure reliable performance and to minimise the risk of spills of mechanical oils and lubricants.
- Imported fill materials, water and flora will be checked and cleared of contamination prior to entering the project area.

At the request of EHP, the proponent included the following additional mitigation measures:

- The administering authority will be advised of any notifiable activity occurring on the mining lease.
- Any disturbance or work associated with contaminated land (including hazardous contaminants and notifiable activities) will be undertaken in consultation with a suitably qualified person in accordance with section 564 of the EP Act, and management would be in accordance with provisions in Chapter 7, Part 8, Contaminated Land, of the EP Act.
- Obtain prior approval from the department for the removal of any contaminated soil from land that is listed on the EMR.

A review of the Department of Defence's unexploded ordnance (UXO) mapping undertaken for the EIS showed no known UXO contamination within the project site. Nevertheless, the EIS included a commitment that the Department of Defence's advice would be sought and followed if any potential devices are identified.

#### 4.5.8 Landscape character and visual amenity

The EIS assessed the likely impacts of the project on landscape character and visual amenity. Five broad landscape character types (LCTs) were relevant to the assessment, including:

- LCT A: Settled croplands and grazing lands
- LCT B: Rural mining towns
- LCT C: Partially to densely forested undulating landscapes
- LCT D: Transitional mining areas
- LCT E: Wooded creek valleys.

The EIS stated that during the construction and operational phases of the project, a moderate to major adverse impact was expected on LCT A: Settled croplands and grazing lands, and LCT E: Wooded creek valleys. The impacts on the other LCTs would be minor or negligible.

The EIS assessed the impacts on viewpoint receptors located around the project area. The EIS stated the impacts on viewpoint receptors varied from negligible to moderately adverse.

Mitigation measures for visual impacts may, in general, be divided into those used at the mine site, and those used at the view point. Table 4.2 provides a modified summary of the mitigation measures first presented in Table 6-25 of the EIS (February 2014).

**Table 4.2 On-site mitigation measures**

Mine element	Mitigation measures during construction and operation
Vegetation removal	Vegetation would remain in-situ for the greatest length of time possible prior to removal to retain the screening effects.
Stripping of topsoil from the proposed ML and storage	Stripped topsoil would be reused for on-going rehabilitation works to maximise the potential of regrowth from the stored seed bank.  The height of the topsoil stockpiles would be minimised.  Rapid stabilisation of topsoil stockpiles would be targeted, using broadacre seeding of appropriate native species (for example, drought resistant, quick growing, natural colonisers).
Removal of overburden and creation of overburden dumps	Overburden would be backfilled as much as possible into mining voids. Out-of-pit spoil dumps would be recontoured and progressively rehabilitated, which would involve respreading stockpiled topsoil and revegetating disturbed areas.
Open cut coal extraction, open cut pits and coal seam recovery	Voids would be backfilled as much as possible. However, a residual void would be left after mining is completed. Except where slopes would be too steep, topsoil would be spread and revegetated.
Lighting associated with permanent facilities and moving plant (including dragline excavators)	The number of lights would be kept to the minimum needed to meet operational health and safety requirements.  Light spill would be contained as much as possible (for example, by using directional lighting).
General Site Landscape	General landscaping within the project area would be maintained in good condition, particularly adjacent to neighbouring properties, where the mine plan allows.



Mine element	Mitigation measures during construction and operation
Progressive Rehabilitation	<p>Progressive rehabilitation would involve backfilling mining voids as much as possible, re-contouring spoil dumps, respreading stockpiled topsoil and revegetating disturbed areas, where the mine plan allows.</p> <p>The conceptual final landscape across the site is planned to be similar to pre-mining landform with an optimum post-mining land capability that supports the establishment of native vegetation cover similar to surrounding vegetation types.</p>

View point mitigation measures are needed at only one residence on Argoon Kilburnie Road. The proponent will negotiate with the landowner to decide appropriate measures.

The EIS assessed the impacts from lighting associated with the project at the following two night time viewpoints: Argoon Kilburn Road about 1km south of the project; and the Dawson Highway about 3.5km south of the project area. These viewpoints were selected based on publicly available access to locations that give a representation of how activities associated with the existing Boundary Hill Pit appear during night time operations. The EIS assessed the potential impact from night time lighting as not significant.

#### 4.5.9 Conclusions and recommendation

The EIS provided an adequate land assessment for the project. Key components of the land assessment included:

- description of regional and surrounding land uses
- description of the project area, including topography, geology and geomorphology
- resource utilisation
- assessment of soils, land suitability and contaminated land
- landscape character and visual impact assessment.

The EIS identified that the project is likely to have an impact on existing and potential land uses on site. The most significant impacts would be experienced by those areas proposed to be directly disturbed by mining activities within the project boundaries, including residual voids and waste rock emplacement areas. During mining operation, the project area would change from grazing to mining use. After mining, the project area would be rehabilitated back to grazing use as much as possible.

The rural zoned land adjacent the project area is unlikely to be significantly affected by mining, and it is expected that the current use would be able to continue unaltered.

The proponent provided adequate commitments in the EIS to address land management, including land use, topsoil management, land contamination, and visual amenity.

## 4.6 Transport

### 4.6.1 Roads

The EIS identified a number of state controlled roads in the vicinity of the project area, including Callide Dam Road, and the Dawson and Burnett Highways.

The EIS identified one council road, Inverness Road, that currently runs south through the proposed mine site to a T-junction at Argoon Kilburnie Road. Argoon Kilburnie Road is outside the project boundary.

The EIS stated that the Road Impact Assessment (RIA) has been conducted in accordance with the Guidelines for Assessment of Road Impacts of Development (GARID) (TMR, 2006).

A unit of measurement of traffic on roadways is equivalent standard axles (ESA). The EIS predicted that construction of the realignment of Inverness Road would increase ESA on the Dawson Highway by 4%. The GARID (TMR, 2006) provides a significance threshold of 5% increase for road impacts resulting from a development. Consequently, with an increase of 4%, the project's pavement impacts would not be considered significant.

The EIS assessed the potential impacts on road intersections surrounding the project area as not significant. This does not include the potential impacts from the realignment of Inverness Road that was assessed separately by Banana Shire Council through a development application process under the *Sustainable Planning Act 2009*.

The EIS assessed that during mining operations, no transport impacts would be expected, as production at the Boundary Hill South pit would continue at the current rate. Mining operations would continue to be managed through the currently established mitigation measures and practices at Callide Mine.

The Department of Transport and Main Roads (DTMR) provided a submission that raised no transport issues with the EIS, but encouraged the proponent to continue liaising and consulting with DTMR.

Powerlink raised issues with the potential encroachment of the proposed road realignment onto the adjoining easement. In response to Powerlink's issues, the proponent included a commitment to consult with Powerlink regarding the Inverness Road realignment and any potential impacts to Powerlink's infrastructure. Powerlink advised that they were satisfied with the proponent's response to the issues they raised.

Banana Shire Council (BSC) advised that the project would result in the use of local government roads. BSC recommended that a road infrastructure agreement (RIA) should be entered into between Anglo and BSC prior to commencement of work onsite and should be prepared at no cost to BSC. The proponent advised that they would consult directly with BSC under section 72 of the *Local Government Act 2009* for the purpose of providing sufficient information and entering an agreement under that section.

Queensland Police Service (QPS) advised that there was no indication in the EIS that QPS would be engaged by the project in any form of consultation regarding the development of the traffic management plan (TMP). The proponent provided an adequate response, advising that QPS would be consulted in relation to traffic management for the project, including the application of any of Callide Mine's existing traffic management measures to the project.

Queensland Ambulance Service (QAS) advised the proponent to notify them of any diversions or restrictions on road infrastructure that may impact on the delivery of ambulance operations and require alternative routes. The proponent advised that they would liaise with QAS regarding the road realignment or restrictions due to the project to ensure that the delivery of ambulance services is uninterrupted.

#### **4.6.2 Rail**

Coal is transported to the Port of Gladstone along the dedicated Moura rail system, which consists of 228km of single track with balloon loops at Boundary Hill, Callide Coalfields and Dawson Mine. The EIS assessed that there would be no additional impacts to the Moura rail system attributable to the project. Consequently, no changes to the current mitigation measures are needed.

#### **4.6.3 Conclusions**

The EIS provided an adequate assessment of transport for the project.

The EIS identified some traffic and transport impacts may be present during the initial stages of the project, during the realignment of Inverness Road. However, these impacts were not considered significant.

The EIS assessed that during mining operations, no transport impacts would be expected, as production at the Boundary Hill South pit would continue at the current rate. Consequently, operations would continue to be managed through the currently established mitigation measures and practices at Callide Mine.

### **4.7 Waste management**

Waste rock is the most significant waste stream that would be generated by the project. There would also be lesser quantities of coal processing waste, regulated wastes, and general waste.

Relevant information about wastes and their management was provided in several parts of the EIS (February 2014), including the following sections:

- Chapter 3, Description of the Project
- Chapter 4, Rehabilitation and Decommissioning

- Chapter 8, Waste
- Appendix I2, Waste Characterisation Report
- Appendix V, Slope Stability Analysis

This section first discusses waste rock, its characteristics and disposal. It then discusses other types of waste that the project may generate in significant quantities.

## **4.7.1 Waste rock**

### **4.7.1.1 Waste rock characteristics**

Whether waste rock would be placed in the pit or form part of a raised dump (particularly its surface) would depend on the physical and chemical characteristics of the rock's type.

The EIS characterised the properties of the three main stratigraphic units of the rock formations, which are: Tertiary overburden (i.e. Biloela Formation); Precipice Sandstone; and Coal Measure sediments. The relevant properties of the rock types within those units may be summarised as follows.

#### **Tertiary overburden**

Alkaline tertiary clay sediments may have high salinity, and other characteristics indicating they may be prone to tunnel erosion. They are unsuitable for placement near the surface of a waste rock dump.

Acidic tertiary clay sediments are also saline and erodible, which with the additional factor of their lower pH means they are very undesirable as a surface or near surface medium.

Tertiary sandstones and siltstones are generally slightly acidic, and extremely dispersive. They are unsuitable for placement near the surface of a waste rock dump.

Weathered basalt (which may include a mix of clay and solid basalt) is alkaline with low to moderate salinity. Material that contains enough solid basalt may be useful as a near surface material on the waste rock dump. However, mixed material with a high proportion of clay may be prone to tunnel erosion.

#### **Precipice Sandstone**

The Precipice Sandstone is slightly acidic and highly dispersive, with very low nutrient and water holding capacity. It is unsuitable for placement near the surface of a waste rock dump.

#### **Coal Measure sediments**

Weathered coal measure sediments are slightly acidic and dispersive, which would make them susceptible to high erosion on steep slopes, and therefore unsuitable for placement near the surface of a waste rock dump.

Carbonaceous roof and interburden materials have relatively good characteristics, except that the EIS found they have the potential for pockets of pyrite that would be acid producing, and consequently, they should not be placed at the surface of a waste rock dump or used to build surface earthworks.

Non-carbonaceous fresh sediments are slightly acidic or neutral, and have relatively low dispersion. These sediments were assessed as being relatively competent for surface placement, but would be a marginal growth medium for plants as a subsoil, and may be prone to infiltration problems with long-term weathering.

### **4.7.1.2 Suitability for near surface placement**

While the EIS noted that all the waste rock types have some undesirable aspects, the non-carbonaceous fresh sediments from the Coal Measures were considered to have the best characteristics for placement near the surface of a waste rock dump, with the basaltic material as second choice provided it has sufficient solid rock with the clay.

The acidic tertiary clay sediments, and the carbonaceous roof and interburden sediments from the Coal Measures, which have the worst characteristics, should have priority for placement in the pit; alternatively, they should be well encapsulated within the waste rock dump.

Other waste rock types may be put in the pit or the above-ground dump as appropriate at the time, provided they are well capped with the non-carbonaceous fresh sediments prior to being covered with topsoil for rehabilitation.

#### **4.7.1.3 Waste rock quantity**

A total of 400 million cubic metres of waste rock would be excavated.

However, the EIS did not say what portions of the total would be contributed by the various rock types. Consequently, the EIS did not make clear whether there would be enough non-carbonaceous fresh sediments or suitable basaltic material to cap the waste rock dump prior to the spreading of topsoil.

In response to an enquiry from EHP, the proponent advised that there would be insignificant amounts of basaltic material, but approximately 60 million cubic metres of the non-carbonaceous fresh sediments over the life of the project. The proposed area of the waste rock dump is 210ha. Consequently, there should be ample non-carbonaceous fresh sediments available to cap the dump with an adequately thick layer.

#### **4.7.1.4 Waste rock disposal**

For the first five years, some 'prestrip' material would be backfilled into the existing pit at Boundary Hill North. Concurrently, a new out-of-pit dump, called the Western Dump, would be established immediately to the west of the Boundary Hill South pit site. As mining progresses at Boundary Hill South, waste rock would backfill its pit and merge with the Western Dump. However, dumped waste rock 'swells' (i.e. settles at a volume greater than it had before it was excavated), and there would be a residual void where the final mining operation stops at the eastern end of the pit. Consequently, not all the waste rock would fit into the pit, and the Western Dump would be raised above the natural ground level.

The height of the dump would be up to approximately 80m above natural ground level. The slope stability analysis presented in Appendix V of the EIS assessed that slopes of 14% should be stable. As noted in the previous section, the proponent has advised EHP that there would be a sufficient quantity of suitable waste rock for capping the dump.

### **4.7.2 Coal processing waste**

The coal from the Boundary Hill South pit would not be washed; rather, it would be mechanically crushed and screened. There would be no wet tailings, only coarse rejects and a negligible quantity of dry, fine reject material. All the reject material would be disposed of in the pit.

### **4.7.3 Other wastes**

#### **4.7.3.1 Callide Mine Waste Management Plan**

The Callide Mine has an existing waste management plan that would be reviewed and updated to manage operations at Boundary Hill South. The Callide Mine Waste Management Plan includes measures that adequately address the following issues:

- implementation of the waste hierarchy
- segregation of waste types
- recycling
- storage of wastes, including bunding, and procedures to deal with any spills
- collection and disposal of wastes off the site.

#### **4.7.3.2 Sewage**

The Boundary Hill part of the Callide Mine has existing sewage infrastructure. That infrastructure would be adequate for the Boundary Hill South operations—there would be no additional impacts.

#### **4.7.3.3 Regulated wastes**

Any regulated waste generated by the project, such as waste oil, would be collected and stored in adequate containers and facilities until removed by a licenced contractor in accordance with statutory requirements.

#### **4.7.3.4 General waste**

The Callide Mine does not have permanent accommodation camps or villages, and none are proposed for the Boundary Hill South project. Consequently, the amounts of general waste generated at the Boundary Hill South mine would be relatively small, and similar to that currently generated by the existing operations.

Any waste that may be recycled would be segregated, and taken to a suitable recycling facility.

Waste that is not regulated, or able to be recycled, would be segregated and taken to licensed facilities operated by Banana Shire Council.

## **4.8 Water resources**

### **4.8.1 Surface water hydrology**

The project is located within the Callide Creek catchment of the Callide sub-basin, which is situated in the upper catchment of the Fitzroy Basin. The Fitzroy Basin has a total catchment area of approximately 143,000km<sup>2</sup>. The Callide sub-basin has a catchment area of approximately 8,000km<sup>2</sup>. The Callide Creek catchment comprises approximately 4,600km<sup>2</sup> of the Callide sub-basin.

There are no defined watercourses on the project site. Consequently, any surface water flow on the Boundary Hill South site, including the creeks, is considered to be 'overland flow' with regard to the provisions of the Queensland *Water Act 2000*.

Campbell (Gate) Creek is the main waterway that crosses the proposed mining lease. Numerous other ephemeral drainage channels convey surface water across the mining lease towards Campbell (Gate) Creek during periods of rainfall that are of sufficient intensity and duration to generate surface water runoff. These drainage features flow generally in a south-westerly direction across the project site, and join Campbell (Gate) Creek approximately 1km downstream of the project boundary.

One landowner directly downstream of the project site captures ephemeral flows from Campbell (Gate) Creek into a farm dam.

### **4.8.2 Existing groundwater regime**

Figure 1 shows a conceptual cross section of the geological units in the region from Callide Creek in the west, across the project site to the range in the east. The geological formations and aquifers of relevance to groundwater impacts of the Boundary Hill South Project are described in the following subsections.

#### **Great Artesian Basin**

The Callide Basin is not part of the Great Artesian Basin. While the Precipice Sandstone (described in more detail below) forms part of the geological structure of the Great Artesian Basin farther west, in the Callide Basin it is isolated, and not hydrologically connected with the aquifers of the Great Artesian Basin.

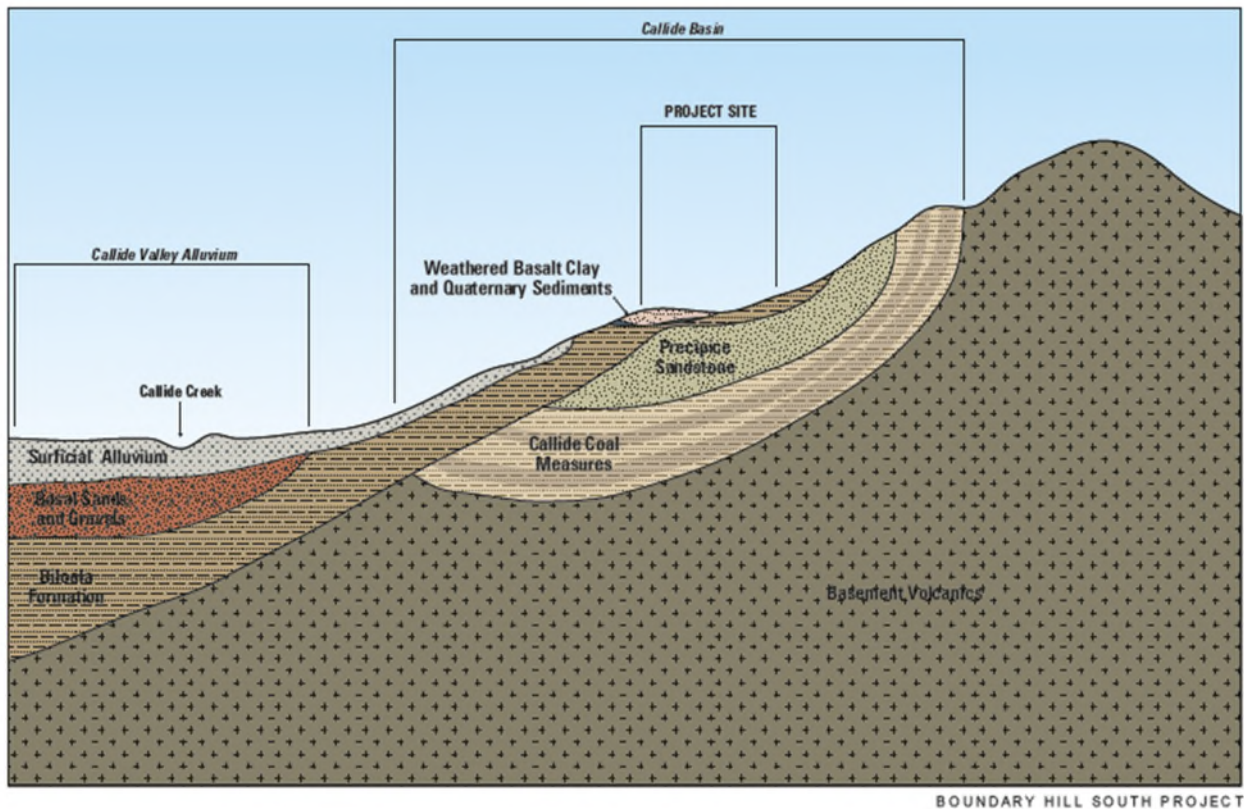
#### **Quaternary alluvium including surficial alluvium along drainage channels, and the Callide Valley alluvium**

The Quaternary alluvium associated with Campbell (Gate) Creek and other drainage channels on the project site is largely unsaturated and bores are dry. The Quaternary alluvium including surficial alluvium along drainage channels within the project site does not provide a significant groundwater resource. The Campbell (Gate) Creek alluvium becomes saturated approximately 4km downstream of the project area. Only one abandoned bore was found in the Campbell (Gate) Creek alluvium.

The Callide Valley alluvium is located 6km west of the project area along Callide Creek, and is a major source of groundwater for irrigation along Callide Creek and in the broader Callide valley.

Groundwater within the Callide Valley alluvium flows in a north-westerly direction along Callide Creek, while groundwater within the minor drainage channels (where present) flows down-gradient, in a south-westerly direction towards Callide Creek. Groundwater levels in the Callide Valley alluvium are typically about 10m below ground level.

A total of 77 private water supply bores were identified in the Callide Valley alluvium within 10km of the project area.



**Figure 1 Conceptual geological cross-section, west to east across the project area**

(Source: Figure 9B-3, EIS Addendum, Round 1)

**Biloela Formation**

The Biloela Formation is a confining, clay rich unit that retards the vertical and lateral flow of groundwater. This unit is up to 35m thick across the project site and 300m thick further downstream in the Callide Valley. The unit exhibits low yields of groundwater with relatively high salinity. It is unsaturated and dry across the project site and elevated areas of the Callide Basin. It does not provide a significant groundwater resource. Groundwater is only extractable from isolated, confined sandstone lenses to the west of the project site. Only three of 10 private bores sunk into the Biloela Formation within 10km of the project area are in use.

**Precipice Sandstone**

The Precipice Sandstone is the principal aquifer under the project area. This aquifer has a moderate to high permeability. The aquifer is saturated across the project area, and is up to 95m thick. The aquifer is recharged by rainfall and surface water flows where it outcrops and forms a prominent ridgeline to the east of the project area.

Groundwater flow in this aquifer largely follows the local geomorphology, starting from where recharge occurs at the geological formation's outcrop below the ridgeline in the east, and flowing generally down towards the south-west, but also with a lower extension of flow in a south-easterly direction towards Callide Dam. Down dip, the Precipice Sandstone ends at an unconformity approximately one kilometre to the west of the project site where it is overlain by the Biloela Formation, which predominantly confines the aquifer.

Several landholders in the neighbourhood of the project site have bores that extract groundwater from the Precipice Sandstone, and one bore is artesian. Relatively high yields of up to 5L/s are obtained from the private bores. One property has three springs close together that are fed by this aquifer. However, the springs have been modified to provide and store water for farming, and have no groundwater dependent ecosystems.

Groundwater quality is fresh to brackish, and generally suitable for stock, though some bores provide water suitable for human consumption.

## Callide Coal Measures

The Callide Coal Measures are the oldest formation in the Callide Basin. The Callide Coal Measures comprise a siltstone dominated matrix containing upper and lower coal seams. The upper Callide Coal Measures are sporadically overlain by a coarse grained sandstone unit that is comparable to the overlying Precipice Sandstone.

The coal measures are laterally continuous across the Callide Basin and outcrop to form the ridgeline at the eastern extent of the basin. This unit dips from the ridgeline to the south-west across the basin. The thickness of the Callide Coal Measures varies across the basin and reaches 150m thick in the centre of the basin and 30m to 40m thick in the project area. The depth to groundwater in this unit is around 50m below ground level at the eastern boundary of the project area and reduces to around 5m at the western project boundary.

Groundwater levels within the Callide Coal Measures and Precipice Sandstone are similar, indicating a degree of hydraulic connectivity between these units. Also, the recharge/discharge mechanisms and flow directions in the Callide Coal Measures are similar to those for the Precipice Sandstone.

However, the hydraulic conductivity of strata within the Callide Coal Measures varies greatly between the upper sandstones with good conductivity and shales and siltstones with very low conductivity.

The EIS reported that no bores target the Callide Coal Measures directly, but some are screen to draw jointly from the Callide Coal Measures and Precipice Sandstone. Water quality from these bores is similar to that of bores extracting from the Precipice Sandstone alone.

## Basement volcanics

The basement volcanics underlying the Callide Basin comprise a heterogeneous and complex sequence of volcanic rocks (including basalt, andesite, breccia, tuff, agglomerate, and ignimbrite) interbedded with sedimentary rocks (including conglomerate, sandstone, and siltstone). This geological unit is located up to 230m below ground level at the project area.

This unit is highly deformed and characterised by low primary porosity, and as a result, groundwater movement is controlled by local joints and fracture sets.

A total of five private bores within 10km of the project area intersect saline to highly saline groundwater within localised fractures of the weathered basement volcanics. However, the basement volcanics are not used for groundwater supply, due to the saline groundwater and low yields.

## 4.8.3 Water quality

### 4.8.3.1 Existing surface water quality

The water quality objectives (WQOs) for the project were derived from the 'Callide Creek Catchment Environmental Values and Water Quality Objectives' (EHP 2011). WQOs for the waters were based primarily on the guidelines developed for aquatic ecosystem environmental value (EV) protection in moderately disturbed waters.

The existing background water quality upstream, downstream and at the site was assessed at three surface water monitoring locations. A description of the three locations, together with a summary of the water quality results at each location, is outlined below:

- **Upstream:** Bell Creek at Craiglands, located approximately 7.35km north-east of Lake Gasteen, was selected to represent local, background water quality. The reference conditions in Bell Creek (at monitoring location 130319A) are characterised as slightly alkaline, fresh to brackish waters with generally low turbidity and suspended solids. Metals (including copper, iron, manganese and zinc), fluoride and nitrogen oxides are also shown to be present in the regional drainage network at elevated concentrations slightly above the trigger values. The elevated levels have been investigated and can be traced back to catchment soil and geology characteristics.
- **Downstream:** Callide Creek at Goovigen, located approximately 21km downstream of the confluence of Campbell (Gate) Creek and Callide Creek was selected to represent the receiving water quality. The water quality shows a generally similar physico-chemical profile to Bell Creek; that is, slightly alkaline, fresh to brackish waters with slightly elevated metals (including copper, iron, manganese and zinc) and fluoride. The site is generally low

in turbidity and suspended solids. The downstream conditions also indicate increased agricultural input, with elevated nitrogen oxides, ammonia, and total nitrogen.

- **At the site:** Lake Gasteen, located approximately 1.4km from the project area, represents the mine affected water that may be discharged into Campbell (Gate) Creek. The water quality at Lake Gasteen is characterised as typically neutral, fresh to brackish water. A range of metals, including copper, iron, manganese, nickel, uranium and zinc are slightly elevated relative to the trigger values. Ammonia is also present at marginally elevated concentrations, although all other nutrient indicators are within the trigger values.

#### **4.8.3.2 Existing groundwater quality**

Groundwater within the alluvium, Precipice Sandstone and Callide Coal Measures is suitable for stock water supply.

Groundwater within the surficial alluvium, Biloela Formation, Precipice Sandstone, Callide Coal Measures and basement volcanics is generally not suitable for human consumption. However, the EIS noted that some properties reported using groundwater from the Precipice Sandstone for drinking, although it may not always meet the Australian Drinking Water Guidelines 2011 (NHMRC, 2011).

The proportions of the major anions and cations show that there are two distinct groundwater types, being:

- water from the surficial alluvium with no dominant ionic composition
- sodium chloride/bicarbonate type groundwater from the deeper sequences.

The EIS assessed that groundwater associated with the surficial alluvium near the project site is predominantly derived from rainfall and surface water runoff. The Precipice Sandstone and Callide Coal Measures coarse grained sandstone, siltstone and shale recorded a sodium chloride/bicarbonate type groundwater. The assessment found that the Biloela Formation and basement volcanics show higher proportions of sodium and chloride, indicating lower recharge rates.

### **4.8.4 Assessment of potential surface water impacts**

#### **4.8.4.1 Surface water hydrology**

The main drainage channel of Campbell (Gate) Creek will not be disturbed.

Smaller ephemeral drainage channels to the south of the main channel will be mined. Those drainage channels presently flow into Campbell (Gate) Creek a few hundred metres east of the project boundary. After mining ceases, those drainage channels will largely be filled by a spoil dump, but the dump will still shed runoff towards Campbell (Gate) Creek.

A final void will be left on part of the area presently covered by the smaller ephemeral drainage channels. The final void will not be permitted to capture overland flow, and will be prevented from doing so by surrounding bunds and drains. The bunds will truncate and divert approximately 449ha of the Campbell (Gate) Creek catchment. That reduction of the Campbell (Gate) Creek catchment is expected to reduce surface flows downstream of the project site. The effect would be experienced most immediately downstream of the project site, then to a lesser extent further downstream as other unaffected tributaries join the main channel.

The property immediately downstream of the project on Campbell (Gate) Creek would likely experience a 6% to 8% reduction in catchment yield as a result of the diversion works. The landholder has an existing beneficial reuse agreement with the proponent to supplement any loss of water supply as a result of the reduction in catchment yield caused by the currently approved operations of the Callide Mine. The proponent has committed to amending the existing agreement to supplement any additional impacts to water supply as a result of diversion works associated with the Boundary Hill South project.

The EIS assessed that reductions in catchment yields to other properties farther downstream on Campbell (Gate) Creek would be insignificant, and not warrant mitigation measures.

Some of the truncated Campbell (Gate) Creek catchment would be diverted into the catchment of Callide Creek. That diversion would increase the flows into two neighbouring properties.



#### **4.8.4.2 Surface water quality**

The potential impacts of the Boundary Hill South project on surface water quality are typical for open cut coal mines in Central Queensland. That is, mining operations may increase sediment and salinity in surface waters. In particular, local landholders expressed concerns that increased fine sediments loads flowing from Campbell (Gate) Creek into Callide Creek (Old Channel) would clog the sides of the channel and reduce recharge to groundwater in the Callide Valley alluvium.

The EIS made reference to the study conducted by EHP in 2009 that 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 EIS stated that salinity levels within the mine's storages would remain generally well below discharge criteria requirements and increases in storage salinity would only occur during extended dry periods when environmental releases are not required. Also, the EIS made reference to the water balance modelling results that indicated that discharges from the mine would be relatively small in proportion to natural stream flows, which would ensure adequate dilution of mine water discharges.

There is also the potential for accidental spills of contaminants at the mining operations to impact on water quality.

#### **4.8.4.3 Great Barrier Reef**

The catchment of Campbell (Gate) Creek comprises 0.01% of the Great Barrier Reef catchment. Furthermore, the Boundary Hill South site is 410km upstream of the Great Barrier Reef lagoon, and there are four minor weirs and one major weir between the site and coast that can trap sediment. Consequently, it is unlikely that the Boundary Hill South project would have any impact on the Great Barrier Reef.

#### **4.8.4.4 Flooding**

Along the eastern side of Boundary Hill South operations, the EIS proposed a levee and diversion drain that would be integrated into the proposed realignment of Inverness Road. The levee would provide the operating pit with immunity from flooding up to the 1 in 1,000 year ARI event, plus a minimum 0.5m freeboard. This level of flood protection meets the minimum level required for a regulated levee under the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EHP, 2013).

Another similar levee would be constructed along the eastern part of southern boundary of the pit to prevent water on the floodplain from entering the pit.

The EIS undertook hydrologic and hydraulic modelling of the levees for the 2 year, 100 year and 1,000 year ARI flood events. The assessments concluded that the project would not create major changes to existing downstream or upstream flood levels or flow velocities, and that no residential or industrial properties would be adversely affected by afflux.

#### **4.8.4.5 Water demand**

The EIS stated that current operations at Boundary Hill use water from the mine affected water circuit, which is supplemented by inflow from the Kilburnie borefield and transfers from the Ghost Ryders storage. Also, inflows at the current Boundary Hill pit would continue after cessation of existing operations, providing an additional water resource.

Water balance modelling was undertaken to assess the potential for additional water demand over the life of the project. The water balance model results indicated an average annual deficit of 1.4ML. The EIS stated that this deficit could be managed by short term alterations to site management operations, and would not require additional water demand from the local water resource.

#### **4.8.4.6 Final void**

The final void will not capture overland flow, so inflow will come only from aquifers intersected by the void's walls and floor, and from rain falling directly into the void. Evaporation will keep the water level in the void below the level of groundwater in the adjacent aquifers. Modelling undertaken for the EIS indicates that the water level in the void should fluctuate over a range of a few metres, averaging about 40m below the lip of the void. Consequently, there is negligible risk of the void overflowing or contaminating surface waters.

#### **4.8.5 Mitigation measures for surface water impacts**

The Boundary Hill South project would be an extension of existing mining operations, and those operations already have mitigation measures that can be applied to the new works.

As occurs with the current operations at Boundary Hill, all mine affected water from the Boundary Hill South operations would be pumped to a release dam called Lake Gasteen. Releases from Lake Gasteen are covered by the existing mine's environmental authority that was amended and issued in December 2014. The environmental authority includes flow criteria for the release of mine affected water into receiving waters, and trigger levels for contaminant investigation. The provisions of the current environmental authority are design to protect downstream environmental values during discharge events. Furthermore, the EIS stated that discharges would be undertaken in accordance with the model water conditions developed as a result of the Fitzroy River Basin cumulative study.

The EIS also proposed the following measures for the mitigation of the potential impacts on water quality:

- the existing erosion and sediment control plan (ESCP) will be reviewed and updated
- disturbance to land and creeks will be avoided or minimised
- temporary and permanent drainage structures will be constructed to minimise catchment size, reduce runoff velocity, enhance infiltration and divert water from undisturbed areas
- construction activities will be undertaken during the dry season, as much as possible, to reduce runoff from disturbed areas
- the existing site management plan will be updated to inform staff about spill containment protocols and handling of potential surface water contaminants
- areas used for storing and handling fuel, waste and paints will be bunded to withstand a 100-year average recurrence interval (ARI) design storm event
- regulated site water containment structures will be regularly inspected and assessed by suitably qualified and experienced persons in accordance with the 'Manual for Assessing Consequence Categories and Hydraulic Performance of Structures' (DEHP, 2013).

Control measures to manage surface water quality and quantity, drainage lines and sediment movements would be detailed in a water management plan for the project.

Monitoring would be necessary to ensure that operational plans are effective at reducing potential impacts to within acceptable control limits. Three monitoring programs are proposed to address the surface water components, including:

- monitoring background water quality to assess whether downstream water quality variations are a product of natural processes or mining operations
- monitoring water quality on site to assess its suitability for release, and to identify processes contributing to any variation in water quality that may require operations to be modified to address any issues of concern
- a Receiving Environment Monitoring Plan to identify any variation in water quality and associated impacts on aquatic ecosystems.

#### **4.8.6 Assessment of potential groundwater impacts**

##### **4.8.6.1 Independent Expert Scientific Committee (IESC)**

The EIS for the Boundary Hill South project was provided to the Independent Expert Scientific Committee (IESC) for their review. On 14 May 2014, IESC provided a submission about the EIS.

The concerns raised by the IESC in their advice were related to the following issues:

- a perceived lack of monitoring data
- an inadequate groundwater model
- limitations on the prediction of impacts due to the inadequacy of the model

- a need for an improved groundwater monitoring plan

The proponent responded to this advice in their response to submissions, and made amendments to the EIS. Firstly, additional data will be obtained from the existing monitoring network, and from the expanded network when it is established. Secondly, the proponent provided an improved and adequate model with their response to submissions. Thirdly, the improved model allowed the proponent to make better predictions of potential impacts, and furthermore, the model will be run again on other occasions, when sufficient additional data is obtained, to further improve predictions. And lastly, the proponent has committed to expanding the water management plan to include the project area, and to undertaking macro-invertebrate sampling under the Receiving Environment Monitoring Plan for early detection of any project related impacts.

EHP considers all issues raised by the IESC have been adequately addressed by the proponent.

#### **4.8.6.2 Modelling of groundwater impacts**

The Queensland Department of Natural Resources and Mines (DNRM), which is the state's lead regulatory authority of water resources, was satisfied that the modelling undertaken in amendments to the EIS was adequate. Calibration of the transient model with existing data demonstrated that it provided an adequate match between observations and predictions, which gives confidence that its predictions of future impacts are reasonable.

Nevertheless, assuming the project goes ahead, DNRM will require the proponent to gather additional data about inflows to the pit, and apply the model to the larger database to improve the predictions of impacts during mining and the subsequent recovery of the water table after mining ceases.

The following sections of this report summarise the assessment of the Boundary Hill South Project's potential impacts on groundwater resources.

#### **4.8.6.3 Quaternary alluvium including surficial alluvium along drainage lines, and the Callide Valley alluvium**

As noted above, the Quaternary alluvium associated with Campbell (Gate) Creek and other drainage channels on the project site is largely unsaturated and dry, and does not provide a significant groundwater resource. Furthermore, the project will not take water from, and have no direct impact on, groundwater resources further downstream in the Callide Valley alluvium. Consequently, the project would not have a significant impact on alluvial groundwater resources.

Some stakeholders were concerned about the potential of the project to have an indirect impact by reducing recharge to the Callide Valley alluvium due to silt deposition downstream of the mine in Callide Creek. Erosion and sediment control measures at the mine will adequately manage that risk of an indirect impact.

#### **4.8.6.4 Biloela Formation**

As with the Quaternary alluvium, the Biloela Formation across the project site is largely unsaturated and dry, and does not provide a significant groundwater resource. The formation is predominantly an aquitard. Consequently, the project would not have a significant impact on groundwater resources in the Biloela Formation.

Groundwater inflows to the mine pit from the Biloela Formation are predicted to be less than 0.3ML per day.

#### **4.8.6.5 Precipice Sandstone**

The Boundary Hill South Pit must dig through the Precipice Sandstone to reach the coal resource. Groundwater from the Precipice Sandstone aquifer will consequently flow into the pit, and during operations must be pumped out to Lake Gasteen. Groundwater inflows to the mine pit from the Precipice Sandstone are predicted to increase to a peak of 4.8ML per day in Year 10 of the operations. Inflows to the pit will cause lowering of the saturated water level in the aquifer. That lowering is known as drawdown.

Because of the dip of the Precipice Sandstone formation, drawdown of more than 1m will not extend more than approximately 500m to the north, directly west, or directly east of the project boundary. However, drawdown of more than 1m will extend beyond the project site up to 6km to the south-east, 5km to the south, and 3km to the south-west.

Drawdown of up to 70m is predicted immediately adjacent to the site. Drawdown would reduce to about 20m within approximately 2km to the south-east, south and south-west of the southern boundary of the site. Drawdown of up to

10m would extend approximately 5km to the south-east of the project boundary, but only to about 2.5km to the south-west.

In private bores accessing the Precipice Sandstone, the Boundary Hill South operations are predicted to add as much as 24.9m of drawdown to the drop already caused by existing nearby operations. The maximum cumulative drawdown in a private bore is predicted to be 37.2m. Some bores may become dry. The three springs fed by the Precipice Sandstone aquifer are predicted to stop flowing.

After mining ceases, a pond will form in the final void and greatly reduce inflows from the Precipice Sandstone, but evaporation will nevertheless cause a net extraction from the aquifer. Groundwater levels would recover by approximately 75% within 10 years, but equilibrium may take 50 years. The water levels in some bores are predicted to fully recover, but some would experience an ongoing, cumulative drawdown of up to 7.1m. Also, the three springs are not expected to recover due to a residual drawdown of between 1.3m and 2.4m, so pumping would be required for their continued use as a water supply for farming.

#### **4.8.6.6 Callide Coal Measures**

The Boundary Hill South Pit must dig through the upper sandstone strata of the Callide Coal Measures to reach the coal resource. Groundwater from those strata would flow into the pit, and add to that flowing from the Precipice Sandstone aquifer. The EIS predicted inflows to the pit from the Callide Coal Measures would peak at 2.3ML per day in Year 12 of the operations.

The EIS predicted that drawdown of more than 1m in the Callide Coal Measures would extend as far from the project boundary as that in the Precipice Sandstone, but would not be continuous; rather it would occur in pockets. Drawdown within the project boundary would be as much as 110m, but outside the boundary only small pockets would experience drawdown of more than 20m.

Private bores drawing water jointly from the Precipice Sandstone and Callide Coal Measures would experience drawdown of up to 34.2m during operations. Most of those bores would recover after mining ceases, but one is predicted to experience ongoing drawdown of 2.4m.

#### **4.8.6.7 Basement volcanics**

The basement volcanic rocks lie below the depth that will be excavated for the Boundary Hill South Pit. Furthermore, a layer of low permeability rock of the Callide Coal Measures will be left on top of the basement volcanics. Consequently, the EIS assessed that the Boundary Hill South project would have no direct impact on groundwater in the basement volcanics.

#### **4.8.6.8 Potential impacts on groundwater quality**

The EIS addressed the following potential sources of groundwater contamination from the project:

- The risk of contaminated run-off from hydrocarbon and chemical storage areas was found to be negligible if those areas are properly bunded and maintained as would be required by the environmental authority.
- The seepage of leachate from overburden emplacement areas was assessed as unlikely to present any significant environmental risks of groundwater contamination.
- The gradually increasing salinity of the final void pond is not predicted to pose a risk to the surrounding groundwater resources because water will flow into the void to replace evaporation rather than percolating into the aquifers.

#### **4.8.6.9 Impacts on surface drainage features**

The EIS predicted that groundwater drawdown would not extend to the perennial reaches of any streams or the saturated extents of alluvium associated with the streams.

Drawdown in the Precipice Sandstone is predicted to extend to ephemeral reaches of Campbell (Gate) Creek, and may result in a decrease in baseflow of up to 9.7ML/y. However, the volume of reduced baseflow would be negligible in terms of total surface water flows in the creek, and would be imperceptible at downstream locations.

#### **4.8.6.10 Cumulative impacts**

Modelling undertaken for the EIS predicted that there would be no cumulative impacts on the Callide Valley alluvium or groundwater levels in the saturated alluvium, neither will there be cumulative impacts on surface water bodies.

The project would contribute to cumulative depressurisation of the Precipice Sandstone and Callide Coal Measures during and after mining. The project is predicted to cause additional drawdown of water levels in 14 bores and three springs used by landholders.

#### **4.8.7 Mitigation measures for groundwater impacts**

##### **4.8.7.1 Make good agreements**

There are no mitigation measures that could be undertaken to avoid the drawdown of levels of groundwater in landholders' bores. Consequently, the only option to mitigate impacts is by *make good measures* under *make good agreements* between the proponent and the affected groundwater users. Make good measures and make good agreements are regulated under the Queensland *Water Act 2000*.

The EIS stated that the proponent has entered into legally binding make good agreements with groundwater users affected by existing mine operations. These existing make good agreements have been negotiated between the proponent and potentially affected landholders to manage the impacts on private bores and other groundwater supplies due to the current approved Callide Mine operations. The agreements require the proponent to monitor and assess whether the existing approved Callide Mine is impacting on water supply and quality. If monitoring data indicates adverse impacts on groundwater supplies or quality, the proponent is legally required to implement the agreed make good mitigation and/or remediation measures. The proponent would be required to enter into amended make good agreements with landholders of any bores subject to additional impacts due to the project.

##### **4.8.7.2 Avoidance of contamination**

The proponent committed to minimising the risk of potential contamination to groundwater from fuel storage by ensuring all mine refuelling activities would occur in areas with adequate bunding and provision for immediate clean-up of spills.

All chemicals would be transported, handled and stored in accordance with Australian Standards.

The proponent made the following commitments to minimise the risk of contamination to groundwater from the seepage of any leachate from the overburden dumps:

- conduct ongoing geochemical characterisation of overburden, interburden and floor rock
- selectively place material in engineered overburden dumps, according to its chemical and physical properties.

Furthermore, the proponent proposes monitoring of groundwater bores for potential seepage and contamination as part of the groundwater monitoring program, which is described in the following section.

##### **4.8.7.3 Groundwater monitoring program**

The current groundwater monitoring program comprises 12 monitoring bores and three vibrating wire piezometers (VWPs) located across the project area and its surrounds. Five of these bores are currently monitored under the existing approved Callide Mine environmental authority. The groundwater monitoring program would be expanded to include nine additional monitoring bores around the Boundary Hill South mining operations.

Recording of groundwater levels from the monitoring bores and VWPs would continue throughout the life of the project to enable natural seasonal variations to be distinguished from water level impacts caused by mining activities. Groundwater would be sampled to detect changes in groundwater quality during and after mining.

Existing groundwater data would be reviewed prior to construction to establish the appropriate frequency of groundwater sampling and decide which water quality parameters should continue to be monitored.

## 4.8.8 Conclusions & recommendations

### 4.8.8.1 Surface water

EHP is satisfied that potential impacts on surface water resources have been adequately assessed.

The Boundary Hill South pit would use the existing infrastructure for the management of mine affected water, and the management measures detailed in the Callide Mine's existing environmental authority for the storage and discharge of mine affected water are adequate. Consequently, no further recommendations are needed in that regard.

Conditions of the environmental authority should require that Campbell (Gate) Creek is excluded from the disturbance area, and that levees are constructed to protect the pit from flooding, as proposed in the EIS.

The reduction of Campbell (Gate) Creek's catchment area may have an impact on one downstream landholder who extracts water from the creek. That landholder has an existing beneficial reuse agreement that would be amended to manage any additional impacts to water supply as a result of the project. Impacts on catchment yield for other downstream landholders were not considered likely to result in a significant reduction in water supply, and would increase surface runoff at two properties along Callide Creek.

### 4.8.8.2 Groundwater

EHP is satisfied that potential impacts on groundwater resources have adequately assessed.

The Great Artesian Basin would not be impacted as the geological strata to be mined have no connection with the aquifers of the Great Artesian Basin.

Alluvial groundwater resources of the Callide Valley would not be significantly impacted.

The EIS predicted that drawdown in the Precipice Sandstone and Callide Coal Measures would extend beyond the project site up to 6km to the south-east, 5km to the south, and 3km to the south-west, but no more than approximately 500m to the north, directly west, or directly east of the project boundary. The drawdown would significant impact on 14 supply bores and three springs, and may cause some to become dry.

Drawdown at those bores and springs cannot be avoided, and direct mitigation measures would not be available. Groundwater users would be compensated by make good agreements. Make good agreements are currently regulated under the *Water Act 2000*. Conditions about make good agreements are not imposed in the environmental authority, which is issued under the *Environmental Protection Act 1999*. The content of make good agreements is a matter for negotiation between the proponent of the project and the affected groundwater users. Consequently, this EIS assessment report makes no recommendations about the amendment of existing make good agreements, or the content of new agreements.

After mining ceases, the water table is predicted to recover by about 75% within 10 years and reach equilibrium after about 50 years.

The final void would partially fill with water due to inflows of groundwater, but there is negligible risk that the void would fully fill and overflow. Evaporation will cause water quality in the final void's pond to gradually deteriorate over time and become more saline. However, evaporation would also cause the final void to act as a sink. Consequently, groundwater would flow into the void, and saline water would not percolate into surrounding aquifers.

The water level in the Precipice Sandstone and Callide Coal Measures would be permanently drawn down by about 5m close to the void. Several private bores would experience permanent drawdown of between 2m and 5m; a few bores would experience permanent drawdown of about 1m; others would effectively recover. The three springs are predicted to stop flowing due to drawdown of between 1.3m and 2.4m.

The EIS stated that groundwater monitoring would be conducted over the life of the mine to confirm the actual extent of groundwater impacts, validate the model predictions, and establish the basis for implementing the make good agreements with any affected groundwater users.

Recommended draft EA conditions for groundwater are in Appendix A of this EIS assessment report.

#### 4.8.8.3 Water licence

The inflows of groundwater to the pit will require the proponent to obtain a water licence under the *Water Act 2000*. The Department of Natural Resources and Mines has informed EHP that the water licence under the *Water Act 2000* will include conditions that require the proponent to gather additional data about inflows to the pit, and apply the groundwater model to the larger database to improve the predictions of impacts during mining and the subsequent recovery of the water table after mining ceases.

## 4.9 Air

### 4.9.1 Identified air environmental values

The EIS (p. 10-8, section 10.4, EIS, Feb 2014) said that the project's existing airshed 'is influenced by natural dust sources in the area as well as dust arising from grazing, ploughing and farming activities, mining operations at the existing Callide Mine, and power generation at Callide Power Station'.

The EIS used meteorological monitoring data from the Bureau of Meteorology (BOM) weather station at the Thangool Airport, which is approximately 26km south-east of the site, as characteristic of the climate in the region. That data was supplemented with meteorological data collected at the Boundary Hill Meteorological Station. Prevailing winds at the project area were described as moderate to strong from the north-east, and light to moderate from the south-east.

There are twelve potentially affected residential properties within the region, seven of which lie relatively close to the south-west of the proposed mine site—that is, downwind of the strongest prevailing winds. The closest residence is only 1.2km from the project area.

The EIS (2014) and EIS Addendum—Round 2 (2015) reported the results of air quality monitoring undertaken at up to eight sites around the project area, including sites close to the potentially affected residential properties, and for various periods between 1997 and 2013.

A summary of the background values of the air quality indicators from all available monitoring is presented in Table 4.3. The table also provides the relevant air quality objectives for comparison with the measured values.

**Table 4.3 Background air quality values**

Indicator	Averaging Period	Value from EIS	Value from EIS Addendum – Round 2	Air quality objective (source)
Total suspended particulates (TSP)	Annual	20.5µg/m <sup>3</sup>	23.0µg/m <sup>3</sup>	90.0µg/m <sup>3</sup> (EPP(Air ))
PM <sub>10</sub>	24 hour	20.4µg/m <sup>3*</sup>	13.3µg/m <sup>3**</sup>	50.0µg/m <sup>3</sup> (EPP(Air ))***
PM <sub>2.5</sub>	24 hour	10.2µg/m <sup>3</sup>	6.7µg/m <sup>3</sup>	25.0µg/m <sup>3</sup> (EPP(Air ))
PM <sub>2.5</sub>	Annual	5.1µg/m <sup>3</sup>	5.8µg/m <sup>3</sup>	8.0µg/m <sup>3</sup> (EPP(Air ))
Dust deposition	30 day	43.3µg/m <sup>3**</sup>	44.5mg/m <sup>2</sup> /day**	120mg/m <sup>2</sup> /day (recommended by EHP)

Source: Table 10-5, EIS, February 2014 and Table 10-3, EIS Addendum – Round 2, October 2015

Notes:

EPP(Air ) is the Environmental Protection (Air) Policy 2008

PM<sub>10</sub> refers to particles with a diameter of less than 10µm, while PM<sub>2.5</sub> refers to particles with a diameter of less than 2.5µm

\* 95% percentile monitoring data

\*\* 70% percentile monitoring data

\*\*\* Not to be exceeded more than five days per year

The background air quality assessment identified no exceedences of the air quality objectives.

#### 4.9.2 Potential impacts and proposed mitigation measures

The EIS (p. 10-16, section 10.5.1.2, Feb 2014) considered the following mining activities as potential sources of emissions to air:

- excavating overburden by dragline
- loading trucks with overburden using excavators and shovels
- dumping material on overburden dumps
- trucks hauling to, and returning from, overburden dumps
- loading trucks with coal using excavators and shovels
- trucks hauling coal to, and returning empty from, ROM dump
- dumping coal onto ROM dump and rehandling coal
- coal processing activities
- loading and unloading coal stockpiles
- loading trains at the load out facility
- wind erosion of ROM stockpile and overburden dumps
- dozers moving coal and overburden
- drilling and blasting activities
- topsoil scraping and grading.

Other activities at the mine would produce insignificant amounts of emissions to air.

Emission rates for the various activities listed above were estimated from well-established emission factors based on research published in reputable sources. By far the largest potential source of dust is the driving of haul trucks carrying waste rock and coal on unpaved roads. Other potentially significant sources include: use of a dragline to excavate waste rock; loading trucks with waste rock; dumping waste rock, and the subsequent reshaping of dumps by dozers; and wind erosion from active (i.e. not yet rehabilitated) waste rock dumps. Blasting would be a relatively minor source of dust overall, but may be intermittently significant when blasts occur.

Submissions on the EIS from some local landholders said they had experienced high deposition rates of dust at their properties. Furthermore, a short report on air quality provided to EHP by the proponent as supporting information to the EIS indicated that elevated levels of dust had been measured in the area. In response to questions about this, the proponent initially said simply that the high deposition levels were 'not indicative of background air quality'. EHP questioned that statement, and asked the proponent to explain how the high levels could not be indicative of the local background. The proponent responded with a detailed report (December 2015) that analysed dust deposition results over a 17 month period, from January 2014 to May 2015, at five dust measuring stations nearest to the mine site, and related the results to wind direction and known activities both on and off the existing mining lease.

There were 19 occasions during the reporting period when the wind was blowing from the existing Boundary Hill Mine towards a dust measuring station. On 16 out of the 19 occasions, the measured dust deposition was within the air quality objective. Furthermore, three out of the five measuring stations were always within the air quality objective when the wind was blowing from the mine towards the stations. Only on three occasions was there the possibility that dust generated by the mine had caused levels exceeding the objective (i.e. exceedences coincided with a wind direction from the mine). In contrast, there were 14 occasions when the dust deposition air quality objective was exceeded at one or other of the measuring stations, yet the wind was not blowing from the mine towards the measuring station. All five of the measuring stations experienced at least one such occurrence during the reporting period. The station with the most exceedences lies to the south-east of the mine—that is, prevalently upwind of the mine—and none of its exceedences occurred when the wind was blowing towards it from the mine. It seems reasonable to conclude that there are activities in the area other than mining that generate locally significant amounts of dust. The proponent's report noted that construction of a gas pipeline, agricultural ploughing, and traffic on local unsealed roads were among likely non-mining sources of dust during the reporting period. The report also



clarified that such locally anomalous sources of dust were the reason for the proponent's previous statement that the high deposition levels were 'not indicative of background air quality'.

The EIS modelled the expected dispersion of dust from the Boundary Hill South mine, and predicted ground level concentrations for the indicators mentioned in Table 4.3 above. The modelling took account of the mitigation measures already used at Callide Mine for those mining activities that are potentially significant sources of dust.

EHP initially had concerns about some of the inputs to the modelling. However, in their response to submissions, the proponent reassessed and repeated the modelling to EHP's satisfaction.

The prevailing winds would carry dust from the mine mainly to the west and south-west. Modelling indicated that mitigation measures currently used at the existing mine would not be sufficient to completely avoid impacts. That is, one of the residences (the EIS did not identify which) may experience dust deposition and PM<sub>10</sub> levels slightly above the air quality objectives in the later years of mining operations. However, if the additional measure of applying dust suppressant to the haul roads was used, modelling indicated the impact would be satisfactorily mitigated. The residential properties identified in the EIS as sites R\_8 and R\_3 would experience more dust than other nearby residences, but the mining activities should not cause dust deposition to exceed the air quality objectives.

The EIS (p.10-7, section 10.8.4, October 2015) proposed the following key mitigation measures for impacts on air quality:

- haul roads will be watered to minimise dust emissions and dust suppressants will be used, where necessary
- progressive rehabilitation will be conducted on available overburden emplacement areas
- inactive disturbed areas will be rehabilitated as soon as possible, considering operational needs.

Such measures are already used at the Callide Mine.

The EIS also said (p. 40, section 7.3.2, Appendix N, Feb 2014) that dust dispersion from the rail transportation of coal would continue to be managed by measures that meet the requirements of the Aurizon Coal Dust Management Plan.

In summary, the assessment of the EIS was that mitigation measures are available that should ensure that mining activities would not cause the air quality objectives to be exceeded at any residences at any time. However, residences may experience high dust levels from sources not associated with the mine.

#### **4.9.2.1 Monitoring and management plans**

It will be necessary for the proponent to monitor air quality to confirm the predictions of the EIS, and to have corrective actions ready to be applied if monitoring shows mining activities are causing an impact. For example, it is unlikely that dust suppressant will need to be applied to haul roads at all times, but it will need to be ready to go at short notice if monitoring shows an air quality objective is being exceeded and normal water spraying is not enough to achieve compliance.

The proponent intends to continue using their existing air monitoring program for the Boundary Hill South operations. The air monitoring program consists of a network of PM<sub>10</sub> monitors and dust deposition gauges close to residences in the vicinity of the mine. The air monitoring program also includes the Boundary Hill Meteorological Station, where weather conditions that would affect dust levels, such as wind speed, direction and temperature, are continuously monitored.

The existing mine has a Trigger Action Response Plan (TARP) in place. As the name suggests, the TARP details the triggers that would be used to start corrective actions in response to an impact, or potential impact, on the air environment. For example, a trigger might be wind above a certain speed and in a certain direction, with dust levels rising at a particular monitoring station. The triggered action might be increasing frequency of spraying water on haul roads or adding dust suppressant to the spray. The existing TARP will be amended so that it applies to the circumstances of the Boundary Hill South Mine. The TARP should function proactively with the goal of preventing problems and impacts from occurring, rather than being reactive to complaints from nearby residents.

Nevertheless, in case impacts on nearby residences do occur, the existing complaints management procedures used at the Callide Mine will be amended to apply to the Boundary Hill South Mine.

Other management measures for avoiding or mitigating impacts on air quality will be detailed in the amended environmental management plan (EM plan). Those measures may be adapted to the Boundary Hill South Mine from measures used at the existing mine.

#### **4.9.2.2 Summary of recommendations**

Mitigation measures used to manage air quality at the existing Callide Mine should be extended for use at the Boundary Hill South mine. The Trigger Action Response Plan, EM plan, complaints procedures, and air quality monitoring program should also be extended and adapted for use at the Boundary Hill South mine. Additional measures, such as dust suppressant for haul roads, should be used as necessary to ensure compliance with the environmental authority.

Additional dust deposition gauges should be set up at those PM<sub>10</sub> monitoring stations where they are not already present.

The conditions concerning air quality in Appendix A of this report are recommended for inclusion in the amended environmental authority for the project.

#### **4.9.3 Greenhouse gas emissions**

The EIS adequately addressed the terms of reference in its assessment of the potential greenhouse gas (GHG) emissions of the project in combination with the rest of the Callide Mine.

During the 2012–2013 reporting year, the Callide Mine produced GHG emissions equivalent to approximately 163,000 tonnes of carbon dioxide. Three activities at the mine together contributed 98.8% of the emissions. Those activities are: diesel use for transportation; diesel use for stationary machinery; and electricity consumption. All other activities at the mine contribute minor to negligible GHG emissions. Consequently, GHG reduction measures should concentrate on minimising diesel use and electricity consumption.

The EIS (p. 10-36, section 10.6.2, EIS, Feb 2014) proposed that GHG reduction measures already used at the Callide Mine would continue at the Boundary Hill South mine. Specifically, the proponent would minimise the number of vehicle trips that transport coal and overburden, and their mining method would use large equipment and economies of scale to minimise diesel and electricity usage by stationary equipment. While those measures would address the major sources of GHG emissions, other measures would nevertheless be used for minor sources. Such measures would include: recycling of refrigerants in equipment and air conditioning; segregation of recyclable and non-recyclable wastes; and minimising burning of green waste vegetation.

The proposed measures for the reduction of GHG emissions are considered adequate.

### **4.10 Noise and vibration**

#### **4.10.1 Identified acoustic environmental values**

The project is located in a rural area, where ambient noise sources include agricultural activities, road traffic and coal mining activities.

The EIS identified 10 sensitive receptors within 5km of the proposed mine. Sensitive receptors surrounding the project area are residential, where human health and wellbeing, and the amenity of the community were the values to be protected and preserved. The EIS stated that sensitive receptors have been identified in accordance with the Environmental Protection Noise Policy 2008 (EPP (Noise)). The sensitive receptors that have the potential to be affected by the Boundary Hill South project are listed in Table 4.4.

The EIS stated that background noise monitoring was conducted over approximately seven days between Monday, 25 June 2012 and Thursday, 12 July 2012 at sensitive receptors that are expected to experience the greatest noise impacts—specifically, locations R\_1, R\_3, R\_5, R\_8 and R\_10. The EIS stated that the noise measurements were undertaken in accordance with the Noise Measurement Manual (EHP 2013) and relevant International and Australian Standards. The measurements obtained by unattended monitors were occasionally checked against hand-held monitors to ensure they correlated satisfactorily and that the unattended monitoring data was reliable. Any noise monitoring data gathered during periods of rain was not included in the determination of background noise levels. The measured background noise levels are summarised in Table 4.5.

**Table 4.4 Sensitive receptors**

Site	ID	Shortest distance from project (km)	Direction from project
Lot 2 RP616094	R_1	3.5	south-east
Lot 1 RP616094	R_2	3.4	south-east
Lot 77 SP163782	R_3	1.2	south
Lot 1 RP618127	R_4	1.8	south-west
Lot 2 RP618127	R_5	1.9	west
Lot 3 RP618127	R_6	2.5	west
Lot 4 RP618127	R_7	2.5	west
Lot 96 RN418	R_8	2.0	west
Lot 100 RN423	R_9	3.2	west
Lot 4 SP199379	R_10	4.9	north-west

Source: Table 11-9, EIS, February 2014

**Table 4.5 Summary of background noise monitoring results**

Monitoring location	Rated background level, minLA90dB(A)		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
R_1 - 3.5km south-east from project area	28	22	23
R_3 - 1.2km south from project area	25	<15	<15
R_5 - 1.9km west of the project area	24	19	16
R_8 - 2.0km west of the project area	26	16	22
R_10 - 4.9km north-west of the project area	25	25	23

Source: Table 11-10, EIS, February 2014

The results indicate that the general noise environment around the proposed mine site is relatively quiet. However, the EIS (p.11-8, section 11.4, EIS, February 2014) noted that:

Noise from the existing Boundary Hill operations was audible for most of the night-time attended measurements and it dominated the background noise level at R\_1, R\_3 and R\_5. At all of these sites, noise from existing Boundary Hill activities could regularly be measured during periods of quiet background noise levels.

The  $L_{Aeq}$  levels measured during the night-time period were up to  $L_{Aeq}$  31 dB(A) at R\_5, with measured mine noise contributions of up to 33 dB(A). The noise measured could either be described as 'intermittent', where short periods of noise could be heard (i.e. loading of haul trucks) or 'continuous', where a noise source is constantly operating (i.e. hum from fixed plant operation). Specific activities such as the loading of haul trucks and plant operation were able to be identified during this time.

It is evident that the existing mine has a significant effect on the noise environment of the area, particularly during night-time. However, because of the way the average ( $L_{Aeq}$ ) noise level is measured and calculated, the intermittent

noises noted in the EIS contribute little to the  $L_{Aeq}$  value. An additional measure called  $L_{Amax}$  is needed to assess the impact of short periods of noise—this is discussed further in the next section of this report.

#### 4.10.2 Noise and vibration criteria for the operations

Mining at Boundary Hill South would include not only the operation of machinery, but also blasting to loosen overburden and coal before excavation. Furthermore, the proponent intends to operate the mine 24 hours each day. Consequently, to avoid impacts it would be necessary to have noise criteria that apply for different times of day, and have criteria for the effects of blasting—specifically, ground vibration and airblast overpressure (which is measure of the noise and pressure wave in the air that results from a blast).

Sleep disturbance is related to intermittent, short periods of noise as well as more continuous background noise. The parameter that describes the average continuous noise level is  $L_{Aeq,1\text{ hour}}$ , while the loudest short periods of noises above background are measured by a parameter known as  $L_{Amax}$ . Table 4.6 provides the criteria proposed in the EIS for  $L_{Aeq,1\text{ hour}}$  below which the large majority of people would not experience significant impacts. However, the EIS did not propose an  $L_{Amax}$  criterion for mitigating impacts due to brief, louder noise during night-time. The best practice criterion for  $L_{Amax}$  to avoid sleep disturbance is 42dB(A) indoor during night-time. Given that there is a typical reduction of 7dB between the outside and inside of a residence with the windows closed, the outdoor  $L_{Amax}$  criterion would be 49dB(A) during night-time (see Table 4.6).

Table 4.6 also provides criteria for ground vibration and airblast overpressure.

**Table 4.6 Noise and vibration criteria**

Issue	Time	Criteria to avoid impacts
External noise (average)	Day (7am–6pm)	45dB(A) $L_{Aeq,1\text{ hour}}$
External noise (average)	Evening (6pm–10pm)	40dB(A) $L_{Aeq,1\text{ hour}}$
External noise (average)	Night-time (10pm–7am)	35dB(A) $L_{Aeq,1\text{ hour}}$
External noise (max.)	Night-time (10pm–7am)	49dB(A) $L_{Amax}$
Ground vibration	At any time*	5mm/s peak particle velocity
Airblast overpressure	At any time*	115dB(Linear) for 9 out of 10 blasts 120dB(Linear) for any blast

\* Note: See the mitigation measures section below for information on when blasts may occur.

#### 4.10.3 Potential noise and vibration impacts and proposed mitigation measures

##### 4.10.3.1 Noise impacts

The EIS adequately addressed the final terms of reference with regard to noise. The EIS used a satisfactory model to make predictions of noise levels that would be experienced at sensitive receptors if no mitigation measures were used at the mine, and again if mitigation measures were applied. The modelling also took account of the range of weather conditions that may be experienced, including: a worst case with a temperature inversion; a neutral weather condition; and a prevailing wind towards sensitive receptors. For this project, all the sensitive receptors are rural residences.

The EIS predicted that during worst case weather conditions and without mitigation measures, the Boundary Hill South operations would result in average,  $L_{Aeq,1\text{ hour}}$  noise levels as much as 10dB above the criteria at three or four sensitive receptors. Furthermore, even during neutral weather conditions, average noise levels would be above the criteria at the Kilburnie Homestead. Consequently, it will be necessary for the proponent to take measures to reduce the emission and/or propagation of continuous noise, so that the criteria are met at all sensitive receptors.

Monitoring of the existing operations at the Callide Mine indicates that brief periods of noise (i.e. noises that would be measured by  $L_{Amax}$ ) have exceeded the 49dB(A) outdoor criterion during night-time by as much as 10dB. Given that the proposed Boundary Hill South operations would be closer to several sensitive receptors than the current operations, it is likely that noise impacts would cause sleep disturbance to nearby residents. Consequently, it will be necessary for the proponent to take action to avoid or adequately mitigate the impacts due to brief or intermittent noise.

#### **4.10.3.2 Blasting impacts**

The EIS provided a separate assessment of blast impacts that adequately addressed the issue.

Ten potential sensitive receptors were considered, at locations ranging from west of the proposed pit, through the south to the south-east.

The EIS predicted the ground vibration impact at all receptors, including the Kilburnie Homestead, would comply with the most stringent criterion of 5mm/s peak particle velocity. Consequently, ground vibrations from blasting are not expected to cause any significant impact.

The EIS also considered the effects of blasting on sound and shock waves through the air. The large majority of people consider an airblast overpressure of 115dB(Linear) to be tolerable, and it is typically only when the airblast overpressure exceeds 120dB(Linear) that people start to complain. The EIS predicted that if no mitigation is applied, blasting for most operational requirements (except when blasting the coal or partings in the pit) would cause the airblast overpressure at all or most receptors to exceed the most stringent criterion of 115dB(Linear). Furthermore, without mitigation, the airblast overpressure may even exceed the structural damage safe limit of 133dB(Linear) at the Kilburnie Homestead. Consequently, it will be necessary for the proponent to apply measures to mitigate the potential impacts of airblast overpressure.

Powerlink raised concerns in their submission about potential impacts from blasting on their infrastructure on the easement adjoining the project area. In response, the proponent has committed to consulting directly with Powerlink in relation to potential noise and vibration impacts to their infrastructure. Powerlink advised EHP that they were satisfied with the proponent's response.

#### **4.10.3.3 Mitigation measures for noise and airblast overpressure**

A variety of mitigation measures are available, which if applied effectively should reduce noise and airblast overpressure to within the acceptable criteria. Some measures are permanent or long-term, while others would be applied when certain circumstances occur, such as adverse weather conditions.

The permanent measures include the construction of a 10m high noise reduction bund of sufficient length along the southern boundary of the Callide Mine to shield the Kilburnie Homestead. That bund should be placed as close as possible to the homestead in order to provide maximum shielding. Modelling undertaken for the EIS predicted that this bund (in conjunction with other mitigation described below) would effectively reduce both the average ( $L_{Aeq,1\text{ hour}}$ ) noise level and the airblast overpressure at the homestead to with the respective criteria.

Long-term mitigation measures include the construction of 6m high noise reduction bunds to shield sensitive receptors to the south and south-west of the Boundary Hill South operations. Night-time dozer activities on overburden dumps, and front end loader activities at the coal stockpile, would only occur behind the bunds. These bunds may not be needed in later years of the operations when shielding would be provided by a spoil dump.

Other long-term operational measures are available to reduce noise impacts. The EIS (p. 29, section 8.2, Appendix 01, EIS, Feb 2014) proposed the following actions:

- maintaining the current speed limits for vehicles on internal roads
- scheduling noisy equipment movements, as much as possible, to avoid sensitive times
- ensuring all vehicle and plant operators are aware of the location of sensitive receptors and the measures required for limiting noise
- informing key stakeholders of when any specific activities that generate excessive noise may occur
- ensuring all vehicles, plant and machinery are regularly maintained to avoid unnecessary engine, motor or muffler noise.

In addition to the permanent and long-term measures, the EIS proposed that the proponent would use a Trigger Action Response Plan (TARP) to detail noise reduction measures that would be applied when certain circumstances occur. The triggers for action could be instigated by the project's own noise monitoring program, or by complaint from a nearby resident. The TARP would provide a range of actions for a variety of scenarios. The EIS (p.25, Response to EHP Noise Submission, Response to Public Submissions on the EIS–Round 2, October 2015) gave the following examples of scenarios and actions that could be included in the TARP:

The following scenarios for Year 1 and Year 4 mine design present an example action response plan under worst case weather conditions:

- Scenario 1
  - Turn off [stop] partings haulage and dozer at western dump
  - Turn off [stop] the pre-strip or coal haul route to BHN [Boundary Hill North]
- Scenario 2
  - Turn off [stop using] one excavator fleet (coal excavator plus trucks)
  - Continue mining with other fleet—Western dump partings haulage only
- Scenario 3
  - Turn off [stop using] one excavator fleet (pre-strip excavator plus trucks)
  - Continue mining with other fleet—BHN coal haulage only

An item that is listed as OFF will cease to operate on the specific task and wither be allocated to another activity or works will be postponed until operation can be undertaken in compliance with the Project noise criteria, e.g. a time period with a less stringent noise criteria or weather conditions less conducive to the propagation of sound.

The EIS (p. 29, section 8.2.2, Appendix O1, EIS, Feb 2014) proposed the following additional measures for the TARP:

- construction of a night tip-head berm for the western overburden dump, if required
- modification of surface level pre-strip activities if trigger conditions are reached
- substitution of machinery to reduce noise emissions (for example, use of rubber tyre dozer instead of track dozer).

However, the EIS did not deal adequately with the issue of mitigation of intermittent loud noises above the average level. Consequently, EHP will require the proponent's EM plan to address the monitoring of, and mitigation measures for, the control of intermittent loud noises during night-time. The EM plan must include an appropriate objective for  $L_{Amax,1}$  and include achievable operational measures that will ensure the objective is met.

With regard to blasting, the 10m bund noted above would serve a dual purpose by reducing airblast overpressure at the Kilburnie Homestead as well as ambient noise. The EIS (p. 11, section 6.1.2, Appendix O2, EIS, Feb 2014) noted that the existing mine has a Blast Management Plan. The plan should be reviewed and amended as necessary to ensure the relevant criteria are not exceeded at nearby residences. Essentially, the plan would require a combination of actions related to: the modelling and forecasting of blasting effects; the design and size of blasts; real time monitoring of blast to refine modelling; timing of blasts with reference to the time of day (i.e. periods when blasts are permitted); and weather conditions.

Additional noise mitigation measures would be available by personal agreement between the proponent and residents at sensitive locations. While agreements for mitigation work off the mining lease cannot be required by the environmental authority, it is not uncommon for proponents of mines to install, with the owner's consent, such things as double glazing, air-conditioners (allowing windows to be closed), and other means of achieving noise shielding within the resident's property.

#### **4.10.3.4 Noise monitoring**

The proponent intends to continue the noise monitoring program that is in place for the existing operations at Boundary Hill. The noise monitoring program will help the proponent plan mining activities to mitigate noise impacts and operate the Trigger Action Response Plan. Additional noise monitoring would be requested by EHP if a reasonable complaint was made by a nearby resident.

As noted above, the EIS stated (p. 12, section 6.3.4, Appendix O2, EIS, Feb 2014) that the proponent would 'continue its blast monitoring and forecasting system to manage blast impacts and determine compliance with the nominated criteria.'

#### 4.10.4 Recommendations

It is recommended that the draft environmental authority for the Boundary Hill South Project contain at least the noise conditions in Appendix A of this report. The recommended conditions state that blasting should not be allowed between 5pm and 9am on any day. The conditions also recommend limits for ground vibration and airblast overpressure. Prescriptive limits for noise are not included, rather the conditions recommend regulation based on ensuring the project does not cause environmental nuisance, which is in accordance with the department's strategy of outcome-based conditioning.

However, it is recommended that the EM plan include the  $L_{Aeq,1 \text{ hour}}$  criteria stated in Table 4.6 above, and an appropriate criterion for  $L_{Amax}$  during night-time.

### 4.11 Nature conservation

Chapter 12A of the EIS identified, described and assessed potential impacts of the Boundary Hill South project (the project) on terrestrial flora and fauna, including matters of state environmental significance (MSES), and matters of national environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) matters of national environmental significance (MNES).

Section 12A.4 described the existing environment, Section 12A.5 identified potential direct and indirect impacts of the project on terrestrial ecology values and Sections 12A.6 and 12A.7 proposed mitigation measures for impacts on biodiversity values. Section 12A.8 discussed environmental offsets for residual impacts that remain after avoidance and mitigation measures have been implemented.

Supporting information for terrestrial ecology assessments was provided in Appendix P2 Terrestrial Fauna Assessment and Appendix P3 Significant Impact Assessment.

Chapter 12B provided information on aquatic ecology assessment procedures. Section 12B.3 contained detailed descriptions of methods used to assess water quality, habitat condition (based on AUSRIVAS protocols) and to survey aquatic plants, macro invertebrates and fish species. Section 12B.4 described existing environmental values at the site. Sections 12B.5 and 12B.6 described the potential direct and indirect impacts of the project on aquatic ecology values and discussed mitigation measures. Detailed supporting information was provided in Appendix Q1 Aquatic Ecology Assessment.

Three EIS addenda provided additional information, responses to submissions, a Threatened Species Profile Report and revised conclusions about ecological impacts of the project on MSES and MNES.

Field surveys of terrestrial ecology were undertaken to ground truth desktop information, identify any additional flora and fauna values, and to target areas likely to have ecological value. Detailed ecological surveys included:

- flora surveys between 26 and 29 March (wet season), and 3 and 6 September (dry season) 2012
- fauna surveys between 17 and 21 April (early dry season) and 6 and 10 September (late dry season) 2012.

In addition, northern quoll reconnaissance surveys were done from 9 to 11 December 2011, and subsequent detailed surveys conducted from 7 to 16 August 2014 based on the *EPBC Act Referral Guidelines for the Northern Quoll*. Habitat assessments and searches for the koala were carried out between 2 and 6 September 2013.

Aquatic ecology was surveyed at seven sites within, upstream and downstream of the project area over 8 days in April 2012 (post-wet season) and September 2012 (pre-wet season). The survey area extended about 13km downstream to Callide Creek near Jambin.

#### 4.11.1 Existing environmental values

The project is located at the northern end of the Brigalow Belt South bioregion, at the interface of the Callide Creek Downs and Mount Morgan Ranges sub-regions. The bioregion is dominated by eucalypt woodlands and *Acacia spp.* forests, especially brigalow (*Acacia harpophylla*).

It is located in the Callide Creek sub-catchment in the Fitzroy Basin. The EIS identified a number of small, ephemeral creeks in the project area that flow into Callide Creek. Callide Creek flows north into the Don River, which then flows west into the Dawson River.

The EIS stated that the mean rainfall for the 2011-2012 wet season was slightly above average while the mean 2012 dry season rainfall was lower than average.

#### 4.11.1.1 Vegetation communities

The EIS stated that according to Queensland regional ecosystem (RE) mapping (version 9) the proposed mining lease area contains 195.4ha of remnant vegetation, 193.1ha of high value regrowth (HVR) vegetation and a further 240.5ha of pastures (non-remnant vegetation). Three REs were mapped within the project area:

- RE11.10.1: lemon-scented gum (*Corymbia citriodora*) and ironbark (*Eucalyptus crebra*) on medium to coarse-grained sediments (usually sandstone) on hills and ranges (70.6ha)
- RE11.9.9: ironbark (*E. crebra*), grey bloodwood (*C. clarksoniana*) and peppermint (*E. exserta*) on fine-grained sedimentary rocks (120.5ha)
- RE11.3.25: blue gum (*E. tereticornis*) along ephemeral watercourses and creeks (4.3ha).

These REs have 'least concern' status under the *Vegetation Management Act 1999* (VM Act). RE11.3.25 is classified as 'of concern' in the Department of Environment and Heritage Protection's (EHP) Biodiversity Status mapping.

The EIS stated the vegetation with the most significant floristic values is mapped within RE11.3.25 and RE11.10.1. RE11.3.25 is associated with an ephemeral watercourse and is a 'Category C' Environmentally Sensitive Area.

No threatened ecological communities under the EPBC Act were found during surveys and none were considered likely to occur.

#### 4.11.1.2 Terrestrial flora species

No flora species listed under the *Nature Conservation Act 1992* (NC Act) were found within the project area. However, EIS surveys cannot be exhaustive, and numerous threatened flora species may occur based on presence of habitat (Table 4.7).

**Table 4.7 Threatened flora species that may occur within the project site.**

Species	Threat category	
	NC Act	EPBC Act
Pedley's wattle ( <i>Acacia pedleyi</i> )	vulnerable	
<i>Acacia spania</i>	near threatened	
rough alyxia ( <i>Alyxia sharpei</i> )	near threatened	
<i>Bertya opponens</i>		vulnerable
native frangipani ( <i>Cerbera dumicola</i> )	near threatened	
<i>Cycas megacarpa</i>	endangered	endangered
large-podded trefoil ( <i>Desmodium macrocarpum</i> )	near threatened	
bluegrass ( <i>Dichanthium setosum</i> )	near threatened	vulnerable
<i>Grevillea hockingsii</i>	vulnerable	



Species	Threat category	
	NC Act	EPBC Act
Grove's paperbark ( <i>Melaleuca groveana</i> )	near threatened	
lesser swamp-orchid ( <i>Phaius australis</i> )	endangered	endangered
austral cornflower ( <i>Rhaponticum australe</i> )	vulnerable	vulnerable
<i>Polianthion minutiflorum</i>	vulnerable	vulnerable
Quassia ( <i>Samadera bidwillii</i> )	vulnerable	vulnerable

Twenty seven introduced flora species were recorded during surveys including the prickly pear (*Opuntia* sp.) and two species of lantana (*Lantana camara* and *L. montevidensis*). These species are declared species under the *Land Protection (Pest & Stock Route Management) Act 2002* (LP Act). Several other environmentally significant weeds that are not declared weeds under the LP Act were recorded within the project area including buffel grass (*Pennisetum ciliare*), Indian couch (*Bothriochloa pertusa*) and green panic (*Megathyrsus maximus* var. *pubiglumis*).

The EIS assessed bioregional corridors and habitat connectivity and found no bioregional corridors occur over the project area. A state significant corridor under the Brigalow Belt North Biodiversity Planning Assessment was identified north east of the project area.

#### 4.11.1.3 Terrestrial fauna species

The EIS stated that a total of 107 fauna species were recorded during field surveys, including 68 bird, three amphibian, 10 reptile and 26 mammal species with five additional mammal species possibly present.

The squatter pigeon was the only vulnerable species (NC Act and EPBC Act) found during surveys. The black-chinned honeyeater (*Melithreptus gularis*) and little pied bat (*Chalinolobus picatus*) (NC Act, near threatened) were also confirmed as present.

To support the fauna assessment, the EIS used a likelihood-of-occurrence assessment (see section 3.4 of the EIS Addendum, Part B, Appendix P, Terrestrial Ecology Report) to decide which NC Act and EPBC Act threatened species may occur in the project area. The following categories of likelihood-of-occurrence were used:

**Present**—species recorded during surveys.

**High**—species not recorded during surveys, but known to occur in the surrounding area, and habitat of suitable quality exists.

**Moderate**—species not recorded during surveys, although known to occur in the wider region. Habitat was identified in the study area, but it was considered marginal, fragmented and/or small or degraded.

**Low**—species not recorded during surveys, and due to lack of, or extremely poor quality, habitat in the study area they are not expected to occur; unlikely to occur in the wider region.

Table 4.8 shows the endangered and vulnerable species that were either confirmed as present, or considered to have a high or moderate likelihood of occurring in the project area.

The square-tailed kite (*Lophoictinia isura*) (NC Act, near threatened) was considered likely to occur. In addition, the echidna (*Tachyglossus aculeatus*), a special least concern species under the NC Act was recorded in the project site.

A scat was found less than one kilometre from the project area that may have been from a quoll, but it could not be positively identified. The original EIS stated that suitable quoll habitat occurs across about half of the project site (200ha), and it was appropriate to assume that the species occurs in the area.

Koalas were not found during surveys, but suitable habitat was identified to the east of the project area and in the south-west corner of the project site.

**Table 4.8 Endangered and vulnerable fauna species that are present, or considered likely to occur in the project area**

Species	Threat status	
	NC Act	EPBC Act
collared delma ( <i>Delma torquata</i> )	vulnerable	vulnerable
yakka skink ( <i>Egernia rugosa</i> )	vulnerable	vulnerable
Australian painted snipe ( <i>Rostratula australis</i> )	vulnerable	endangered
red goshawk ( <i>Erythrotriochis radiatus</i> )	endangered	vulnerable
southern squatter pigeon ( <i>Geophaps scripta scripta</i> )	vulnerable	vulnerable
northern quoll ( <i>Dasyurus hallucatus</i> )		endangered
koala ( <i>Phascolarctus cinereus</i> )	vulnerable	vulnerable
grey-headed flying-fox ( <i>Pteropus poliocephalus</i> )		vulnerable
large-eared pied bat ( <i>Chalinolobus dwyeri</i> )	vulnerable	vulnerable
south-eastern long-eared bat ( <i>Nyctophilus corbeni</i> )	vulnerable	vulnerable

The northern extent of the core range of the grey-headed flying-fox is approximately Miriam Vale on the Queensland coast. However vagrants are known as far north as Yeppoon and will range in sub-coastal areas to forage. The site may offer occasional foraging opportunities, but it is unlikely. Although there is suitable woodland forests on the project site, EHP considers that the site does not contain important habitat for this species.

Fauna habitat maps were produced to complement fauna surveys, to describe potential species occurrence, and to help with impact assessment (see section 3.3 of the EIS Addendum Part B, Appendix P, Terrestrial Ecology Report). Maps of high quality, low quality, or unsuitable habitat were produced for threatened species that were considered likely to occur in the project area based on criteria including, but not limited to, species records, RE mapping, topography, and the presence of threats, permanent water sources and preferred food plants.

Mapped habitat categories included:

**High value**—habitat containing resources of high value essential for the persistence of the species. Examples include core breeding habitats around permanent water, and REs containing primary food plants that are essential for a species existence.

**Low value**—habitat containing resources that may be used on occasion for foraging or dispersal, but which are not essential for the species's existence.

**Unsuitable**—habitats consisting of vegetation and other habitat features unlikely to be used or inhabited by the species.

Based on the habitat mapping approach, the project site was considered to be either low quality or unsuitable habitat for all threatened species listed in the table above, except the squatter pigeon. Low quality habitat included areas of remnant vegetation and surrounding areas of semi-cleared, non-remnant vegetation. Areas totally cleared of woody vegetation were classified as unsuitable habitat. The EIS identified high value squatter pigeon habitat in the north of the mining lease, part of which would be impacted by the spoil dump.

#### 4.11.1.4 Migratory species

The EIS identified thirteen migratory species that could possibly occur within the project area, based on available habitat, including the Australian painted snipe (*Rostratula australis*) (NC Act, vulnerable; and EPBC Act, endangered).

#### 4.11.1.5 Introduced fauna

The EIS identified the following pest species during field surveys:

- cane toad (*Rhinella marina*)
- dingo (*Canis lupus dingo*)/dog (*Canis familiaris*)
- cat (*Felis catus*)
- rabbit (*Oryctolagus cuniculus*)
- pig (*Sus scrofa*)
- European fox (*Vulpes vulpes*).

#### 4.11.1.6 Aquatic ecology

The EIS stated that the condition of aquatic habitat in the study area was mostly moderate, with low streamside cover and low habitat diversity. These results were consistent with state of the rivers reports from the broader Dawson River sub-catchment (Telfer 1995<sup>1</sup>, Van Manen 2005<sup>2</sup>). Native grasses and eucalypt trees typically dominated the riparian vegetation at all survey sites. The in-stream habitats at most sites were dominated by small pools and had low cover of woody debris and overhanging bank vegetation.

Water quality parameters (pH, turbidity, dissolved oxygen (DO) and electrical conductivity (EC) varied (relative to water quality objectives (WQO) of the Fitzroy Basin) at the different sample sites. Both pH and turbidity were below WQOs in the post wet season surveys. EC was above the WQO in post-wet season surveys and DO was both above and below the WQO at different sites.

Aquatic plant and animal biodiversity was low and dominated by species that are tolerant of varying and often harsh conditions. These conditions are typical of ephemeral waterways.

A total of 26 aquatic plant species were recorded during field surveys, none of which are threatened under the NC Act or EPBC Act.

Macroinvertebrates were sampled from stream bed and stream edge habitats. They were less abundant in bed habitat and more, or equally, abundant in edge habitats than at reference sites for the catchment monitored by the Department of Natural Resources and Mines (DNRM). Macroinvertebrate taxonomic richness was below the WQO in bed habitat and within range in the edge habitat. However, richness was below that found at DNRM reference sites for all survey sites.

'PET richness' is an indicator of the richness of stonefly, mayfly and caddisfly species in a stream. These PET groups (Plecopterans, Ephemeropterans and Trichopterans) are considered to be sensitive to changes in their environment. PET richness in bed habitats was much lower in the survey sites than DNRM reference sites. In edge habitats, PET richness varied, with some sites within the WQO and others below.

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<sup>1</sup> Telfer, D., 1995, State of the Rivers, Dawson River and Major Tributaries, report prepared for Department of Natural Resources and Mines.

<sup>2</sup> Van Manen, N., 2005, State of the Rivers – An Ecological and Physical Assessment of the Condition of Streams in the Fitzroy River, Isaac River and Capricorn Coastal Catchments, Department of Natural Resources, Brisbane.

The EIS stated that five fish species were caught in field surveys, out of a total of 42 species that occur in the Fitzroy Basin. The only exotic species caught was the mosquito fish (*Gambusia holbrooki*). Abundance and species richness of fish were both low.

The EIS stated that the freshwater waterways of the survey area may provide breeding and dry-season refuge habitat for macroinvertebrates and fish, and therefore are likely to contribute to the success of downstream populations through movement and migration, or both. However, it is more likely that downstream sites will be used for breeding and refuge, as they are more likely to retain water.

The EIS stated that no NC Act or EPBC Act listed species of aquatic plants or animals were recorded within, or are likely to occur in, the waterways of the project area.

#### **4.11.1.7 Stygofauna**

The sampling methodology for the stygofauna pilot study was in accordance with current best practice, which is the Western Australian Environmental Protection Authority's *Guidance for the Assessment of Environmental Factors No.54a* (August 2007) (the Western Australia guidelines).

Stygofauna samples were collected in May 2012 from eleven bores inside and nearby the project area. All bores, with the exception of Bore 2, sampled the Biloela Formation, which is the formation at or near the surface of the project site. Bore 2 sampled the shallow alluvium that in some parts of the site overlies the Biloela Formation. However, as noted in the water resources section of this report, the shallow alluvium is largely unsaturated and dry.

The EIS stated that one cyclopoid copepod was caught at a bore approximately 1.5km outside the project area within the Biloela Formation. No stygofauna were caught inside the project area, or at Bore 2 within the alluvial aquifer. Cyclopoid copepods are stygoxenes, and not considered to be dependent on groundwater ecosystems. Cyclopoid copepods are widespread and are known from both groundwater and surface water ecosystems across Australia. Copepods have also been reported elsewhere in the Fitzroy Basin.

Based on the pilot study, the EIS concluded that the population of stygofauna in the project area is not likely to be significant, so no further studies are required, which is in accordance with the Western Australian guidelines.

EHP considers the study was adequate.

#### **4.11.2 Potential impacts**

The EIS identified that clearing vegetation will have the following direct impacts on terrestrial fauna and flora:

- removal of threatened fauna habitat
- removal of threatened flora
- habitat fragmentation
- fauna mortality.

In addition, the project may have the following potential indirect impacts on flora and fauna:

- spread of introduced plants and plant diseases
- greater impact of pest fauna
- increased incidence and intensity of fire
- dust generation
- erosion, sedimentation and contamination
- light, noise and vibration disturbance
- night-time works.

##### **4.11.2.1 Impacts on vegetation communities**

Initial EIS studies involved field verification of the extent of remnant vegetation and the RE types in the project area. The results of this field work were submitted to the Queensland Herbarium, and recommendations that were

supported by sufficient information were included in the Queensland Government's current mapping (version 9) of REs and remnant vegetation. That vegetation mapping was used to calculate the extent of project impacts on habitat of threatened species. Table 4.9 shows the REs occurring in the project site and areas that will be disturbed by mine development, derived from digital maps provided in the EIS and current Queensland government RE mapping.

**Table 4.9 Vegetation communities in the mining lease area**

Vegetation Community	RE	VM Act	Biodiversity Status	Area (ha) in project area	Area (ha) to be removed
Blue gum ( <i>E. tereticornis</i> ) along ephemeral watercourses creeks.	11.3.25	least concern	of concern	3.52	1.25
Ironbark ( <i>E. crebra</i> ), grey bloodwood ( <i>C. clarksoniana</i> ) and peppermint ( <i>E. exserta</i> ) on fine-grained sedimentary rocks.	11.9.9	least concern	no concern	105.91	100.6
Lemon-scented gum ( <i>Corymbia citriodora</i> ) and ironbark ( <i>E. crebra</i> ) on medium to coarse-grained sediments (usually sandstone).	11.10.1	least concern	no concern	68.82	8.32
<i>E. melanophloia</i> open woodland on Cainozoic igneous rocks.	11.8.4	least concern	no concern	16.21	9.55
<i>E. moluccana</i> or <i>E. macrocarpa</i> or <i>E. woollsiana</i> open forest on fine-grained sedimentary rocks.	11.9.13	of concern	of concern	10.27	1.41
HVR of RE 11.10.1	11.10.1	least concern	no concern	68.2	3.6
HVR of RE 11.9.9	11.9.9	least concern	no concern	124.8	93.2
Non-remnant pasture—open grassland/pasture.				240.6	192

Source: EIS spatial files of the lease and its disturbance footprint, and state government vegetation mapping

#### 4.11.2.2 Impacts on terrestrial flora species

No threatened flora species were found during surveys and none are considered likely to occur.

The original EIS identified potential impacts on *Desmodium macrocarpum* as a result of clearing RE11.10.1. However, this species is not listed as threatened under the NC Act at the time of writing the assessment report.

#### 4.11.2.3 Impacts on terrestrial fauna species

The EIS stated that the main impact of the project on fauna species would be from the clearing, fragmentation and modification of fauna habitat.

#### Impact assessment

For species listed under the EPBC Act, the significance of project impacts was assessed using the EPBC Act Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (Department of the Environment 2013), which this report will refer to as the EPBC Act significant impact guidelines.

The EIS determined whether impact assessment for a species was necessary based on its likelihood-of-occurrence and the degree of habitat loss resulting from the project (see Table 3.6 EIS Addendum Part B Appendix P Terrestrial Ecology Report). Impact assessment was carried out for all species that were confirmed as present. For species that

had a high likelihood of occurrence, impact assessment was carried out if the project resulted in habitat loss. For species with a moderate likelihood of occurrence, impact assessment was deemed necessary only where the project would result in significant habitat loss.

Table 4.10 lists areas of habitat for the endangered and vulnerable species that were either confirmed as present or considered to have a high or moderate likelihood of occurring in the project area.

**Table 4.10 Threatened fauna known or likely to occur on site and areas of habitat**

Species	Area (ha) total	Area (ha) remnant vegetation	RE description	Area (ha) non-remnant vegetation
collared delma	9	9	11.10.1	0
grey-headed flying-fox <sup>1</sup>	224	121	11.10.1/11.9.9/11.8.4	103
northern quoll <sup>1</sup>	266	121	11.10.1/11.9.9/11.8.4	144
koala	257	113	11.10.1/11.9.9/11.8.4	144
red goshawk	266	121	11.10.1/11.9.9/11.8.4	144
yakka skink	110	110	11.9.9/11.8.4/11.3.25	0
large-eared pied bat	224	121	11.10.1/11.9.9/11.8.4	103
south-eastern long-eared bat	224	121	11.10.1/11.9.9/11.8.4	103
squatter pigeon	266	121	11.10.1/11.9.9/11.8.4	144

1. Listed as threatened under the EPBC Act only

The EIS described the areas of habitat in Table 4.10 as low quality habitat, and concluded that the project would not have a residual impact on these species. The rationale provided for this conclusion is that there are no important populations of the species on the site and that the areas to be cleared are not important habitat because the EIS assessments classified them as low value habitat.

EHP considered all the information provided in the EIS and addenda, and advice provide by the Commonwealth Department of the Environment (DOE). EHP accepted the proponent’s assessment that the project would not significantly impact on the collared delma, grey-headed flying-fox, red goshawk, yakka skink and the large-eared pied bat. However, in accordance with the advice provided by DOE, EHP concluded that the project would have a significant impact on habitat of the squatter pigeon, northern quoll, koala. EHP also concluded that the project would have a significant impact on habitat of the south-eastern long-eared bat.

The EPBC Act significant impact guidelines (pp.9-10) state that an action is likely to have a significant impact on an endangered or vulnerable species if there is a real chance or possibility that it will:

- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- adversely affect habitat critical to the survival of a species (foraging, breeding, roosting, or dispersal habitat)
- interfere with the recovery of a species (interfere **substantially** for vulnerable species).

For impacts to be significant the EPBC Act significant impact guidelines do not require the presence of an important population. The squatter pigeon was recorded on site, and the close proximity of known records of the northern quoll and koala highlights that suitable habitat on the project site is part of broader habitat in the local area. In addition, individuals of the genus *Nyctophilus* were recorded on site and foraging and roosting habitat exists across the

project area for the south-eastern long-eared bat. The removal and fragmentation of this contiguous habitat is considered likely to decrease the availability of habitat and contribute to the decline of these species.

The echidna, a special least concern species under the NC Act, was also confirmed as present on the site. About 121ha of remnant vegetation was identified as echidna habitat. The Queensland Environmental Offsets Policy Significant Residual Impact Guideline 2014 (QEOP significant impact guideline) states that an action is likely to have an impact on a special least concern species if it may cause:

- a long-term decrease in the size of a local population, or
- a reduced extent of occurrence of the species, or
- fragmentation of an existing population, or
- result in genetically distinct populations forming as a result of habitat isolation, or
- disruption to ecologically significant locations (breeding, feeding or nesting sites) of a species.

However, the EIS stated that the project is unlikely to result in any of those impacts because there is a large amount of echidna foraging habitat in areas adjacent to the site. EHP is satisfied that if the proposed biodiversity management plan for the site puts in place measures to minimise mortality of the echidna, along with other species, and if habitat areas to be retained are managed to the benefit of the species, the impacts on the local population can be satisfactorily mitigated.

The Australian painted snipe was assessed as having a moderate likelihood-of-occurrence in the project site, but the area affected by the mine development is small and the residual impact was not considered to be significant according to the definitions in the EPBC Act significant impact guidelines.

**4.11.2.4 Potential impacts on aquatic ecology**

Table 4.11 shows mining activities that may cause impacts on aquatic ecology (see section 12B.5.1.1, EIS, April 2014).

**Table 4.11 Summary of potential impacts of the project on aquatic ecology values**

Activity/Element	Potential impacts
Operation and maintenance of vehicles and other equipment during construction and operation.	Litter, waste, fuel and lubricant spills entering watercourses.
Vegetation clearing and earthworks for construction of the mine pit and associated infrastructure.	Increased turbidity and sedimentation Input of nutrients or other contaminants Decreased habitat for aquatic fauna
Management of water resources—construction and operation of sediment dams and levees, and controlled releases of mine affected water.	Decreased water quality Loss of catchment area Changes to flow regime that may affect fauna (including fish breeding cues)
Excavation of the mine pit and construction of associated infrastructure.	Loss of catchment area, leading to: <ul style="list-style-type: none"> <li>• changes to flow regime that may affect fauna (including fish breeding cues)</li> <li>• decreased habitat for aquatic fauna.</li> </ul>

Activity/Element	Potential impacts
Construction and operation of creek crossings, such as haul roads.	Increased turbidity Sedimentation Decreased habitat through erosion Obstruction of fish passage

The EIS stated that considering all the proposed activities, construction of the open cut mine and haul road may result in the greatest impact on the aquatic environment. However, the potential impacts of these activities can be mitigated by measures to manage flow regimes, fish migration and sediment transport.

#### 4.11.2.5 Potential impacts on stygofauna

Based on hydrogeological modelling, the EIS stated that there would be a decrease in groundwater levels at and within 5km of the site. The pilot study described above found no significant stygofauna communities in the project area. The nearest likely occurrence of stygofauna communities would be in the alluvial deposits along Campbell (Gate) Creek to the west of the project area. The project is not expected to significantly impact on groundwater in those alluvial deposits, and there would be no consequential impact on stygofauna communities. Consequently no project specific mitigation measures will be required for stygofauna.

### 4.11.3 Mitigation measures

#### 4.11.3.1 Terrestrial environments

Table 4.12 summarises the general measures proposed by the proponent to avoid and mitigate impacts on terrestrial biodiversity values caused by clearing vegetation.

**Table 4.12 Potential impacts on terrestrial biodiversity and proposed mitigation measures**

Potential impact	Mitigation measures
Clearing and fragmentation of vegetation <ul style="list-style-type: none"> <li>• loss of habitat</li> <li>• loss of connectivity</li> <li>• edge effects</li> </ul>	Minimise vegetation and habitat loss <ul style="list-style-type: none"> <li>• limits of clearing delineated and marked clearly</li> <li>• native vegetation beyond limits of clearing left undisturbed</li> <li>• ancillary facilities located in cleared areas</li> <li>• clearing undertaken sequentially according to Permit to Disturb process</li> <li>• worker briefings on care and conservation of native vegetation</li> </ul> Vegetation conservation and management of retained native vegetation <ul style="list-style-type: none"> <li>• implement measures to manage weeds and feral animals</li> <li>• implement grazing management</li> </ul> Mine rehabilitation <ul style="list-style-type: none"> <li>• progressive rehabilitation during the life of the mine</li> <li>• staged rehabilitation of all disturbed areas</li> <li>• re-create and establish self-sustaining post-mining landscape</li> <li>• use local provenance plant species and seeds collected in study area</li> <li>• topsoil translocated from proposed mine to conserve native seed bank</li> <li>• implement Rehabilitation Management Plan</li> </ul>



Potential impact	Mitigation measures
Fauna mortality	<p>Pre-clearing surveys</p> <ul style="list-style-type: none"> <li>• prepare an inventory of trees and hollows to be removed before clearing</li> <li>• check hollow bearing trees for presence of fauna</li> <li>• safely remove fauna before clearing and relocate to adjacent woodland</li> <li>• nest boxes and salvage tree hollows provided in adjacent woodland to compensate for removal of hollows</li> <li>• boulders and large logs placed in adjacent areas of native vegetation</li> <li>• spotter-catcher with appropriate permits present at all times</li> </ul>

Source: section 12A.7, EIS, April 2014

The other Anglo American mining operations in the area use a range of management plans to protect environmental values and monitor potential environmental impacts including:

- Species Management Plan (SMP)—management of potential impacts on animal breeding places, particularly threatened species
- Vegetation Management Plan (VMP)—minimising impacts on remnant vegetation and biodiversity values
- Rehabilitation Management Plan (RMP)—progressive rehabilitation of the mine site
- Weed and Feral Animal Control Plan (WFACP)—management of risks associated with the introduction and spread of weeds and feral animals throughout the construction, operation and rehabilitation phases of the project life, specifically high biosecurity risk species
- Fire Management Plan (FMP)—provides strategies, plans and processes for the management of fire at the Callide Mine.

The EIS proposed updating these management plans to cover the project area throughout the design, construction and operational phases of the mine.

#### 4.11.3.2 Aquatic environments

Table 4.13 summarises the general measures proposed by the proponent to avoid or mitigate impacts on aquatic environments as a result of project construction.

**Table 4.13 Potential impacts on the aquatic environment and proposed mitigation measures**

Potential impact	Mitigation measures
Spills of fuel and other contaminants	<p>Provide storage areas for potentially hazardous materials that are adequately signed and comply with relevant Australian standards ensuring they are:</p> <ul style="list-style-type: none"> <li>• sufficiently bunded to minimise potential for leaks</li> <li>• managed in accordance with existing spills management procedures.</li> </ul>
Vegetation clearing and earthworks	<p>For land scheduled to be cleared:</p> <ul style="list-style-type: none"> <li>• avoid unnecessary exposure of alkaline or sodic soils and minimise exposure time</li> <li>• restrict vegetation clearing to minimum area required for project works</li> <li>• slash grass cover instead of clearing (where possible)</li> <li>• install drainage and erosion control measures prior to, or as soon as possible after, clearing</li> <li>• prevent stormwater flowing over cleared land</li> <li>• direct stormwater around stockpiled materials using diversion drains, contour banks, and catch drains</li> <li>• revegetate exposed soils, including stockpiles, as soon as practicable after works are completed</li> </ul>

Potential impact	Mitigation measures
Management of water resources	Update existing site Water Management Plan to include project site water management controls that will address surface water quality, drainage patterns and sediment movements.
Loss of catchment area and change to flow regimes <ul style="list-style-type: none"> <li>reduction in water availability to Campbell (Gate) Creek</li> </ul>	Supplementary water release to Campbell (Gate) Creek would be considered from on-site storages. Where stream diversions or levees are considered necessary, the areas downstream should be monitored for scour and erosion and, if detected, appropriately designed measures would be put in place to prevent further occurrence.
Obstruction of fish passage	A waterway barrier works permit under the <i>Fisheries Act 1994</i> may be required for the haul road crossing of Campbell (Gate) Creek. Specific requirements for fish passage would be investigated once detailed design of the haul road has commenced

Source: section 12B.6, EIS, April 2014

The EIS stated that monitoring would be necessary to ensure that operational plans are effective at reducing potential impacts on aquatic ecology. The proponent proposed the following three monitoring programs to address the surface water components:

- background water quality sampling
- site water quality sampling
- Receiving Environment Monitoring Program—monitor downstream surface waters to identify any variation in water quality.

#### 4.11.4 Matters of State Environmental Significance

The EIS assessed the potential impacts of the project on Prescribed environmental matters (Matters of State Environmental Significance (MSES)) listed in Schedule 2 of the Environmental Offsets Regulation 2014 (EO Regulation). Under Schedule 1 of the EO Regulation, a resource activity carried out under an environmental authority under the EP Act 1994 is a Prescribed Activity for the purposes of the *Environmental Offsets Act 2014* (EO Act).

The EO Act requires offsets to compensate for residual impacts on MSES. The EIS identified the following two prescribed environmental matters under the EO Act that occur on the project site:

- regulated vegetation (vegetation within a defined distance from defining banks of a relevant watercourse)
- protected wildlife habitat (habitat for an animal that is endangered or vulnerable wildlife or special least concern animal)

##### Regulated vegetation

Within the project footprint, 1.9ha of vegetation occurs within 25m of a 'stream order 1' watercourse. The QEOP significant impact guideline sets a 2ha threshold for significant impacts on regulated vegetation. Therefore, EHP is satisfied that the project would not have a significant impact on regulated vegetation.

##### Protected Wildlife Habitat

The squatter pigeon (vulnerable) and the echidna (special least concern) were both recorded on site during EIS surveys. Individuals of the genus *Nyctophilus* were recorded during surveys but no further work was done to determine whether vocalisations were from the south-eastern long-eared bat.

As discussed in section 4.11.2.3, EHP concluded that the project would have a significant residual impact on the squatter pigeon and the south-eastern long-eared bat. Under the QEOP significant impact guideline, EHP concluded

that the project would impact on these species on the basis that it would lead to a long-term decrease in the size of a local population, interfere with the recovery of the species, and disrupt ecologically significant locations (breeding and feeding).

EHP accepted the EIS's conclusion that the project would not result in a significant residual impact on the echidna, provided avoidance and mitigation measures were put in place.

### **MSES Offsets**

Offsets are applicable for the project under the Queensland EP Act and EO Act for the unavoidable clearing of habitat for protected wildlife species listed in Table 4.8.

However, Section 14 of the EO Act states that the administering agency must consider any offset condition that has been imposed under another Act. Therefore, because the Australian Government will impose a condition requiring offsets for substantially the same matters, the proponent will not be required to provide offsets again under the EP Act. The offset strategy to be developed by the proponent will propose offsets consistent with the requirements of the EPBC Act, which will effectively account for offsets required under the EP Act.

### **4.11.5 Matters of National Environmental Significance**

The submitted EIS included an assessment of the potential impacts of the project on MNES under the EPBC Act. All the species listed in Table 4.8 (section 4.11.1.3) are MNES.

Appendix B provides a detailed summary of MNES values, impact assessment, conclusions and recommendations regarding environmental offsets. Appendix B is a stand-alone component of the EIS assessment report that has been prepared in accordance with section 59 of the EP Act. It addresses the requirements of section 9 of the EP Regulation and 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. Appendix C, Species profiles, provides detailed descriptions of the threatened fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that have the potential to be impacted by the Boundary Hill South Project.

In summary, EHP determined that:

- There are no threatened ecological communities that would be impacted by the project.
- The project would not result in significant residual impacts on groundwater dependent ecosystems.
- Impacts on threatened species and migratory species may be accepted, but would require offsets in the case of the squatter pigeon, northern quoll, koala and south-eastern long-eared bat.

The rationale for offset requirements for the threatened species is that an action is likely to have a significant impact on an endangered or vulnerable species if there is a real chance or possibility that it will:

- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline
- adversely affect habitat critical to the survival of a species.

(Refer to the EPBC Act significant impact guidelines, pp.9-10).

Refer to Appendix B for a detailed assessment of MNES values (including species profiles), project impacts and offset obligations.

### **4.11.6 Major issues**

#### **4.11.6.1 Northern quoll management**

The proponent was asked to clarify management outcomes for the quoll management area that they proposed for the northern part of the site. In particular, DOTE asked why the EIS considered that habitat in the southwest of the site to be only isolated fragments. An alternative view is that the project would fragment potentially significant quoll habitat. DOTE requested a new impact assessment that addressed the impact guidelines/recovery plan criterion of a 10ha threshold of disturbance (the original EIS stated that the project will clear 47ha).

The response stated that there is unlikely to be any high value habitat in the project site due to extensive clearing

and grazing and the presence of high densities of cane toads, cats and foxes. The EIS further stated that survey work captured no quolls in and adjacent to the project site. For these reasons, the EIS concluded that the project would not have a significant impact on the quoll, and no offsets were proposed.

The northern quoll is endangered nationally and is by definition uncommon. An individual was captured in 2012 in a highly disturbed environment at the Callide Power Station 12km south east of the project area. The capture site and the Boundary Hill South project area are connected by the Callide Timber Reserve, situated in a network of large tracts of remnant vegetation. The EPBC Act referral guidelines for the northern quoll, *Dasyurus hallucatus*, state that a population of northern quoll is presumed to occur in any area with recent evidence of a single animal. Due to the significant connection of remnant vegetation in the area, for the purposes of the referral guidelines it can be assumed that there is a local population adjacent to the project area to which the remnant vegetation in the project area is connected.

As mitigation for possible project impacts, the original EIS proposed a quoll management plan (QMP) focussing on areas of potential good quality habitat along the creek lines in the north of the project site. However, in the EIS Addendum the quoll habitat mapping was changed, and this QMP was removed. It is recommended that the proponent should reinstate and implement a QMP as outlined in the EIS that aims to:

- enhance the area of potential quoll habitat and management through weed control, stock exclusion, and revegetation
- implement a toad management strategy.

#### **4.11.6.2 Koala impact assessment**

The project area contains at least two known koala food species, is connected to a larger area of likely koala habitat (large tracts of remnant vegetation to the east) and there are recent records of the koala near the site. After the original version of the EIS was reviewed, the proponent was asked to revise the koala impact assessment given that the area is likely to be critical inland habitat for the koala.

The EIS stated that the majority of the study area does not support suitable feed tree species for the koala. Using habitat mapping and modelling the EIS concluded that only low value habitat occurs in the area due to extensive clearing and fragmentation, a lack of preferred food trees and abundance of predators. The EIS concluded that a lack of high value habitat is supported by a lack of koala records from the study area.

However, the Queensland Herbarium verified vegetation map indicates that RE11.9.9 is the major vegetation type that is to be cleared for the project. The short description of this RE is *Eucalyptus crebra* woodland. Ellis *et al.* (1995)<sup>3</sup> found that *E. crebra* was the preferred winter food species for koalas in the Springsure area and Ellis *et al.* (2002)<sup>4</sup> found that *E. crebra* is the second most important food species in the Blair Athol area in central Queensland. The koala naturally occurs at low density (0.005 animals per hectare) and has a large home range in the central Queensland environment. While the EIS's surveys did not record koalas and found no sign, there are recent records of the species to the south of the mine.

Using the EPBC Act referral guidelines for the vulnerable koala (2014), the EIS calculated a habitat score of 5 for the proposed action. While the proponent concluded that the impact of clearing 257 ha of habitat for this species was not significant, EHP concluded in accordance with advice from DOTE that it was significant.

#### **4.11.6.3 Squatter pigeon**

The EIS concluded that although the project would remove an area of high value habitat for the squatter pigeon (southern subspecies), a significant residual impact is unlikely to occur because the species has broad habitat

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<sup>3</sup> Ellis, W.A.H, Melzer, A., Green, B., Newgrain, K., Hindell, M.A. and Carrick, F.N. (1995) . Seasonal variation in water flux, field metabolic rate and food consumption of free-ranging koalas (*Phascolarctos cinereus*). Australian Journal of Zoology, 43, 59-68.

<sup>4</sup> Ellis, W.A.H., Melzer, A., Carrick, F.N. and Hasegawa, M. (2002). Tree use, diet and home range of the koala (*Phascolarctos cinereus*) at Blair Athol, central Queensland. Wildlife Research 29, 303-311

requirements, and widespread areas of potential breeding and foraging habitat would remain outside the project area

The species has recently been confirmed as vulnerable under the EPBC Act. Its range has contracted in NSW, and it is still subject to significant threats.

The species was confirmed as present on the site. Habitat critical to the survival of the species (foraging and dispersal; possibly breeding) is therefore present.

As outlined in the EPBC Act significant impact guidelines, a project is determined to have a significant impact on a vulnerable species if it:

- has an adverse impact on habitat critical to the survival of a species;
- is going to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

EHP concluded that there would be a significant impact on the species and offsets will be required for the residual impacts of the project.

#### **4.11.6.4 Large Eared pied bat**

The EIS Threatened Species Profile Report concluded that none of the project site meets the Commonwealth's definition of habitat for this species and that no roosts were detected. However, it also states that there is suitable woodland vegetation that is foraging habitat; that there are overhangs and crevices present in the north of the project site (but no caves, cliffs or disused mines shafts); that there are two permanent farm dams and creeks in the north of the project site; and that there are tree hollows in the woodland north of the project site.

The large-eared pied bat was not recorded from the project site during EIS field surveys and there were no records within 25km of the project site in any of the desktop searches or within 100km of the site in the Australian Museum database. Nevertheless, the species is difficult to detect. Given that the north of the project site contains suitable habitat, the species has the potential to be present.

The EIS estimates that the project area contains 347ha of low quality habitat for the large-eared pied bat. EHP undertook an analysis of habitat shape files provided in the EIS, and determined that 223.4ha of possible habitat will be impacted by the project.

#### **4.11.6.5 Significant impact assessment and offsets**

In the EIS Threatened Species Profile Report significant impact assessments were done for the following species:

- collared delma
- yakka skink
- squatter pigeon
- red goshawk
- Australian painted snipe
- northern quoll
- koala
- grey-headed flying fox
- large-eared pied bat
- south-eastern long-eared bat.

The EIS concluded that there would be no significant residual impacts on any flora or fauna species, and therefore the project would not require offsets under the EPBC Act Environmental Offsets Policy.

DOTE commented that the EIS did not contain an adequate discussion of offsets. The EIS's conclusion regarding offsets was based on the proposition that the site does not contain an important population or suitable habitat for the species listed above, and is disconnected from adjacent areas because of a power easement and haul road.

Using the EPBC Act significant impact guidelines a project is determined to have a significant impact on an endangered or vulnerable species if it:

- has an adverse impact on habitat critical to the survival of a species
- is going to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Although not all species were found during field surveys on the project site, the detectability, the presence of suitable habitat, and the close proximity of known records of the yakka skink, squatter pigeon, northern quoll, koala, south-eastern long-eared bat, and the large-eared pied bat, indicates a high likelihood of these species occurring on the project site.

DOTE advised that the site contains habitat critical to the survival of these species, which is defined as areas for foraging, breeding or dispersing. The removal and fragmentation of this contiguous habitat is considered likely to decrease the availability of habitat and contribute to the decline of the species. The species profiles in Appendix C provide more detailed analysis of each species and a conclusion regarding impacts and offsets.

In summary, EHP considered the information provided in the EIS and its addenda, including avoidance and mitigation measures, and, in accordance with advice from DOTE, concluded that the project was likely to result in a significant residual impact on the squatter pigeon (southern subspecies), northern quoll, and koala. EHP also concluded the project was likely to result in a significant residual impact on the south-eastern long-eared bat. The proponent was advised of this decision and was requested to confirm the areas of disturbance of habitat for each species.

Furthermore, the proponent was advised that an offset proposal will be required with an evaluation of the availability of offset areas.

#### **4.11.7 Conclusion and recommendations**

Based on the Queensland Government's vegetation mapping (version 9), a total of 266ha of wildlife habitat, including 121ha of remnant vegetation, would be removed to build the mine. The EIS proposed mitigation measures to ensure that clearing is undertaken in a manner that limits the disturbance to the minimum area possible.

No threatened ecological communities under the EPBC Act were recorded during the field survey, and none are considered likely to occur.

The EIS concluded that the impact of the project on threatened flora is likely to be low because species predicted to occur in the project area were given a low likelihood of occurrence.

The EIS assessed the potential impacts of the project on threatened fauna listed under the EPBC Act and concluded that the project is unlikely to result in a significant residual impact on any threatened fauna species. Similarly, due to a lack of high value habitat in the project area, the EIS concluded that the project would not have a significant residual impact on migratory species listed under the EPBC Act.

Based on the information provided in the EIS and advice provided by DOTE, EHP considers that there will be a residual significant impact on the following species:

- northern quoll
- koala
- south-eastern long-eared bat
- squatter pigeon.

Residual impacts will require offsets under the EPBC Act environmental offsets policy.

Preclearance surveys should be undertaken to ensure that any unexpected impacts on protected plants can be avoided and managed in accordance with the *Nature Conservation Act 1992*.

## Recommendations

### 1. Management of impacts on threatened species and communities

The proponent should develop species management plans for species with breeding places that will be affected by the project. The plans should contain measures to avoid and minimise impacts on breeding places. The proponent should also prepare a quoll management plan as recommended in the EIS.

### 2. Pre-clearing surveys

Suitably qualified persons should carry out pre-clearing surveys, and a spotter catcher should be present at all times during clearing. The proponent should implement additional measures to avoid and mitigate impacts on all threatened flora and fauna species that were assessed as part of the EIS.

### 3. Disturbance limits

The proponent must not exceed the agreed whole of project disturbance limits for threatened species and communities.

### 4. Management of impacts on MNES during vegetation clearing and construction, operation and decommissioning of the project

The proponent must implement measures to avoid and mitigate impacts on EPBC listed species and their habitat encountered during clearance of vegetation, construction, operation and decommissioning of the project. The proponent should undertake vegetation clearance for each project phase in a manner that avoids impacts on EPBC listed fauna species. The proponent must ensure that management actions are carried out in a manner that is consistent with relevant recovery plans, conservation advice and threat abatement plans.

### 5. EPBC offset requirements

The proponent must provide environmental offsets for impacts on EPBC listed threatened species. The proponent should submit an Offset Management Plan for the project that complies with the EPBC Act environmental offsets policy, and that provides details of the offset proposed for significant residual impacts associated with project. The Offset Management Plan should be submitted to DOTE for approval by the Minister for the Environment prior to start of the project.

## 4.12 Cultural heritage

### 4.12.1 Indigenous cultural heritage

A cultural heritage investigation and management agreement has been in place since 2003 between the proponent and the Gangulu people, the Aboriginal party for the area. A number of cultural heritage surveys have been conducted on the proponent's mine lease areas, including Boundary Hill South, by the Gangulu people as part of the cultural heritage investigation and management agreement. A Cultural Heritage Management Plan (CHMP) was approved on 2 August 2011.

The statutory requirements for the assessment and management of Indigenous cultural heritage within the Boundary Hill South project area in accordance with the *Aboriginal Cultural Heritage Act 2003* are satisfied by the CHMP.

### 4.12.2 Non-Indigenous cultural heritage

A search of the Queensland Heritage Register (QHR) found no listing of any heritage places within the project area. However, the Kilburnie Homestead, approximately 1.2km south of the proposed mining lease, is a registered heritage place.

The Kilburnie Homestead is a complex of buildings, including a main house (built around 1890), a detached kitchen, a number of outbuildings, yards and fences, and a small family graveyard. Although the homestead is outside the project area, there is the potential for it to be impacted by noise and ground vibration from blasting. Section 4.10 of this assessment report discusses impacts from noise and ground vibration from blasting at the project area, and includes mitigation measures for protecting identified cultural heritage values.

The cultural heritage survey of the project area did not locate any places of historical or archaeological significance.

However, there is still the potential for unidentified sub-surface deposits to exist across the area.

If any places or items of potential historical archaeological are uncovered during construction, the EIS proposed that the following 'stop works' procedures should be undertaken:

- work would cease and the site would be secured (bunting, barriers or temporary fences would be erected as a buffer around the find)
- the identified material or site would not be removed or disturbed any further
- the find would be reported directly to EHP in accordance with sections 88-90 of Queensland Heritage Act 1992 by a site supervisor, manager, or cultural heritage specialist.

Site staff would be told how to identify historical cultural heritage through a cultural heritage induction factsheet or similar document, which would be provided to them during Callide Mine's site induction. This document would be prepared and reviewed by a qualified heritage specialist, and would include the following content:

- familiarisation material for work crews, so that they are aware of what constitutes a cultural heritage find
- clear instructions on what to do if any material is found.

### **4.12.3 Conclusion**

The EIS provided an adequate assessment of cultural heritage for the project.

The site already has a CHMP for the project approved by EHP under the *Aboriginal Cultural Heritage Act 2003* (ACH Act). The CHMP provides for the protection and management of Aboriginal cultural heritage at the project area.

No registered heritage places listed in the Queensland Heritage Register (QHR) were found in the project area. However, the QHR registered Kilburnie Homestead is located approximately 1.2km to the south of the project area. The EIS proposed adequate mitigation measures to minimise potential impacts on historical cultural heritage.

## **4.13 Social**

### **4.13.1 Identified social values**

The EIS provided an adequate assessment of the existing social values that may be affected by the Boundary Hill South Project.

The EIS stated that community consultation was carried out to:

- inform landholders, government authorities, local businesses and communities about the project
- assist in the development of a baseline community profile
- identify stakeholder issues and concerns in relation to the project.

The EIS considered communities ranging from the near neighbours on rural properties, to local regional centres, the wider Local Government Area of Banana Shire, and the state as a whole.

The near neighbours are farming families living close to the mine on their own rural properties with which each family has a long connection.

The nearest regional centre is Biloela, which has a population of around 5,885, while Banana Shire has an estimated population of 14,456 (ABS, 2011).

The workforce of the Callide Mine predominantly resides in local regional communities rather than coming to the site on a fly in–fly out, or drive in–drive out, arrangement. The nearby town of Biloela and the wider community of the Banana Shire benefit significantly from the presence of the Callide Mine and the Callide Power Station, which the mine supplies. Such industry provides direct employment to local residents and business opportunities for contractors and service providers. For example, 16% of employed people in Biloela work in coal mining, and the proposed Boundary Hill South pit is expected to provide ongoing permanent jobs for 180 employees.



#### 4.13.2 Main issues identified by the EIS or raised in submissions

The EIS identified the following main issues of interest to nearby landholders and the local community:

- noise, vibration, dust and lighting impacts on near neighbours
- psychological impacts and landowners associated with the proximity to, and encroachment of, mining operations
- water security for nearby landowners, which has relevance for their livelihood
- community relations, particularly landholder relations
- downturn in coal industry or unexpected mine closure
- loss of amenity
- health and wellbeing
- cumulative impacts of multiple projects (particularly project fatigue).

Submissions on the EIS provided by near neighbours tended to focus on the potential physical effects of the project, such as impacts on water supply, noise and dust, rather than commenting directly on social issues. Nevertheless, the EIS recognised that physical effects can result in psychosocial impacts that affect health and wellbeing. The psychological effects of noise, particularly when sleep is disturbed, are a significant issue. Similarly, dust may impact on both health and wellbeing, not only as a contaminant, but also as a cause of frustration and loss of amenity. No less significant is the potential impact on wellbeing from anxiety about the effects of the mine on its neighbours' livelihoods due to such matters as the reduction of water supply for farming, or the loss of customers for a local small business that supplements farming income. Near neighbours may also experience negative psychological impacts due to uncertainty about the future because of encroachment of the mine.

Department of State Development (DSD) provided a submission on the EIS that requested the proponent to address the following issues:

- the Social Impact Management Plan needed further mitigation and/or management measures for impacts that have a medium or higher residual impact
- communication strategies were needed for providing information to landholders about:
  - the monitoring occurring on and/near their property under the proposed environmental management plan (EM plan)
  - any measures taken to avoid, mitigate or offset impacts identified under the EM plan, which could affect a landholder
- an alternative accommodation option was needed for the construction workforce of 25 contractors, if the current option of short term accommodation is not available
- sourcing of the 25 additional construction contractors needed to be outlined
- strategies were needed for mitigating the identified psychosocial impacts associated with the proximity and encroachment of operations (e.g. stress, grief, depression).

In response to DSD's issues, the proponent provided the following advice:

- The draft social impact management plan was amended to include additional management actions to address medium and high residual impacts.
- Communication strategies for landholders will be provided in a new stakeholder engagement plan (SEP) for the project, which will be provided to DSD prior to commencement of the project's construction.
- It is unlikely that alternative accommodation options would be required for the construction workforce given that the small number of required rooms would be available at the current vacancy rates for short term accommodation in Banana Shire. Also, due to the slowdown in the Queensland mining industry, the demand for 25 contractors is unlikely to place any pressure on the local labour force.

- The stakeholder engagement officer would identify any social concerns that would be reported through the social incident procedure, and the concern would be managed by following established protocols.

DSD was satisfied with the proponent’s response and did not raise any further issues.

### 4.13.3 Potential social impacts and proposed mitigation measures

No local landholders would be impacted by land resumptions for the Boundary Hill South mine.

However, as noted above, near neighbours may experience psychosocial impacts that affect their health and wellbeing due to physical impacts related to matters such as water resources, dust, noise, and vibration. Mitigation strategies for psychosocial impacts must therefore be largely focussed on addressing physical impacts. Table 4.14 below summarises the potential impacts and mitigation strategies identified in the EIS.

Impacts on near neighbours due to dust, noise, vibration, and sediment runoff may be avoided or minimised by combining onsite measures at the mine with modifications to the neighbours’ homes that the proponent could undertake with the owners’ agreement. Amended or new make good agreements or beneficial water use agreements would be major factors in mitigating impacts due to the reduction of groundwater supply from farmer’s bores and springs.

The continuation of mining at the Callide Mine, and the associated operation of the Callide Power Station, is important for the local regional community by providing employment, training and business opportunities. Continued operation of the mine would have no significant adverse impacts on local regional centres, but it would have significant beneficial impacts. Conversely, closure of the mine would have significant adverse impacts on regional centres due to the loss of employment. There would be similar impacts for the wider community of the state.

**Table 4.14 Social impact assessment summary**

Summary of potential impacts	Mitigation strategies
<p><b>Health, safety and amenity</b></p> <ul style="list-style-type: none"> <li>• level of interference on the health and amenity of residents of neighbouring properties from dust, noise, vibration and lighting.</li> <li>• psychosocial impacts associated with the proximity and encroachment of operations (e.g. stress, grief, depression).</li> </ul>	<ul style="list-style-type: none"> <li>• watering for dust suppression</li> <li>• noise and air quality monitoring, including blast fume monitors for oxides of nitrogen and carbon monoxide</li> <li>• noise mitigation arrangement for affected landowners, such as noise bunding</li> <li>• beneficial water use agreement enabling landowners to use water for lifestyle enhancements, e.g. to plant and sustain vegetation screens</li> <li>• new social incident procedure, developed, implemented and communicated to all landowners</li> <li>• offers of water filters and air conditioning to landowners to reduce impact of dust and noise</li> <li>• rehabilitation and landscaping for visual amenity.</li> </ul>
<p><b>Livelihood</b></p> <ul style="list-style-type: none"> <li>• loss of quantity or quality of water resources.</li> </ul>	<ul style="list-style-type: none"> <li>• make good agreements</li> <li>• beneficial reuse agreements</li> <li>• groundwater monitoring program</li> <li>• onsite water testing.</li> </ul>

<p><b>Social cohesion</b></p> <ul style="list-style-type: none"> <li>• potential for ineffective engagement around water issues, complaints response, to lead to a deterioration of mine – landholder relationships leading to loss of social licence and damage to mine reputation.</li> <li>• potential for ineffective community engagement strategies to lead to a deterioration of mine – community relationships leading to social disharmony and damage to mine reputation.</li> </ul>	<ul style="list-style-type: none"> <li>• Callide community liaison forum</li> <li>• six-monthly meetings established for adjacent landowners (Neighbour Day)</li> <li>• make good agreements</li> <li>• beneficial reuse agreements</li> <li>• review the community complaints procedure</li> <li>• employment of a stakeholder engagement officer who has a role of maintaining positive relationships with near neighbours</li> <li>• new social incident procedure developed, implemented and communicated to all landowners</li> <li>• downstream landowners engaged during the water modelling process, and ongoing engagement process to deliver results</li> <li>• new social management plan and stakeholder engagement plan prepared and implemented</li> <li>• social investment and donations program</li> <li>• community engagement through: <ul style="list-style-type: none"> <li>○ providing the community with information about the Callide Mine complex operation to enable meaningful participation in consultation</li> <li>○ maintaining long-term relationships with key stakeholders and ensure that a cross section of the community is involved in the engagement process</li> <li>○ ensuring that information opportunities are delivered within a timely process culminating in a full technical information and question session.</li> </ul> </li> </ul>
<p><b>Economy/local business</b></p> <ul style="list-style-type: none"> <li>• downturn in coal industry or unexpected closure leads to: <ul style="list-style-type: none"> <li>○ population outflow</li> <li>○ business downturn</li> <li>○ loss of local products and services.</li> </ul> </li> <li>• increased local employment opportunities through construction</li> <li>• increased local procurement opportunities.</li> </ul>	<ul style="list-style-type: none"> <li>• mandatory mine closure planning</li> <li>• stakeholder engagement plan</li> <li>• participation in regional development forums</li> <li>• implementation of the proponent's local procurement toolbox</li> <li>• focus on targeted local employment, including apprentice employment program.</li> </ul>
<p><b>Liveability and lifestyle</b></p> <ul style="list-style-type: none"> <li>• minor increase in demand for emergency services during six month construction phase</li> <li>• opportunity to improve the liveability and sustainability of the Biloela and surrounding communities through social investment funds.</li> </ul>	<ul style="list-style-type: none"> <li>• onsite first aid capability</li> <li>• on-going liaison with paramedical and hospital staff in Biloela.</li> <li>• timely communication with the Ambulance and Police services about the emergency management plan</li> <li>• continued implementation of the social investment and donations program.</li> </ul>

Source: Table 14-10, EIS Addendum–Volume 1, February 2015

The EIS included a draft social impact management plan (SIMP). The SIMP identified actions that the proponent would undertake to mitigate the potentially adverse social impacts arising from the project on the communities in which it operates.

The draft SIMP contained the following draft action plans for the project:

- Housing and Accommodation Action Plan to provide accommodation solutions for the non-resident project construction workforce
- Local Procurement Action Plan to maximise opportunities for local and regional businesses to benefit from the development of the project
- Workforce Management Plan to ensure the ongoing timely supply of labour to the project
- Social Investment Action Plan to make a positive contribution to the community through supporting community capacity building initiatives
- Community Safety and Safety Action Plan to minimise project related adverse health and safety impacts to the community including impacts on near neighbours related to air quality, noise and vibration.

The proponent stated that a review of the draft SIMP would be undertaken at the commencement of the project.

#### **4.13.4 Conclusions and recommendations**

The EIS provided an adequately assessed the potential social impacts of the project and proposed adequate strategies to mitigate the social impacts.

The EIS stated that social impacts to near landholders will be managed through operational controls, environmental monitoring, and an effective grievance and complaints handling mechanism.

The EIS stated that that the project would have a positive impact on the wider community by maintaining jobs and associated revenues streams in Biloela and Banana Shire.

The proponent has developed a draft SIMP that identifies actions the proponent would undertake to mitigate the potentially adverse social impacts arising from the project on the communities in which it operates.

Other sections of this EIS assessment report provide more detail about conclusions and recommendations for impacts on matters to do with water resources, noise, vibration and dust. Those sections note how conditions in the environmental authority for the Callide Mine may be applied to address the physical impacts of the project. However, it should be noted that the legislation does not provide the power for the environmental authority to require actions to be taken outside the mining lease boundary.

#### **4.14 Health and safety**

Mining projects of this nature may cause some, though not necessarily all, of the following impacts:

- noise—prolonged exposure to excessive noise may cause hearing impairment, hypertension, and sleep disturbance
- vibration—the wellbeing of nearby residents and the structural integrity of buildings may be adversely impacted by excessive or prolonged exposure to vibration
- dust—health implications such as respiratory disease, and visibility issues may be caused by excessive or prolonged exposure to dust
- odour—the wellbeing of nearby residents may be compromised by continuous exposure to odours from aspects of a mining project
- hazardous materials—the storage, handling and transportation of hazardous materials may result in adverse impacts to human health in the event of accidental spills, leaks or explosions
- transport—there is a risk of adverse interactions between a mine's light or heavy vehicles and other road users, pedestrians or local fauna
- pests and disease—weeds, pest fauna and disease vectors may be increased or spread by mining activities

- wastes—wastes generated by such projects have the potential to create impacts on air quality, water (surface and groundwater) quality, soil quality, biodiversity and visual amenity of the site and the surrounding environment if they are not managed appropriately
- nuisance lighting—the wellbeing of nearby residents can be disrupted by continuous exposure to artificial lighting from night-time operations.

The EIS adequately considered the project's potential impacts on community health and safety. Three aspects were assessed as having particular relevance. They were: dust; noise and vibration; and disease vectors (specifically, biting insects).

The EIS stated that air and noise modelling undertaken demonstrated that the project has the potential to adversely impact community values unless adequate mitigation measures are undertaken. The implementation of mitigation measures outlined in the air and noise sections of this report should allow residual effects be avoided or satisfactorily minimised.

The potential impacts on community values and appropriate mitigation response are summarised in Table 4.15.

**Table 4.15 Potential community impacts and mitigation measures**

Issue	Proposed mitigation
Dust, particles and gaseous pollutants	<p>Dust impacts were assessed for compliance with the Environmental Protection (Air) policy 2008.</p> <p>Due to the distance separating the project from community receptors (e.g. hospitals, childcare centres, schools and retirement homes), it is unlikely that the health of sensitive groups such as children and the elderly will be adversely affected by air emissions during construction or operation.</p> <p>Residual dust levels at nearby residential receptors will be minimised by adopting the appropriate mitigation measures discussed in the air section of this report.</p>
Noise and vibration	<p>Noise levels were assessed for compliance against Environmental Protection (Noise) Policy 2008 and are discussed in detail in Chapter 11 of the EIS.</p> <p>Noise emissions from the project area will be mitigated and managed throughout construction and operation as discussed in the noise section of this report.</p>
Disease vectors	<p>Control measures to manage and reduce the spread of biting insect species will be incorporated into a weed and feral animal control plan for the project.</p>

#### 4.14.1 Conclusion and recommendations

The EIS adequately assessed the potential impacts of the project on health and safety. The assessment has identified a number of potential impacts associated with health and safety of the community. Mitigation measures were provided that should avoid or satisfactorily minimise potential impacts on health and safety.

#### 4.14.2 Recommendation

The proponent should implement the management measures discussed in the relevant section of this report for air, noise, and disease vectors.

### 4.15 Economy

#### 4.15.1 Identified economic values

The EIS project is located in the Banana local government area (LGA) which forms part of the Fitzroy statistical division (SD). Commercial coal mining contributes more than 25% of the Fitzroy region's gross regional product (GRP).

The AEC Group (2012) estimated the gross regional product (GRP) of the Fitzroy SD to be \$17.1 billion, and the Fitzroy SD accounted for approximately 6.4% of Queensland gross state product (GSP). Mining is the largest contributor to GRP in the Fitzroy SD providing 26.7% of total regional income. The second largest contributor to GRP is manufacturing, providing 13.7% of the Fitzroy's GRP. The economy of Fitzroy SD is less diverse than that of Queensland with over 40% of its total income reliant on its two largest industries.

Currently, Anglo American directly employs approximately 500 permanent employees and 180 contractors at Callide Mine.

During construction, approximately 25 contractors would be employed for the realignment of Inverness Road and the development of additional temporary mine infrastructure. Construction would occur over approximately six months.

The EIS stated that operational workforce at the mine would not increase when the Boundary Hill South Pit starts, because employees would be remobilised from existing operations for construction and operation of the new project. The operational workforce at the proposed Boundary Hill South pit is expected to be 180 permanent employees and five contractors over the life of the project.

#### **4.15.2 Potential economic impacts and proposed mitigation measures**

The EIS presented an assessment of the total economic impact of the project, including the flow-on or indirect effects at the regional, state and national level.

The project would bring in approximately \$418 million of royalties to the state over the 20 year operation of the project, assuming the price of thermal coal stays below \$100 per metric tonne. Also, the project is expected to contribute income and company tax to the Australian Government and payroll tax revenues to the Queensland Government.

The EIS stated that the adverse economic impacts from the project are minimal. The EIS stated that the project site is unsuitable or wholly unsuitable land for broadacre or dryland cropping, as well as for beef cattle grazing on improved pastures. Consequently, the residual effects of the mining, such as the final void, will not have a significant impact on the economics of the land at the site.

The land use assessment indicated that the rural zoned land adjacent to the project area is unlikely to be significantly affected. The project has the potential to result in a significant impact to landholders bores surrounding the project area but this should be mitigated through make good agreements.

The positive impacts resulting from the project include ongoing employment opportunities for existing Callide Mine employees, minor additional employment opportunities for contractors during construction of the project, and the direct and indirect contributions to the regional, state and national economies. The positive impacts are considered significant, as a result of the value added to the regional economy over the life of the project.

The EIS stated that positive impacts can be maximised by encouraging local participation by business and residents. The proponent has a range of local procurement initiatives that are advertised on their website ,which outlines actions of engaging the local community and businesses, and providing opportunities for the local economy

#### **4.15.3 Major issues raised in submissions**

The Department of State Development (DSD) reviewed the economic section and requested the proponent take the following actions:

- adopt the following:
  - the Queensland Resource and Energy Sector Code of Practice for Local Content (2013)
  - the Queensland Aboriginal and Torres Strait Islander Economic Participation Framework (Department of Aboriginal and Torres Strait Islander and Multicultural Affairs, 2013)
- implement the proposed Anglo American Local Procurement Toolbox and the Callide Local Procurement Strategy, prior to the commencement of construction
- provide details of:
  - local business engagement and communication strategies to ensure businesses are aware of opportunities to provide goods and services

- capacity building for local businesses, including Indigenous organisations, to ensure they have an understanding of the process, and have the requisite skills for tendering for contracts
- how the methodology for employing local businesses would be reviewed.

In response to DSD issues, the proponent took the following actions:

- They amended the Draft Local Procurement Action Plan in the draft SIMP to include reference the documents mentioned above.
- They advised the existing procurement approach is currently being formalised into the Callide Local Procurement Strategy as per the Anglo American Local Procurement Toolbox. The timing of the completion of the strategy is still to be confirmed. Existing procurement processes would continue to be applied to the project, and in particular prior to, and during, the construction phase.
- They advised that the finalised Callide Local Procurement Strategy would formalise Anglo American's existing informal, but successful, local procurement strategies. Also, the proponent advised that Anglo American Brisbane Supply Chain is managing the Indigenous Business Opportunities associated with the project.

DSD reviewed the proponent response and requested the proponent to provide them with a copy of the new Stakeholder Engagement Plan (SEP). In response, the proponent committed to updating their existing Callide Mine's SEP, and to providing it to DSD prior to the commencement construction.

The Department of Agriculture and Fisheries (DAF) and the Department of National Parks, Sport and Racing (DNPSR) raised a concern that the EIS did not adequately assess potential impacts of the project on the economic resource of timber lands, including potential impacts on the adjoining timber reserve. The proponent advised that the project area currently does not have timber of economic value. They also stated that the project area would not encroach on the timber reserve, and would not have economic impacts on the timber reserve.

Landholders also raised economic issues regarding the potential economic impacts of the project on their agricultural activities, and in particular the impact on agriculture land after the project has been decommissioned.

In response to landholder issues, the proponent committed that the mine would be progressively rehabilitated and returned back to agriculture use as much as possible.

Major issues related to the economic impact assessment were adequately addressed by the proponent.

#### **4.15.4 Conclusion**

The EIS adequately assessed the potential economic impacts during construction and operational phases of the project.

The positive impacts resulting from the project include ongoing employment opportunities for existing Callide Mine employees, minor additional employment opportunities for contractors during the construction stage of the project, and the direct and indirect contributions to the regional, state and national economies.

The proponent proposed to develop a LIPP that outlines the strategy of engaging the local community and businesses.

### **4.16 Hazard and risk**

#### **4.16.1 Potential hazard and risk impacts**

The EIS stated that the potential risks to people and property during construction and operation of the project were identified in accordance with the Australian/New Zealand Standard AS/NZS ISO 31000:2009 Risk Management - Principles and Guidelines (Standards Australia/Standards New Zealand, 2009). A risk matrix was used to determine the likelihood and consequence of each identified project hazard. The assessment identified the following risks:

- medium risks:
  - major and minor spillage of dangerous goods and/or hazardous substances
  - uncontrolled bushfire
  - major (uncontrolled) fire other than bushfire

- low risks:
  - minor (controlled) fire other than bushfire
  - severe weather event such as a storm resulting in flooding of the pit
  - changed climatic variables (e.g. increased storm activity)
  - increased number of disease vectors, including mosquitoes and rats
  - exposure of workforce to cattle, pests, snakes and vermin.

#### 4.16.2 Proposed hazard and risk mitigation measures

The EIS proposed mitigation measures to reduce risks to an acceptable level. Table 4.16 summarises the risks and the proposed mitigation measures.

#### 4.16.3 Major issues raised in submissions

Queensland Ambulance Service (QAS) requested the proponent provide them with a copy of the emergency response plan, which should include contact details for key stakeholders in case of a disaster or emergency. The proponent stated that the existing Callide Mine’s emergency response plan would be updated to include the project, and will be provided to QAS.

Queensland Police Service (QPS) advised that should an emergency incident happen, and QPS were to make a declaration under the *Public Safety Preservation Act 1986*, then control of the incident and mine site would come under the authority of the QPS. This issue was noted by the proponent.

#### 4.16.4 Conclusion

An adequate hazard and risk assessment was carried out as part of the EIS that included mitigation measures to reduce risks to an acceptable level.

**Table 4.16 Risk mitigation measures**

Risk	Proposed mitigation
Chemical hazard	<p>All dangerous goods will be managed and transported in accordance with requirements of relevant legislation and standards.</p> <p>Only appropriately trained and qualified personnel will be allowed to handle dangerous goods.</p> <p>Licensed operators will handle, store and transport explosives in accordance with a safe work plan that complies with relevant standards.</p> <p>Leaks of fuel, oil and other chemicals will be controlled by appropriate infrastructure design (AS 1692:2006) and bunded areas to contain spills (AS 1940:2004), tank level indicators to monitor levels, and appropriate maintenance to ensure safe operation.</p> <p>Spill kits will be available at appropriate locations.</p>
Fire	<p>Relevant Callide Mine employees and contractors will attend fire training, as part of site induction process, and complete fire and evacuation drills.</p> <p>The Callide Mine fire management plan will be used for the project to address the risk of a bushfire impacting the workforce and/or surrounding community.</p> <p>Other existing appropriate emergency procedures will be updated to include the new project area.</p>
Natural hazards including flooding	<p>Adequate drainage will be provided.</p> <p>Appropriate emergency procedures will be used within the project area.</p>



Risk	Proposed mitigation
Disease vectors	<p>Adequate drainage will be provided to prevent pooling of water.</p> <p>Site personnel will wear appropriate personal protective equipment (PPE).</p> <p>Awareness will be developed through staff training.</p>
Wildlife hazards	<p>Appropriate personal protective equipment will be provided.</p> <p>First aid kits will be made available.</p> <p>Awareness of appropriate conduct will be developed through staff induction and training.</p> <p>Appropriate staff will undergo snake handling training, as per existing operations.</p>

Source: Table 17-4, EIS, February 2014

## 4.17 Rehabilitation

### 4.17.1 Approach

The project would require the rehabilitation of about 477ha of land disturbed by mining operations, including the spoil emplacement area, final void, topsoil stockpile and infrastructure areas.

The EIS discussed the current rehabilitation practices for Callide Mine operations, which are managed under a Rehabilitation Management Plan (RMP) in accordance with the environmental authority (EA).

The Callide Mine RMP would be reviewed and updated over the life of the project.

The EIS (section 4.3.1, p.4-2, EIS Addendum – Round 3, Dec 2015) proposed the following rehabilitation goals for the project:

- ‘creation of a native vegetation – to rehabilitate post-mining land to a self-sustaining, low maintenance vegetation state demonstrated to be similar with regards to structure, composition and function to that of a native vegetation of the Brigalow Belt
- creation of grazing and forestry land – to rehabilitate suitable areas of post-mining land to sustainable and economically viable grazing and forestry land...’

The proponent’s intent is to give priority to returning land to primary industries, such as grazing and forestry. However, where grazing and forestry would be unsuitable, the intent would be to rehabilitate disturbed land to self-sustaining native vegetation communities that would include appropriate grass species, native trees and shrubs.

The final void would form a lake that would be suitable for watering livestock at the time the mining lease is relinquished. However, the quality of water in the lake is expected to become more saline over time.

The EIS developed rehabilitation objectives for the project. These objectives were included in Table 4-1 (EIS, Feb 2014) with performance indicators and criteria.

Also, Table 28 in the EM plan (Dec, 2015) proposed final rehabilitation goals, indicators and completion criteria for each final land use domain in the project area. Table 28 would be used by the proponent to demonstrate compliance rehabilitation conditions required by the EA. This table generally meets criteria in the following EHP guidelines:

- *Rehabilitation requirements for mining resource activities*, EM1122, (EHP, May 2014)
- *Model mining conditions*, EM944, (EHP, Nov. 2014).

### 4.17.2 Potential impacts

If disturbed land is not suitably rehabilitated and managed properly, the following potential impacts may occur:

- sedimentation of surface water due to erosion of exposed surfaces

- ground water contamination
- loss of vegetation communities and fauna habitat
- wind erosion of exposed surfaces
- slope failure of any, or all, of the high-wall and low-wall in the void, and the Western Dump
- visual impacts due to exposed areas on the Western Dump and in the void.

#### **4.17.3 Proposed rehabilitation measures**

The EIS (section 4.5.1, p.4-6, EIS, Feb 2014) said that disturbed lands in the project area would be progressively rehabilitated based on the mine plan. Progressive rehabilitation during mining operations would minimise the area of exposed disturbance and reduce the potential environmental impacts. The methods of progressive rehabilitation would include the following measures, which are already being used at the Callide Mine:

- stripping the topsoil to a depth of about 0.3m based on soil surveys, and then stockpiling the topsoil for reuse in rehabilitation works
- minimising the amount of cleared areas before mining operations to minimise impacts on flora and fauna and reduce the risk of erosion
- progressively backfilling the void, as much as possible
- selectively placing and burying in the pit, or in the Western Dump, waste rock that has the potential to adversely affect plant growth, or that may potentially contaminate surface and groundwater
- reshaping the waste rock dump and areas disturbed by mining so that they are stable and adequately drained
- ripping the top layer of compacted soils, and then applying topsoil to establish a suitable plant growth environment
- revegetating areas with suitable plant species as soon as possible
- implementing control measures to reduce wind erosion and sediment runoff within the final landform
- decommissioning and removing infrastructure, including crib rooms and amenities
- implementing a Weed and Feral Animal Control Plan to control weeds and pest animals in the project area
- monitoring rehabilitated areas to ensure success of rehabilitation and undertaking any necessary corrective action to address specific issues, including using fertilisers.

Topsoil removed from mined areas would be stockpiled between two water courses at the northern end of the project area. Section 4.5.6.2.1 of the EM plan (Dec 2015) described measures for topsoil management. A key measure is the implementation of a topsoil inventory for the project area, showing the location, volume of topsoil and area of the stockpiles. The area with the soil stockpile would be rehabilitated after mining. However, the EM plan did not include the assessment of the soil stockpile area and did not adequately describe how this area would be rehabilitated. It is recommended that this issue be addressed in the final EM plan.

Erosion and sediment control is another important factor to achieve rehabilitation success. The proponent will need to implement erosion and sediment control measures to stabilise the project area until adequate vegetation cover is established. Section 4.5.6.3 of the EM plan (Dec 2015) adequately described erosion and sediment control measures. Completion criteria for erosionally stable landforms were provided in Table 28 of the EM plan (Dec 2015).

Soil surveys and waste rock characterisation identified material that is unsuitable for dumping or placement near or at the surface of rehabilitated landforms. These materials will need to be selectively placed below the surface and adequately capped or encapsulated with competent rock.

The EIS (section 4.5.6.2.2, p.81-82, EM plan, Dec 2015) provided a list of flora species to be used in those rehabilitation areas where a self-sustaining native vegetation community needs to be established. The EIS stated that these species have been used in successful revegetation at the Callide Mine site. The trees and shrubs listed reflect the species that occur naturally in the surrounding woodlands, and if successfully established, could provide potential foraging habitat for listed species, including the grey-headed flying-fox, large-eared pied bat and south-

eastern long-eared bat. Also, a number of the proposed *Eucalyptus* species to be planted would be preferred food trees for the koala. However, the proposed vegetation would not establish a recognised regional ecosystem.

The proponent still needs to provide details in the EM plan of the areas and methods to be used to establish self-sustaining native vegetation communities, and demonstrate that the areas would provide suitable habitat for threatened fauna. Also, the proponent should provide performance criteria in Table 28 of the EM plan (Dec 2015) as per comments provided to the proponent in previous correspondence, to demonstrate the success of restoring areas to native vegetation.

#### 4.17.3.1 Monitoring

The proponent proposes to monitor the success of rehabilitation, and rework any areas not developing adequately. The current rehabilitation monitoring program in the RMP, which commenced in 1994, would be continued and amended to cover the project area.

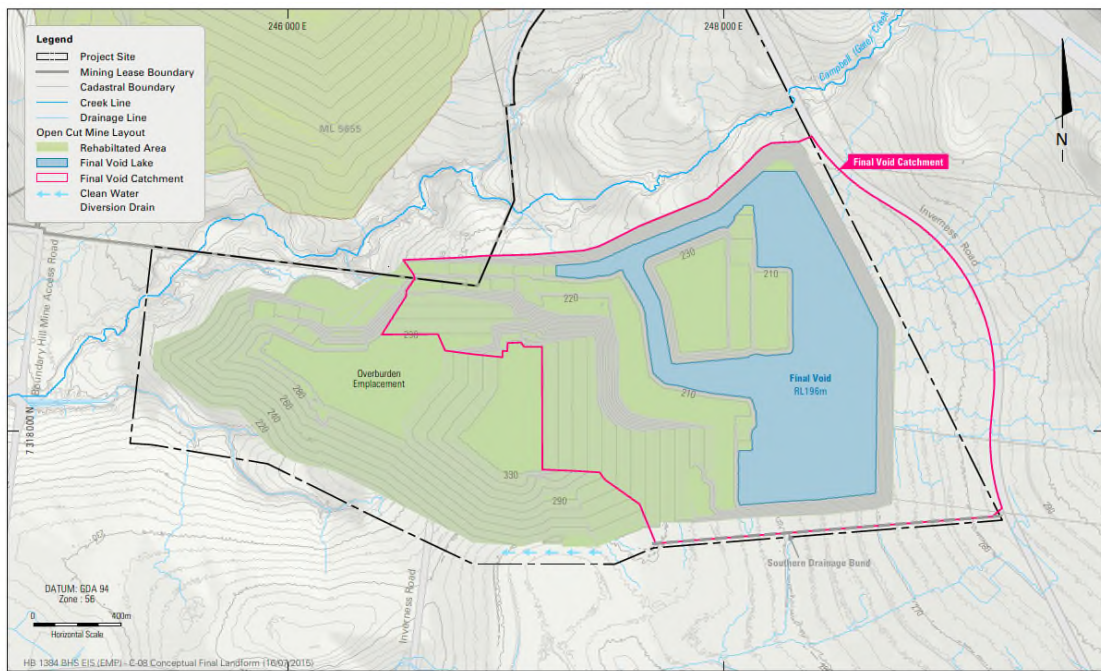
Section 4.5.7 of the EM plan (Dec, 2015) provided a description of the current annual monitoring program at twelve sites at the Callide Mine.

If it is determined through monitoring that rehabilitation was not adequate, the proponent would implement corrective actions.

#### 4.17.4 Final landform

Figure 2 shows the conceptual final landform for the project. The final landform would include the following key features:

- an overburden emplacement called the Western Dump that would cover an area of about 210ha.
- a final void at the eastern extent of the open cut pit area that would cover an area of approximately 85ha.



BOUNDARY HILL SOUTH PROJECT

Conceptual Final Landform

**Figure 2: Conceptual final landform**

Source: Figure 8, EM plan, December 2015

A safety bund and a security fence would be installed to prevent people, wildlife and livestock accessing the final void. Also stock fencing would be placed on the ramp and low wall crests.

Groundwater inflow and limited surface water would collect in the final void after mining creating a lake. The water quality in the lake is expected to deteriorate over time and become more saline. However, modelling undertaken for the EIS indicates that the water level in the void should fluctuate over a range of a few metres, averaging about 40m below the lip of the void. Consequently, there is negligible risk of the void overflowing or contaminating surface waters. Furthermore, evaporation will keep the water level in the void below the level of groundwater in the adjacent aquifers, and prevent infiltration of saline water into the aquifers.

The EIS said that internal roads and dams are likely to remain after mining, and be reused by future landowners. The dams may be used as a supply of water for agriculture activities. Dams would be made with stable batters and spillways. However, EHP considers that the proponent should provide alternative criteria for the decommissioning and rehabilitation of such infrastructure until they can demonstrate that the landholder(s) will agree to retain such infrastructure.

The small embankment levee along the eastern part of the southern boundary would remain after mining. This levee, and the proposed Inverness Road diversion/ flood protection levee outside the mining lease, would protect the pit with immunity from a 1000 year average recurrence interval flood.

#### **4.17.5 Conclusion and recommendations**

Rehabilitation objectives for the project area include:

- creation of grazing and forestry land
- creation of a self-sustaining, low maintenance vegetation community that is similar to a Brigalow Belt ecosystem.

The EIS adequately proposed methods and objectives for the progressive rehabilitation of disturbed lands. This would involve backfilling of voids as much as possible, reshaping the emplacement area, respreading stockpiled topsoil over worked areas and revegetating disturbed areas.

##### **4.17.5.1 Recommendations**

The proponent should update the completion criteria in Table 28 of the EM plan as previously recommended in this section. EHP may then update Condition H1, which with other recommended rehabilitation and decommissioning conditions is provided in Appendix A of this assessment report.

## **5 Adequacy of the environmental management plan**

On 31 March 2013, amendments to the EP Act commenced that removed the requirement for mining operations to have an environmental management plan (EM plan). However, the application to amend the environmental authority for the Callide Mine to include the Boundary Hill South Project was made prior to 31 March 2013. Consequently, the requirement for an EM plan still applies, and the EM plan must meet the content requirements of s203 of the EP Act as it applied prior to 31 March 2013.

A draft EM plan was included with the version of EIS that was released during the public submission period. A number of submissions on the EIS and subsequent EIS Addendums raised issues that required amendments to the draft EM plan and many of these amendments were agreed to by the proponent. However, the most recent version of amended EM plan, which was submitted with the EIS Addendum—Round 3 (Dec 2015), does not adequately meet the statutory content requirements. A revised version that meets the statutory content requirements must be submitted to EHP before a decision can be made to allow the application to proceed to the draft environmental authority stage. The following list of recommended changes is provided to assist the proponent revise the EM plan:

### **Noise**

- The EM plan should include the  $L_{Aeq,1\text{ hour}}$  criteria and the vibration and airblast overpressure criteria stated in Table 5.1 below. The table should also include an appropriate criterion for  $L_{Amax}$  during night-time. EHP recommends a criterion of 49dB(A) $L_{Amax}$  as a guide. However, the proponent may undertake further assessment of this issue and propose an alternative value with the revised EM plan.

**Table 5.1 Noise and vibration criteria**

Issue	Time	Criteria to avoid impacts
External noise (average)	Day (7am-6pm)	45dB(A) $L_{Aeq,1 \text{ hour}}$
External noise (average)	Evening (6pm-10pm)	40dB(A) $L_{Aeq,1 \text{ hour}}$
External noise (average)	Night-time (10pm-7am)	35dB(A) $L_{Aeq,1 \text{ hour}}$
External noise (max.)	Night-time (10pm-7am)	49dB(A) $L_{Amax}$
Ground vibration	At anytime*	5mm/s peak particle velocity
Airblast overpressure	At anytime*	115dB(Linear) for 9 out of 10 blasts 120dB(Linear) for any blast

\* Does not include the period between 5pm and 9am on any day, when no blasting should occur.

### Rehabilitation

- The criteria in relation to progressive rehabilitation provided by the proponent in their response to Issue 12 in the Response to Submissions – Round 3 (p. 32, Dec 2015) are too imprecise, The EM plan should provide measurable and auditable criteria to be used when determining that a mined area is available for rehabilitation.
- In section 4.6.5.1 of the EM plan, the proponent should address the burial in the pit of carbonaceous material from the base of the ROM stockpiles, hardstand areas and haul roads.
- The EM plan should clearly identify and map the intended final land uses at the mine site, indicating, for example, those areas that would have self-sustaining native vegetation, and those where grazing and forestry would be re-established.
- The EM plan should show that the areas to be restored to self-sustaining native vegetation would be suitable habitat for threatened fauna.
- The EM plan should address the rehabilitation of the topsoil stockpile area situated between the two branches of Campbell (Gate) Creek.
- Table 28 of the EM plan (Dec 2015) should be amended in accordance with comments provided to the proponent in previous correspondence. Then, sections 4.5.4, 4.5.6.2.2 and 4.6.5.1 of the EM plan should be amended in accordance with the revised Table 28.

## 6 Suitability of the project

The proponent has met the statutory requirements of Chapter 3 of the EP Act for the EIS process.

The detailed information provided in this EIS process by Anglo Coal about the proposed Boundary Hill South Project, and its potential impacts 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 EIS has adequately addressed the final terms of reference, and has outlined a range of mitigation measures to avoid or minimise adverse environmental, social and economic impacts. The majority of issues were covered satisfactorily in the version of the EIS that was released for public review in 2014 and subsequently in the proponent's responses to the submissions, which together comprise the final EIS.

However, a number of additional actions are required to be completed. Notably, the environmental management plan must be amended (see section 5 of this report for details), and the proponent must provide an offset proposal to the Commonwealth Department of the Environment for residual impacts on matters of national environmental significance.

Nevertheless, no issues of sufficient magnitude have been identified during the EIS process that would prevent the project from proceeding. The outstanding matters can be dealt with when the proponent provides an updated environmental management plan, and/or by imposing conditions on an approval that would require the proponent to take any necessary actions. Consequently, the project has been determined to be suitable to proceed.

## 7 Recommended conditions

Section 59(d) of the EP Act requires this report to recommend conditions on which any approval required for the project may be given. The approvals required by the Boundary Hill South Project are an environmental authority under the EP Act and a water licence under the *Water Act 2000*, both of which are regulated by the Queensland Government, and an approval from the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*. The following sections of this report discuss the conditions relevant to each of those approvals.

### 7.1 Environmental authority

The Boundary Hill South Project would be an extension of, and integrated with, the Callide Mine. Therefore, it will be regulated by amendment of the current environmental authority for the Callide Mine, rather than by a new environmental authority. Most of the conditions of the current environmental authority will be carried over to the amended environmental authority.

Another relevant issue is that the application for amendment of the current environmental authority was made before the Greentape changes to the EP Act commenced. Therefore, an environmental management plan is still required for the project, and the purpose of the environmental management plan is to help the EHP prepare the environmental authority. The proponent has not yet provided an environmental management plan that adequately meets the statutory content requirements. So, it is not possible for this EIS assessment report to recommend the full suite of conditions for the amended environmental authority.

Nevertheless, Appendix A of this report recommends those conditions for which adequate assessment was made possible by the EIS. Those recommended conditions are considered necessary and desirable for the regulation of identified and potential environmental impacts identified in this assessment. However, the recommended conditions should not be considered complete or final at this stage of the approval process.

### 7.2 Water licence

As noted in section 4.8 of this report, dewatering of the pit in the operational phase of the project will require a water licence under the *Water Act 2000* in accordance with the Water Resource (Fitzroy Basin) Plan 2011. However, the EIS did not provide sufficient details for the development of recommended conditions for the water licence. Conditions will be developed when the application for the licence has been received and assessed by the Department of Natural Resources and Mines.

### 7.3 Australian Government approval

The Boundary Hill South Project is a controlled action requiring approval under the EPBC Act.

The EIS provided sufficient information for this EIS assessment report to be written. The proponent used the information in the EIS to form the view that there would be no residual impacts on matters of national environmental significance. However, DOTE and EHP have assessed the same information, and determined that there would be residual impacts on matters of national environmental significance.

The proponent's stance on the lack of impacts led them to omit from the EIS suitable mitigation measures or an offset package for the impacts on matters of national environmental significance. It will be necessary for them to complete the work on mitigation measures and offsets for the impacts on matters of national environmental significance before their application for Australian Government approval under the EPBC Act can progress. The proponent will deal directly with DOTE to address those requirements.

## 8 Approved by

This report has been approved by the delegate for the chief executive. The giving of this EIS assessment report to the proponent completes the EIS process.

SIGNED

Signature

Chris Loveday  
Director, Impact Assessment and Operational Support  
Regulatory Support and Customer Service Branch  
Department of Environment and Heritage Protection  
Delegate of the chief executive  
*Environmental Protection Act 1994*

20 April 2016

Date

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# Appendix A Recommended draft environmental authority conditions

Callide Coal Mine Boundary Hill South Project (including the currently approved Dunn Creek, Trap Gully, The Hut, The Bluff and Boundary Hill Mining Areas)

## 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** 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**.

Within this environmental authority the following mining areas relate to the following mining leases (ML's):

- Boundary Hill South Mining Area – ML80186.
  - Boundary Hill Mining Area – ML5655, ML6994, ML80107, ML80115, ML80151.
  - Dunn Creek Mining Area – ML5632, ML5641, ML80030, ML80092, ML80093 and ML80118.
  - Trap Gully Mining Area – ML5653, ML5662, ML80117 and ML80112.
  - The Hut Mining Area – ML5654.
  - The Bluff Mining Area – ML6993.
- A3** This environmental authority authorises the extraction of coal within all Mining Leases referred to in condition **A2**. The environmental authority holder is authorised to extract no more than 2.9 million tonnes of run-of-mine (ROM) coal per annum from ML80186 (Boundary Hill South Mining Area).

### Measures and maintenance of plant and equipment

- A4** The holder of this environmental authority must:
- a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority;
  - b) maintain such measures, plant and equipment in a proper and efficient condition;
  - c) operate such measures, plant and equipment in a proper and efficient manner;
  - d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.

### Monitoring

- A5** 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

- A6** 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 *Environmental Protection Act 1994*.

- A7** 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**

- A8** The holder of this environmental authority must develop and implement a risk management system for mining activities within the Boundary Hill South Mining Area 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**

- A9** The holder of this environmental authority must notify the administering authority by written notification within **twenty-four (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.
- A10** Within **ten (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**

- A11** 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.
- A12** 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

**A13** For the Boundary Hill South Mining Area, the holder of this environmental authority must:

- a) by [\[insert date that is within one year of the commencement of this environmental authority\]](#), 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 **ninety (90) days** of its completion.

**A14** 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, or where the amendment or change relates specifically to regulated structures referred to in condition **J33**, the time specified in that condition;
- 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<sub>10</sub>) 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<sub>10</sub> 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<sub>10</sub> low volume sampler—Gravimetric method.*

**\*Note:** *The five exceedances allowed each year within condition B1 b) are only permitted to allow for events that are known to occur, but which cannot be managed by the environmental authority holder. Such events could include emissions from bushfires, fuel reduction burning for fire management purposes or dust storms. More than five exceedances due to such events would not be considered to be in breach of condition B1 b) if the environmental authority holder can demonstrate that the exceedance was caused by*

*such events outlined above.*

- c) 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.*

## Schedule C - Waste management

### Burning of Waste – Boundary Hill South Mining Area

- 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 within the Boundary Hill South Mining Area.

### Storage of tyres

- C2** Tyres stored awaiting disposal or transport for take-back and recycling, or waste-to energy options, should be stockpiled in volumes less than 3m in height and 200m<sup>2</sup> in area and at least 10m from any other type storage area.
- C3** All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a 10m radius of the scrap tyre storage area.
- C4** Disposing of scrap tyres resulting from the mining activities in spoil emplacements is acceptable, provided tyres are placed as deep in the spoil as possible but not directly on the pit floor.
- C5** Scrap tyres resulting from mining activities disposed within the operational land must not impede saturated aquifers and compromise the stability of the consolidated landform.

## Schedule D - Noise

### Noise nuisance

- D1** Subject to the requirements of condition **D2**, noise from the mining activity must not cause an environmental nuisance at any sensitive place.
- D2** When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place, and the results must be notified within **ten (10) business days** to the administering authority following completion of monitoring.
- D3** The method of measurement and reporting of noise levels (including vibration levels) must comply with the latest edition of the administering authority's '*Noise Measurement Manual*'.
- D4** Subject to conditions **D5** and **D6** airblast overpressure and ground vibration from the mining activity must not cause an environmental nuisance at any sensitive place.
- D5** When requested by the administering authority, airblast overpressure and ground vibration monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place, and the results must be notified within **ten (10) business days** to the administering authority following completion of monitoring.

**D6** If the environmental authority holder can provide evidence through monitoring that the limits defined in **Table D1 – Blasting noise limits** are not being exceeded at a sensitive place then the environmental authority holder is not in breach of condition **D4**. 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  $L_{A90}$ ;
- 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  $L_{pLIN,T}$  and one third octave band measurements in dB(LIN) for centre frequencies in the 10–200Hz range.

**Table D2 – Blasting noise limits**

Blasting noise limits	Blasting noise limits at a sensitive place or commercial place		
	Monday to Saturday 9:00am – 5:00pm	Sunday's and public holidays 9:00am – 5:00pm	All days 5:00pm – 9:00am
Airblast overpressure	<p><b>All mining areas:</b></p> <p>Maximum air blast overpressure level (linear peak) for all blasts in any given 12 month period:</p> <ol style="list-style-type: none"> <li>a) less than 115dB(L) for 90% of blasts;</li> <li>b) 115–120dB(L) for 9% of blasts; and</li> <li>c) 120–125dB(L) for 1% of blasts.</li> </ol>	<p><b>At The Hut Mining area only:</b></p> <p>All blasts permitted.</p> <p><b>All other mining areas:</b></p> <ol style="list-style-type: none"> <li>a) interburden and coal blasts only and no overburden blasts permitted; and</li> <li>b) maximum air blast overpressure level (linear peak) for all blasts in any given 12 month period:               <ol style="list-style-type: none"> <li>i) less than 115dB(L) for 90% of blasts;</li> <li>ii) 115–120dB(L) for 9% of blasts; and</li> <li>iii) 120–125dB(L) for 1% of blasts.</li> </ol> </li> </ol>	No blasting.
Ground vibration peak particle velocity	<p><b>All mining areas</b></p> <p>5mm/s peak particle velocity for any four (4) out of five (5) consecutive blasts and a maximum of 10mm/s.</p>	<p><b>At The Hut Mining area only:</b></p> <ol style="list-style-type: none"> <li>a) all blasts permitted; and</li> <li>b) 5mm/s peak particle velocity for any four (4) out of five (5) consecutive blasts and a maximum of 10mm/s.</li> </ol> <p><b>All other mining areas:</b></p>	No blasting.

Blasting noise limits	Blasting noise limits at a sensitive place or commercial place		
	Monday to Saturday 9:00am – 5:00pm	Sunday's and public holidays 9:00am – 5:00pm	All days 5:00pm – 9:00am
		a) interburden and coal blasts only; and b) no overburden blasts permitted.	

- D7** If monitoring indicates exceedence of the relevant limits in **Table D1 – Blasting noise limits**, then the environmental authority holder must:
- a) address the complaint including the use of appropriate dispute resolution if required; or
  - b) immediately implement air blast overpressure and/or vibration abatement measures so that air blast overpressure and/or vibration from the activity does not result in further environmental nuisance.

## Schedule E - Groundwater

### Contaminant release

- E1** The holder of this environmental authority must not directly release waste or mine affected water 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 (Dunn Creek, Trap Gully, The Hut and Boundary Hill Mining Areas)** and **Table E3 - Groundwater quality triggers and limits (Boundary Hill South Mining Area)**.

**Table E1 - Groundwater monitoring locations and frequency**

<b>Mining area</b>	<b>Monitoring bore<sup>1</sup></b>	<b>Aquifer (Boundary Hill South Mining Area only)</b>	<b>Latitude (decimal, degree GDA94)</b>	<b>Longitude (decimal degree GDA94)</b>	<b>Surface RL<sup>2</sup></b>	<b>Monitoring frequency – Groundwater quality</b>
<b>Reference Bores</b>						
Boundary Hill South	TBA	TBA <sup>5</sup>	TBA	TBA	TBA	TBA
<b>Compliance Bores</b>						
Dunn Creek	1900	-	-24.32425	150.62783	270.32m	6-monthly
	C2455C	-	-24.31403	150.60452	344.38m	6-monthly
	C2455P	-	-24.31403	150.60452	344.38m	6-monthly
	DC01	-	-24.328032	150.613433	291.50m	6-monthly
	DC02	-	-24.32697	150.62417	267.50m	6-monthly
	DC030C	-	-24.31449	150.60739	360.38m	6-monthly
	DC030P	-	-24.31445	150.60735	360.41m	6-monthly
	DC040C	-	-24.29879	150.62687	367.25m	6-monthly
	DC040P	-	-24.29879	150.62681	367.16m	6-monthly
Trap Gully	C1363C	-	-24.28198	150.56661	249.34m	6-monthly
	C1363P	-	-24.28198	150.56661	249.34m	6-monthly
	R1829	-	-24.28295	150.57877	278.97m	6-monthly
	TG01	-	-24.28296	150.55309	240.66m	6-monthly
	R1831	-	-24.28858	150.57286	274.33m	6-monthly
The Hut	HUT01	-	-24.28107	150.63558	368.69m	6-monthly
	HUT02	-	-24.25213	150.61243	291.50m	6-monthly
	HUT03	-	-24.27211	150.58539	291.83m	6-monthly
Boundary Hill	R2940	-	-24.20823	150.48502	202.81m	6-monthly
	BH01	-	-24.20774	150.48117	204.29m	6-monthly
	R3055	-	-24.22092	150.5217	274.12m	6-monthly
	R3072	-	-24.24243	150.51632	248.25m	6-monthly

<b>Mining area</b>	<b>Monitoring bore<sup>1</sup></b>	<b>Aquifer (Boundary Hill South Mining Area only)</b>	<b>Latitude (decimal, degree GDA94)</b>	<b>Longitude (decimal degree GDA94)</b>	<b>Surface RL<sup>2</sup></b>	<b>Monitoring frequency – Groundwater quality</b>
	R3038	-	-24.23665	150.49637	238.53m	6-monthly
Boundary Hill South	MB19	Surficial Alluvium	TBA	TBA	TBA	Quarterly
	BH01	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB06	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB15	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB16	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	R3076	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	R3079	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	R3084	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB20	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB21	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB22	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB24	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB25	Precipice Sandstone	TBA	TBA	TBA	Quarterly
	MB07	Callide Coal Measures	TBA	TBA	TBA	Bi-monthly
	R3055	Callide Coal Measures	TBA	TBA	TBA	Bi-monthly
	R3072	Callide Coal Measures	TBA	TBA	TBA	Quarterly
	C0507663	Callide Coal Measures	TBA	TBA	TBA	Quarterly
	R3038	Callide Coal Measures	TBA	TBA	TBA	Quarterly
	R3070	Callide Coal Measures	TBA	TBA	TBA	Quarterly
	MB23	Callide Coal Measures	TBA	TBA	TBA	Quarterly
	MB26	Callide Coal Measures	TBA	TBA	TBA	Quarterly
	MB27	Callide Coal Measures	TBA	TBA	TBA	Quarterly
MB18	Basement Volcanics	TBA	TBA	TBA	Quarterly	
R2940	Basement Volcanics	TBA	TBA	TBA	Quarterly	

Mining area	Monitoring bore <sup>1</sup>	Aquifer (Boundary Hill South Mining Area only)	Latitude (decimal, degree GDA94)	Longitude (decimal degree GDA94)	Surface RL <sup>2</sup>	Monitoring frequency – Groundwater quality
	VWP01	Precipice Sandstone and Callide Coal Measures	TBA	TBA	TBA	N/A

Notes:

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.

**E4** The following information required (referenced as “TBA”) under **Table – E1 Groundwater monitoring locations and frequency** must be provided to the administering authority by the following dates:

- a) reference bore information (monitoring bore, aquifer, longitude, latitude, surface RL and monitoring frequency – groundwater quality) to be submitted prior to the commencement of mining activities within the Boundary Hill South Mining Area; and
- b) surface RL for the Boundary Hill South Mining Area to be submitted by *<insert date that is 12 months after the issue of the EA>*.

**Table E2 - Groundwater quality triggers and limits (Dunn Creek, Trap Gully, The Hut and Boundary Hill Mining Areas)**

Mining area	Monitoring bore	Surface RL	Parameter – pH Contaminant trigger levels (acceptable range)	Parameter – EC (µs/cm) Contaminant trigger levels (Maximum)
Dunn Creek	1900	270.32m	6.0 – 8.8	10,000
	C2455C	344.38m	5.5 – 7.5	2000
	C2455P	344.38m	5.5 – 7.5	2000
	DC01	291.50m	N/A	N/A
	DC02	267.50m	N/A	N/A
	DC030C	360.38m	N/A	N/A
	DC030P	360.41m	N/A	N/A
	DC040C	367.25m	N/A	N/A
	DC040P	367.16m	N/A	N/A



Mining area	Monitoring bore	Surface RL	Parameter – pH Contaminant trigger levels (acceptable range)	Parameter – EC (µs/cm) Contaminant trigger levels (Maximum)
Trap Gully	C1363C	249.34m	6.0 – 9.0	2000
	C1363P	249.34m	6.0 – 9.0	2000
	R1829	278.97m	5.5 – 8.5	1500
	TG01	240.66m	N/A	N/A
	R1831	274.33m	6.0 – 8.5	1500
The Hut	HUT01	368.69m	N/A	N/A
	HUT02	291.50m	N/A	N/A
	HUT03	291.83m	N/A	N/A
Boundary Hill	R2940	202.81m	6.0 – 8.0	25,000
	BH01	204.29m	N/A	N/A
	R3055	274.12m	N/A	N/A
	R3072	248.25m	N/A	N/A
	R3038	238.53m	N/A	N/A

**Table E3 - Groundwater quality triggers and limits (Boundary Hill South Mining Area)<sup>1</sup>**

Aquifer	Parameter	Contaminant triggers	Contaminant limit
Surficial alluvium	TBA	TBA	TBA
Precipice Sandstone	TBA	TBA	TBA
Callide Coal Measures	TBA	TBA	TBA
Basement volcanics	TBA	TBA	TBA
TBA	TBA	TBA	TBA

Note:

1. Refer to condition E4 of this environmental authority.

- E5** The environmental authority holder is required to submit the proposed groundwater quality contaminant triggers and limits relating to monitoring bores associated with the Boundary Hill South mining area (ML80186) by [\[insert date that is 24 months after the EA is issued\]](#). Limits and triggers are to be informed based on monitoring results obtained in accordance within conditions **E2** and **E3**
- E6** 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 E4 - Groundwater level monitoring (all mining areas)** below.

**Table E4 - Groundwater level monitoring (all mining areas)**

<b>Mining Area</b>	<b>Monitoring location</b>	<b>Level trigger threshold<sup>1</sup></b>	<b>Monitoring frequency</b>
Dunn Creek	1900	2m drawdown per year	2-monthly
	C2455C	2m drawdown per year	2-monthly
	C2455P	2m drawdown per year	2-monthly
	DC01	2m drawdown per year	2-monthly
	DC02	2m drawdown per year	2-monthly
	DC030C	2m drawdown per year	2-monthly
	DC030P	2m drawdown per year	2-monthly
	DC040C	2m drawdown per year	2-monthly
	DC040P	2m drawdown per year	2-monthly
Trap Gully	C1363C	2m drawdown per year	2-monthly
	C1363P	2m drawdown per year	2-monthly
	R1829	2m drawdown per year	2-monthly
	TG01	2m drawdown per year	2-monthly
	R1831	2m drawdown per year	2-monthly
The Hut	HUT01	2m drawdown per year	2-monthly
	HUT02	2m drawdown per year	2-monthly
	HUT03	2m drawdown per year	2-monthly
Boundary Hill	R2940	2m drawdown per year	2-monthly
	BH01	2m drawdown per year	2-monthly
	R3055	2m drawdown per year	2-monthly
	R3072	2m drawdown per year	2-monthly
	R3038	2m drawdown per year	2-monthly
Boundary Hill South	MB19	TBA	Monthly
	BH01	TBA	Monthly
	MB06	TBA	Monthly
	MB15	TBA	Monthly
	MB16	TBA	Monthly
	R3076	TBA	Monthly

<b>Mining Area</b>	<b>Monitoring location</b>	<b>Level trigger threshold<sup>1</sup></b>	<b>Monitoring frequency</b>
	R3079	TBA	Monthly
	R3084	TBA	Monthly
	MB20	TBA	Monthly
	MB21	TBA	Monthly
	MB22	TBA	Monthly
	MB24	TBA	Monthly
	MB25	TBA	Monthly
	MB07	TBA	Monthly
	R3055	TBA	Monthly
	R3072	TBA	Monthly
	C0507663	TBA	Monthly
	R3038	TBA	Monthly
	R3070	TBA	Monthly
	MB23	TBA	Monthly
	MB26	TBA	Monthly
	MB27	TBA	Monthly
	MB18	TBA	Monthly
	R2940	TBA	Monthly
	VWP01	TBA	Daily

**E7** After **twenty-four (24) months** of monitoring (i.e. 24 monitoring events) is obtained in accordance with conditions **E2** and **E3** of this environmental authority, the proposed groundwater level trigger thresholds (referenced as “TBA” within **Table E4 - Groundwater level monitoring (all mining areas)**) for the Boundary Hill South Mining Area must be provided to the administering authority

#### **Exceedance investigation**

**E8** 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 (Dunn Creek, Trap Gully, The Hut and Boundary Hill Mining Areas)** and **Table E3 - Groundwater quality triggers and limits (Boundary Hill South Mining Area)** or exceed any of the groundwater level trigger threshold stated in **Table E4 - 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.

- E9** 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 (Dunn Creek, Trap Gully, The Hut and Boundary Hill Mining Areas)** and **Table E3 - Groundwater quality triggers and limits (Boundary Hill South Mining Area)**.

**Bore construction and maintenance and decommissioning.**

- E10** 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

**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 – Water Monitoring Locations & Release Points (Boundary Hill)**, **Attachment 4 – Water Monitoring Location & Release Points (Trap Gully & The Hut)** and **Attachment 5 – Water Monitoring Locations & Release Points (Dunn Creek)** of 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 **F29** is permitted.

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

<b>Release point (RP)</b>	<b>Latitude (decimal degree, GDA94)</b>	<b>Longitude (decimal degree, GDA94)</b>	<b>Mine affected water source and location</b>	<b>Monitoring point</b>	<b>Receiving waters description</b>
RP1	-24.3293	150.6269	Dunn Creek Dam spillway overflow	Flow: Dam Spillway Quality: Storage	Dunn Creek
RP1a	-24.2638	150.6208	Turkey's Nest Storage	Flow: End of pipe flow monitor Quality: Storage	Oaky Creek
RP1b	-24.2686	150.5528	Trap Gully Pipeline	Flow: End of pipe flow monitor Quality: Storage (Ghost Ryder's Dam)	Oaky Creek

Release point (RP)	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Mine affected water source and location	Monitoring point	Receiving waters description
RP2	-24.3019	150.5628	Ghost Ryders Storage	Flow: End of pipe flow monitor Quality: Downstream of pipe	Oaky Creek
RP3	-24.2115	150.4793	Lake Gasteen	Flow: End of pipe flow monitor Quality: Downstream of pipe	Gate Creek

**F4** The release of mine affected water to waters in accordance with condition **F2** must not exceed the release limits stated in **Table F2 Part A – Mine affected water release limits (Dunn Creek Dam)**, **Table F2 Part B – Mine affected water release limits (Other than for Dunn Creek Dam)** 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 Part A – Mine affected water release limits (Dunn Creek Dam)**

Quality characteristic	Release limits	Monitoring frequency
Electrical conductivity ( $\mu\text{S}/\text{cm}$ )	1400	Daily during release (the first sample must be taken within 2 hours of commencement of release)
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	
Suspended Solids (mg/L)	200	
Sulfate ( $\text{SO}_4^{2-}$ ) (mg/L)	400	

**Table F2 Part B – Mine affected water release limits (other than for Dunn Creek Dam)**

Quality characteristic	Release limits	Monitoring frequency
Electrical conductivity ( $\mu\text{S}/\text{cm}$ )	1800 maximum	Daily during release (the first sample must be taken within 2 hours of commencement of release)
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	
Suspended Solids (mg/L)	1000	
Sulfate ( $\text{SO}_4^{2-}$ ) (mg/L)	520	

- 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 Part A – Mine affected water release limits (Dunn Creek Dam)**, **Table F2 Part B – Mine affected water release limits (Other than for Dunn Creek Dam)** 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 ( $\mu\text{g}/\text{L}$ )	Comment on trigger level	Monitoring frequency
Aluminium	55	<i>For aquatic ecosystem protection, based on SMD guideline</i>	Commencement of release and thereafter weekly during release
Arsenic	13	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Cadmium	0.2	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Chromium	1	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Copper	2	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Iron	300	<i>For aquatic ecosystem protection, based on low reliability guideline</i>	
Lead	4	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Mercury	0.2	<i>For aquatic ecosystem protection, based on LOR for CV FIMS</i>	

Quality characteristic	Trigger levels (µg/L)	Comment on trigger level	Monitoring frequency
Nickel	11	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Zinc	8	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Boron	370	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Cobalt	90	<i>For aquatic ecosystem protection, based on low reliability guideline</i>	
Manganese	1900	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Molybdenum	34	<i>For aquatic ecosystem protection, based on low reliability guideline</i>	
Selenium	10	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Silver	1	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Uranium	1	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Vanadium	10	<i>For aquatic ecosystem protection, based on LOR for ICPMS</i>	
Ammonia	900	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Nitrate	1100	<i>For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN</i>	
Petroleum hydrocarbons (C6- C9)	20		
Petroleum Hydrocarbons (C10-C36)	100		
Fluoride (total)	2000	<i>Protection of livestock and short term irrigation guideline</i>	
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 <sub>4</sub> <sup>2-</sup> ) (mg/L)	TBA – Limit to be determined based on receiving water reference data and achievable best practice sedimentation control and treatment*	<i>Drinking water environmental values from NHMRC 2006 guidelines OR ANZECC</i>	

**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.

**F6** All analysis and tests for water quality that are required under this environmental authority must be performed by a laboratory that has National Association of Testing Authorities' certification for such analysis and tests. The only exception to this condition is for the in situ monitoring of pH.

**F7** 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:

- 1) where the trigger values are not exceeded then no action is to be taken; or
- 2) 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:
  - a) if the result is less than the background monitoring site data, then no action is to be taken, or
  - b) 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 **ninety (90) days** of receiving the result, outlining:
    - i) details of the investigations carried out
    - ii) actions taken to prevent environmental harm.

*Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with **F7 2) b)** of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.*

**F8** If an exceedance in accordance with condition **F7 2) b)** is identified, the holder of the environmental authority must notify the administering authority in writing within **twenty-four 24 hours** of receiving the result.

#### **Mine affected water release events**

**F9** 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**.

**F10** 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**.



**F11** 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 water / stream	Release Point	Gauging Station	Gauging station latitude (decimal degrees GDA94)	Gauging station longitude (decimal degrees GDA94)	Minimum flow in receiving water required for a release event	Flow Recording frequency
Dunn Creek	Dunn Creek Dam (RP1)	Callide Dam headwaters	-24.32305	150.68501	1.5 m <sup>3</sup> /sec	Continuous (minimum daily)
Both: Callide Creek and Oaky Creek	Turkey's Nest Storage (RP1a) and Trap Gully Pipeline (RP1b)	Goovigen Gauging Station (GS4)	- 24.1065	150.2872	Both: ≥ 3 m <sup>3</sup> /s	
		Oaky Creek Downstream (GS1)	- 24.2617	150.5961	And ≥ 0.1 m <sup>3</sup> /s*	
Both: Callide Creek and Oaky Creek	Ghost Ryder's Storage (RP2)	Goovigen Gauging Station (GS4)	- 24.1065	150.2872	Both: ≥ 3 m <sup>3</sup> /s	
		Oaky Creek Trap Gully Confluence (GS2)	- 24.2952	150.5326	And ≥ 0.1 m <sup>3</sup> /s*	
Callide Creek	Lake Gasteen Dam (RP3)	Goovigen Gauging Station (GS4)	- 24.1065	150.2872	≥ 3 m <sup>3</sup> /s	

Note:

*\*In addition, at the tail end of a natural flow event, low flow releases continue to be authorised for a period of **fourteen (14)** calendar days from the moment that natural flow has receded below the threshold in column 5 (Minimum flow in receiving water required for a release event) and the electrical conductivity is limited to 1220uS/cm. Maximum release rate during this period must not exceed 0.5m<sup>3</sup>/s.*

**F12** The daily quantity of mine affected water released from each release point must be measured and recorded.

**F13** 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**

**F14** The environmental authority holder must notify the administering authority as soon as practicable and

no later than **twenty-four (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 **Schedule F – Water (Fitzroy model conditions)** 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 WaTERS reporting system or the Manager and Project Manager of the local administering Authority via email.*

**F15** The environmental authority holder must notify the administering authority as soon as practicable and nominally no later than **twenty-four (24) hours** after cessation of a release event of the cessation of a release notified under condition **F14** 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 **twenty-four (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 **F14** and **F15**, provided the relevant details of the release are included within the notification provided in accordance with conditions **F14** and **F15**.*

#### **Notification of release event exceedence**

**F16** If the release limits defined in **Table F2 Part A Contaminant Release Limits (Dunn Creek Dam)** and **Table F2 Part B Mine Affected Water Release Limits (Other than for Dunn Creek Dam)** are exceeded, the holder of the environmental authority must notify the administering authority within **twenty-four (24) hours** of receiving the results.

**F17** The environmental authority holder must, within **twenty-eight (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**

**F18** The quality of the receiving waters must be monitored for each quality characteristic and at the monitoring frequency stated in **Table F5 – Receiving waters contaminant trigger levels** at the locations specified in:

- a) **Table F6 Part A – Receiving water upstream background sites and downstream monitoring points (Dunn Creek Dam);**
- b) **Table F6 Part B – Receiving water upstream background sites and downstream monitoring points (other than Dunn Creek Dam);**
- c) **Attachment 3 – Water monitoring locations & release points (Boundary Hill);**
- d) **Attachment 4 – Water monitoring location & release points (Trap Gully & The Hut);**
- e) **Attachment 5 – Water monitoring locations & release points (Dunn Creek); and**
- f) **Attachment 6 – Additional Callide Mine downstream monitoring network for mine water releases**

**Table F5 – Receiving waters contaminant trigger levels**

Quality characteristic	Trigger level	Monitoring frequency
pH	6.5 – 8.0	Daily during the release
Electrical Conductivity ( $\mu\text{S/cm}$ )	80 <sup>th</sup> Percentile (1600) Maximum 1920	
Suspended solids (mg/L)	1000	
Sulfate ( $\text{SO}_4^{2-}$ ) (mg/L)	250 (Protection of drinking water Environmental Value)	
Sodium (mg/L)	180 (Australian Drinking Water Guidelines, 2004)	

**Table F6 Part A – Receiving water upstream background sites and downstream monitoring points (Dunn Creek Dam)**

Monitoring points	Receiving waters location description	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)
<b>Upstream Background Monitoring Point</b>			
Dunn Creek Dam	Callide Dam headwaters	- 24.3224	150.66994
<b>Downstream background monitoring point</b>			
Dunn Creek Dam	Callide Dam	-24.3693	150.6143

*Note: The data from background monitoring points must not be used where they are affected by releases from other mines.*

**Table F6 Part B – Receiving water upstream background sites and downstream monitoring points (other than Dunn Creek Dam)**

Monitoring points	Receiving waters location description	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)
<b>Upstream Background Monitoring Points</b>			
Monitoring Point 1	Dingo Gully 3700 metres upstream of RP1a	- 24.2772	150.6447
Monitoring Point 2	Timber Reserve Background 3000 metres Upstream of RP1b	- 24.2487	150.5666
Monitoring Point 3	Trap Gully 5000 metres upstream of RP2 unnamed gully confluence with Oaky Creek	- 24.2826	150.5708
Monitoring Point 4	Gate Creek 1500 meters upstream of RP3 unnamed gully confluence with Gate Ck.	- 24.2287	150.4867
Monitoring Point 5	Callide Creek at Dawson Highway Crossing		
<b>Downstream monitoring points</b>			
CC1	NRM Goovigen Gauging Station on Callide Creek	-24.1054	150.2866
CC2	Callide Creek Main Channel –Electrical Conductivity Gauge	-24.2649	150.4132

Monitoring points	Receiving waters location description	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)
CC3	Callide Creek old Channel –Electrical Conductivity Gauge	-24.2581	150.4263
Monitoring Point 6	Kroombit Creek at McCann's Road Crossing	-24.2394	150.3872

Notes:

- a) The upstream monitoring point should be within 15km the release point.
- b) The downstream point should not be greater than 15km from the release point.
- c) The data from background monitoring points must not be used where they are affected by releases from other mines.

**F19** 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.*

**F20** All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

### Receiving environment monitoring program (REMP)

**F21** 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 as described in **Table E6 Part A – Receiving water upstream background sites and downstream monitoring points (Dunn Creek Dam)**, **Table E6 Part B – Receiving water upstream background sites and downstream monitoring points (other than Dunn Creek Dam)** and connected waterways within 8.3km downstream of the Dunn Creek Dam release, and additionally the Callide Creek and Oaky Creek 15 km downstream of the respective releases and connected or surrounding waterways within the Callide Catchment (15km) 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.

- F22** A REMP Design Document that addresses the requirements of the REMP<sup>5</sup> must be prepared and submitted to the administering authority for approval by [insert date that is 3 months after the issue of the final environmental authority]. The REMP must also be made available to the administering authority upon request.
- F23** 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 administering 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

- F24** 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).
- F25** All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.

### Annual water monitoring reporting

- F26** 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

- F27** 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*.

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<sup>5</sup> The REMP is required to include a water hardness correction for relevant metals as per ANZECC and ARM CANZ (2000) and other relevant guidelines.

## Water management plan

**F28** A Water Management Plan must be developed by an appropriately qualified person and implemented.

## Stormwater and water sediment controls

**F29** 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.

**F30** 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 **F28**; and
- b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition **F27**, for the purpose of ensuring water does not become mine affected water.

## Schedule G - Sewage treatment

**G1** All effluent released from the sewage treatment plants at the Dunn Creek and Boundary Hill Mining Areas must be monitored at the frequency and for the parameters specified in **Table G1 – Sewage effluent quality targets for irrigation**.

**Table G1 – Sewage effluent quality targets for irrigation**

Quality characteristics	Release limit	Units	Limit type	Monitoring frequency
pH	6.0 to 9.0	-	Range	Monthly
Free Chlorine Residual	5	mg/L	Maximum	Monthly
Faecal Coliforms, based on the average of a minimum of five samples collected	<10	Colonies per 100 millilitres	Maximum	Monthly
Total Nitrogen	60	mg/L	Maximum	Monthly
Total Phosphorus	20	mg/L	Maximum	Monthly

**G2** Sewage effluent used for dust suppression or irrigation must not exceed sewage effluent release limits defined in **Table G1 – Sewage effluent quality targets for irrigation**.

**G3** Sewage effluent used for dust suppression or irrigation must not cause spray drift or over spray to any sensitive place.

**G4** Subject to conditions **G1**, **G2** and **G3**, sewage effluent from sewage treatment facilities must be reused or evaporated and must not be directly released from the sewage treatment plant to any water way or drainage line.

## Schedule H - Land and rehabilitation

### Rehabilitation requirements – All mining areas (Boundary Hill, Dunn Creek, Trap Gully, The Hut, The Bluff and Boundary Hill South)

**H1** Rehabilitation must commence progressively in accordance with the plan of operations.

### Rehabilitation requirements – Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas

**H2** All areas significantly disturbed by the Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas must be rehabilitated to the final land description as defined in:

- a) **Table H1 – Final land use capability and projective area (Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas);**
- b) **Table H2 – Final landform design criteria (Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas);** and
- c) the acceptance criteria stated in *Callide Mine Report on Rehabilitation Acceptance (Completion) Criteria*, Barcode C1554627, December 2003.

**Table H1 – Final land use capability and projective area Schedule (Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas)**

Southern Pits		Boundary Hill	
Tenure ID: ML's: 5632, 5641, 5662, 5653, 5654, 80093, 6993, 80030, 80092, 80118, 80117, 80122		Tenure ID: ML5655, 6994, 80115, 80107, 80151	
Post Mine land capability classification	Projective surface area (ha)	Post mine land capability classification	Projective surface area (ha)
4	100	4	64
5	6.9	5	0
6	239.4	6	360
7	2203.70	7	563
8	2028.70	8	168

**Table H2 – Final landform design criteria (Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas)**

Disturbance type	Slope	Drainage
Dragline and prestrip soil (except Dunn Creek A and S Cut spoil) – outer slopes.	Overall slope angle of 15% on outer slopes.	Graded banks at 10m vertical intervals (approx. every 60m along the slope).



Disturbance type	Slope	Drainage
Dunn Creek A & S Cut spoil – outer slopes.	Overall slope angle of 25%, 120m slope length, basalt mulch cladding.	Berms or graded banks at 120m spacing along the slope.
Internal slopes .	Generally, 15% or flatter.	Graded banks at 10m vertical intervals.
Trial slopes.	From 15% to 25% with topsoil or basalt mulch cladding.	Graded banks at 10m vertical intervals.
	Up to 37% (angle of repose).	Cut off drain/diversion bund across top of slope.

**H3** Areas which are to be progressively rehabilitated to native ecosystem must comply with the following outcomes:

- a) achievement of a self-sustaining native ecosystem with a species composition and distribution comparable and similar to nominated analogue sites;
- b) all areas disturbed by mining activities must be rehabilitated to the landform design criteria defined in **Table H2 – Final landform design criteria (Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas)**; and
- c) landforms are stable with erosion comparable and similar to analogue sites.

**H4** Residual voids must comply with the following outcomes:

- a) residual voids must not cause any serious environmental harm to land, surface waters or any recognised ground water aquifer, other than the environmental harm constituted by the existence of the residual void itself, and subject to any other condition within this environmental authority;
- b) residual voids must comply with **Table H3 – Residual void design outcomes (Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas)**; and
- c) residual voids must meet the acceptance criteria stated in *Callide Mine Report on Rehabilitation Acceptance (Completion) Criteria*, Barcode C1554627, December 2003.

**Table H3 – Residual void design outcomes (Boundary Hill, Dunn Creek, Trap Gully, The Hut and The Bluff Mining Areas)**

Void Identification	Configuration
High wall	<ul style="list-style-type: none"> <li>• 75° slope angle.</li> <li>• Safety bunds will be constructed along the top of the high walls and along the crest of the pre-strip benches. The pre-strip benches will be shaped to shed runoff over the high wall at several locations to limit erosion.</li> <li>• All exposed coal seams will be covered with inert material.</li> </ul>
Low wall	<ul style="list-style-type: none"> <li>• Generally at angle of repose.</li> <li>• Where the low all toe will be submerged, the slope will be lowered to 27° by backfilling against the toe or dozing the low wall slope down to this angle.</li> </ul>

Void Identification	Configuration
Ramp Spoil	<ul style="list-style-type: none"> <li>• Generally at angle of repose.</li> <li>• Where the low wall toe will to be submerged, the slope will be lowered to 27° by backfilling against the toe or dozing the low wall slope down to this angle.</li> </ul>

### Rehabilitation requirements – Boundary Hill South Mining Area

**H5** Land disturbed within the Boundary Hill South Mining Area must be rehabilitated in accordance with **Attachment 7 – Rehabilitation requirements (Boundary Hill South Mining Area)**.

### Contaminated land

- H6** 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.
- H7** 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.
- H8** Minimise the potential for contamination of land by hazardous contaminants.

### Biodiversity offsets

- H9** Activities related to the Boundary Hill South Mining Area are only authorised to occur within matters of state environmental significance (MSES) if the:
- a) activities are specified in **Table H4 – Matters of State Environmental Significance**;
  - b) activities are carried out in the location specified in **Table H4 – Matters of State Environmental Significance**;
  - c) activities are no greater than the maximum extent of impact for each MSES specified in **Table H4 – Matters of State Environmental Significance**; and
  - d) activity is specified as a significant residual impact in **Table H4 – Matters of State Environmental Significance**, an offset must be delivered subject to conditions **H10** and **H13**, inclusive.

**Table H4 – Matters of State Environmental Significance\***

Matter of State Environmental Significance	Activity	Location	Maximum extent of impact (ha)	Impact

Note: \* Offsets to the authorized impacts to the matters listed in **Table H4 – Matters of State Environmental Significance** will be offset via approvals issued under the Environmental Protection and Biodiversity Conservation Act 1999 (Cwth).

“Schedule I” has not been used.

## 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) 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<sup>6</sup> 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<sup>7</sup> 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 environmental authority holder has:
  - a) submitted a consequence category assessment report and certification to the administering authority;

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<sup>6</sup> Construction of a dam includes modification of an existing dam — refer to the definitions.

<sup>7</sup> Certification of design and construction may be undertaken by different persons.

- b) received certification from 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.
- 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 Register of Regulated Structures.
- 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.

### Operation of a regulated structure

- J10** Operation of a regulated structure, except for an existing structure, is prohibited unless the environmental authority holder has submitted to the administering authority:
- a) one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition **J7**;
  - b) a set of 'as constructed' drawings and specifications;
  - c) certification of those 'as constructed drawings and specifications' in accordance with condition **J9**;
  - d) where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the design storage allowance (DSA) volume across the system, a copy of the certified system design plan;
  - e) the requirements of this authority relating to the construction of the regulated structure have been met;
  - f) the environmental authority holder has entered the details required under this authority, into a Register of Regulated Structures; and
  - g) there is a current operational plan for the regulated structures.
- J11** For existing structures that are regulated structures:
- a) where the existing structure that is a regulated structure is to be managed as part of an integrated containment system for the purpose of sharing DSA volume across the system, the environmental authority holder must submit to the administering authority within **twelve (12) months** of the commencement of this condition a copy of the certified design plan including that structure; and

b) there must be a current operational plan for the existing structure.

**J12** 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**

**J13** Conditions **J14 to J17** inclusive only apply to regulated structures which have not been certified as low consequence category for 'failure to contain – overtopping'.

**J14** 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.

**J15** The environmental authority 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.

**J16** The environmental authority 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.

**J17** The environmental authority holder must record any changes to the MRL in the Register of Regulated Structures.

### **Design storage allowance**

**J18** The environmental authority 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.

**J19** 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).

**J20** The environmental authority 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.

**J21** The environmental authority 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**

**J22** Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.

**J23** 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.

**J24** 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)*.

- J25** The environmental authority holder must:
- a) Within **twenty (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 **ten (10) business days** of receipt of the request.

### Transfer arrangements

- J26** The environmental authority 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.

### Register of Regulated Structures

- J27** A Register of Regulated Structures must be established and maintained by the environmental authority holder for each regulated structure.
- J28** The environmental authority 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.
- J29** The environmental authority 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.
- J30** The environmental authority holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.
- J31** All entries in the Register of Regulated Structures must be approved by the chief executive officer for the environmental authority holder, or their delegate, as being accurate and correct.
- J32** The environmental authority 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.

### Transitional arrangements

- J33** All existing structures that have not been assessed in accordance with either the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* or the former *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* must be assessed and certified in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* by **27 May 2016**.
- J34** All existing structures must subsequently comply with the timetable for any further assessments in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* specified in **Table J1 - Transitional requirements for existing structures**, depending on the consequence category for each existing structure assessed in the most recent previous certification for that structure.
- J35** **Table J1 - Transitional requirements for existing structures** ceases to apply for a structure once any of the following events has occurred:

- a) it has been brought into compliance with the hydraulic performance criteria applicable to the structure under the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*; or
- b) it has been decommissioned; or
- c) it has been certified as no longer being assessed as a regulated structure.

**Table J1 - Transitional requirements for existing structures**

<b>Transition period required for existing structures to achieve the requirements of the <i>Manual for Assessing Consequence Categories and Hydraulic Performance of Dams</i></b>			
<b>Compliance with criteria</b>	<b>High</b>	<b>Significant</b>	<b>Low</b>
>90% and a history of good compliance performance in last 5 years	No transition required	No transition required	No transitional conditions apply. Review consequence assessment every 7 years.
>70%-≤90%	Within 7 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 10 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	No transitional conditions apply. Review consequence assessment every 7 years.
>50-≤70%	Within 5 years unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 7 years unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Review consequence assessment every 7 years.
≤50%	Within 5 years or as per compliance requirements (e.g. TEP timing)	Within 5 years or as per compliance requirements (e.g. TEP timing)	Review consequence assessment every 5 years.

**J36** Certification of the transitional assessment required by J33 and J35 (as applicable) must be provided to the administering authority by 27 May 2016.

## 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.

**'assess', '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.



**'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.

**'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'** means 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.

**'matters of state environmental significance'**, or **'MSES'**, has the meaning in schedule 2 of the *Environmental Offsets Regulation 2014*.

**'maximum extent of impacts'** in terms of biodiversity offsets means the total maximum, unabated, impact to a matter of state environmental significance that could occur over the whole of project life.

**'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':**

- 1) means the following types of water:
  - a) pit water, tailings dam water, processing plant water;
  - b) 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;
  - c) 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;
- d) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated;
  - e) groundwater from the mine's dewatering activities; or
  - f) a mix of mine affected water (under any of paragraphs a) to e) above) and other water;
- 2) 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:
- a) 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
  - b) 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:
    - i) areas that have been capped and have monitoring data demonstrating hazardous material adequately contained with the site;
    - ii) 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
  - c) both a) and b) above.

'**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.

'**notice of election**' has the meaning in section 18(2) *Environmental Offsets Act 2014*

'**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).

'**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*.

'**proposed financial settlement offset**' means the proposed amount required as a financial settlement offset calculated in accordance with the *Queensland Environmental Offset Policy 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 being authorised for significant disturbance from mining activities **Attachment 1 – Authorised disturbance footprint**, attached to 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<sup>8</sup> 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 Environmental Protection (Noise) Policy 2008. That is, a sensitive place is inside or outside of 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 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.*

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<sup>8</sup> 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.

**'significant residual impact'** has the meaning in section 8 *Environmental Offsets Act 2014*.

**'spillway'** means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

**'structure'** means dam or levee.

**'suitably qualified person / appropriately qualified person'** in relation to biodiversity offsets means a person who has professional qualifications, training or skills or experience relevant to the nominated subject matters and can give authoritative assessment, advice and analysis about performance relevant to the subject matters using relevant protocols, standards, methods or literature.

**'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:

- 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 geomechanics, hydraulic design or engineering hydrology.

**'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.

**'the Act'** means the *Environmental Protection Act 1994*.

**'µS/cm'** means micro Siemens per centimetre.

**'void'** means any constructed, open excavation in the ground.

**'waste'** is defined under section 13 of the *Environmental Protection Act 1994*.

**'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**

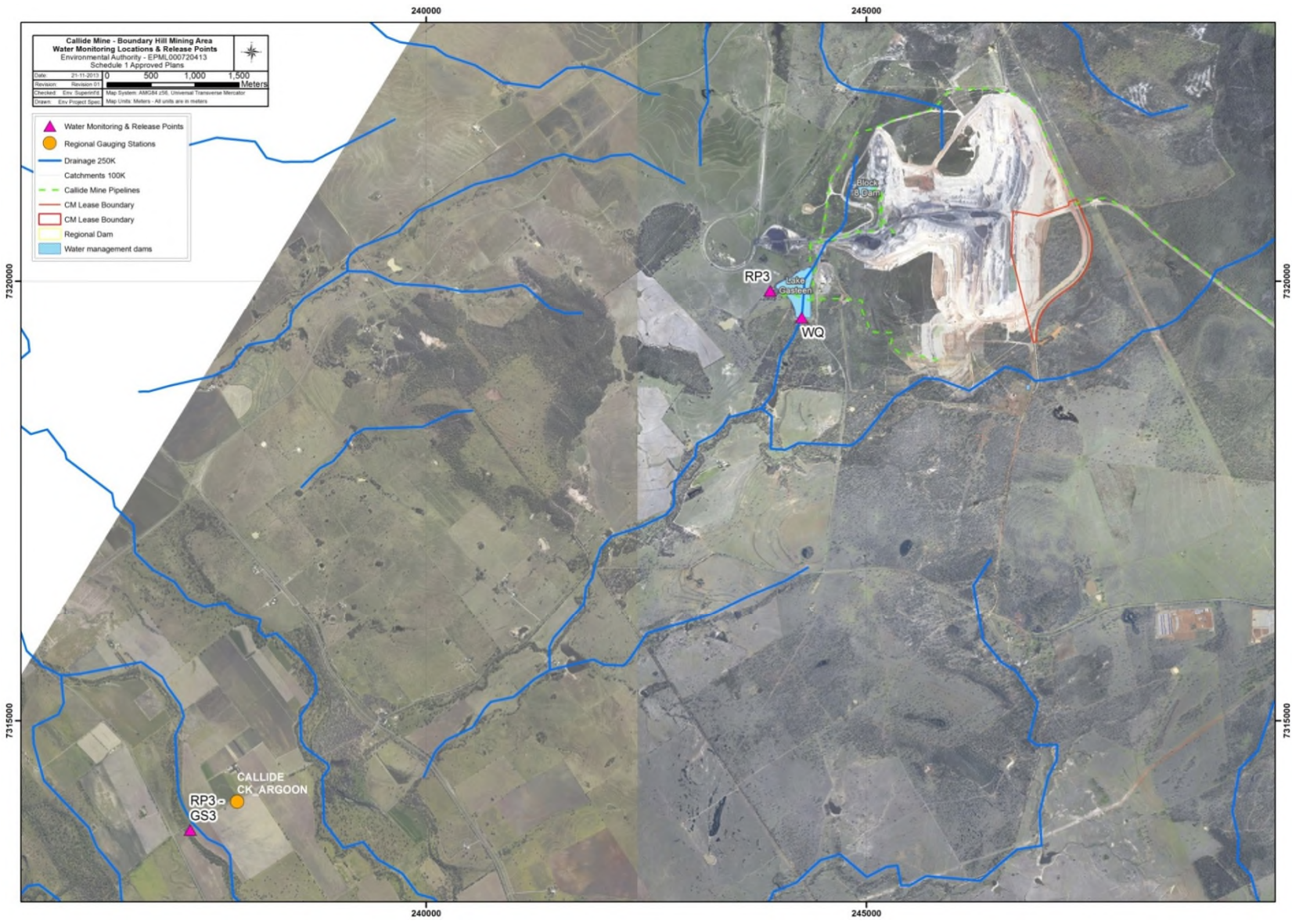
Figure for all mining areas to be provided by the environmental authority holder prior to issuing of the draft environmental authority.



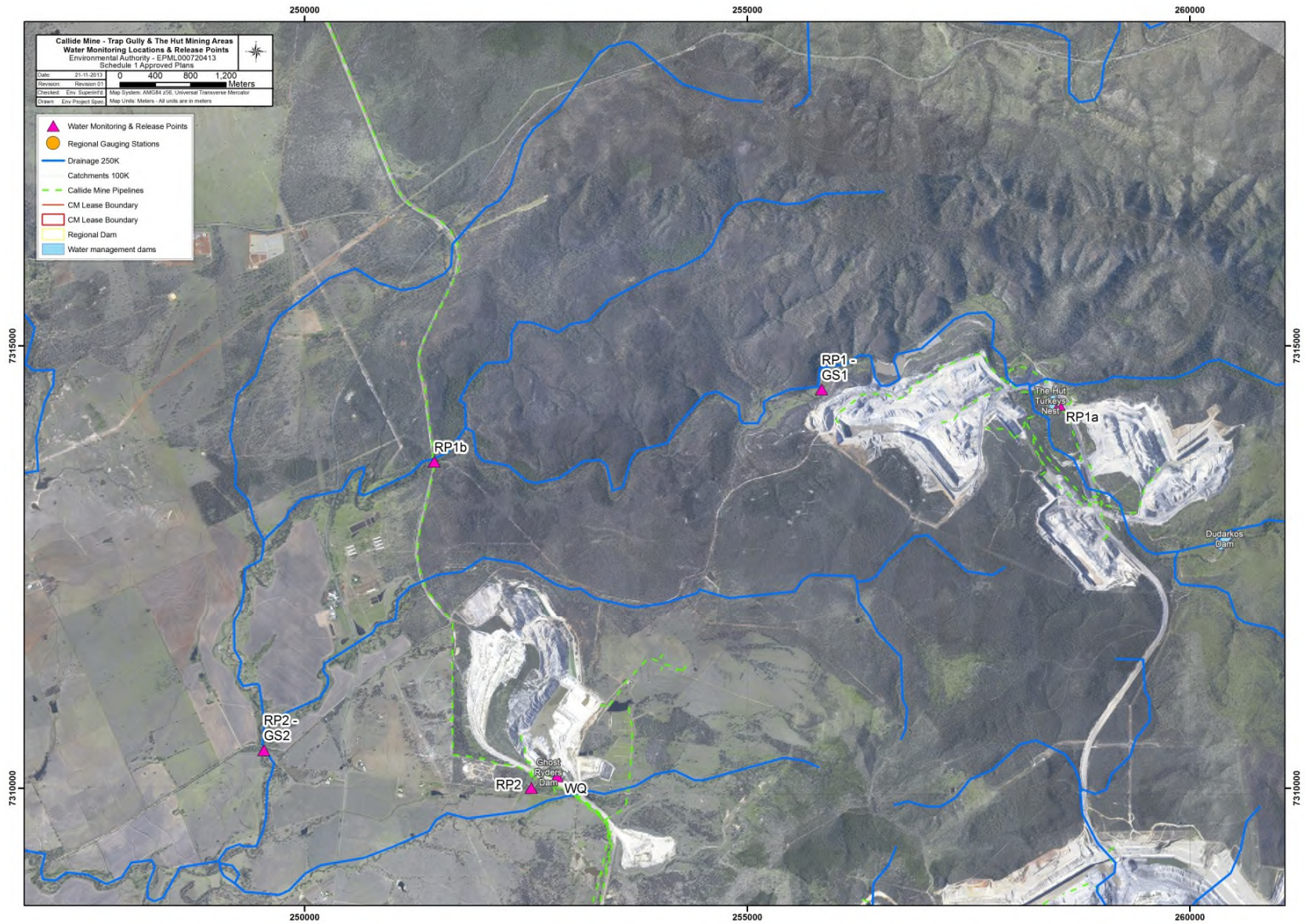
## **Attachment 2 – Groundwater monitoring locations**

Figure for all mining areas to be provided by the environmental authority holder prior to issuing of the draft environmental authority.

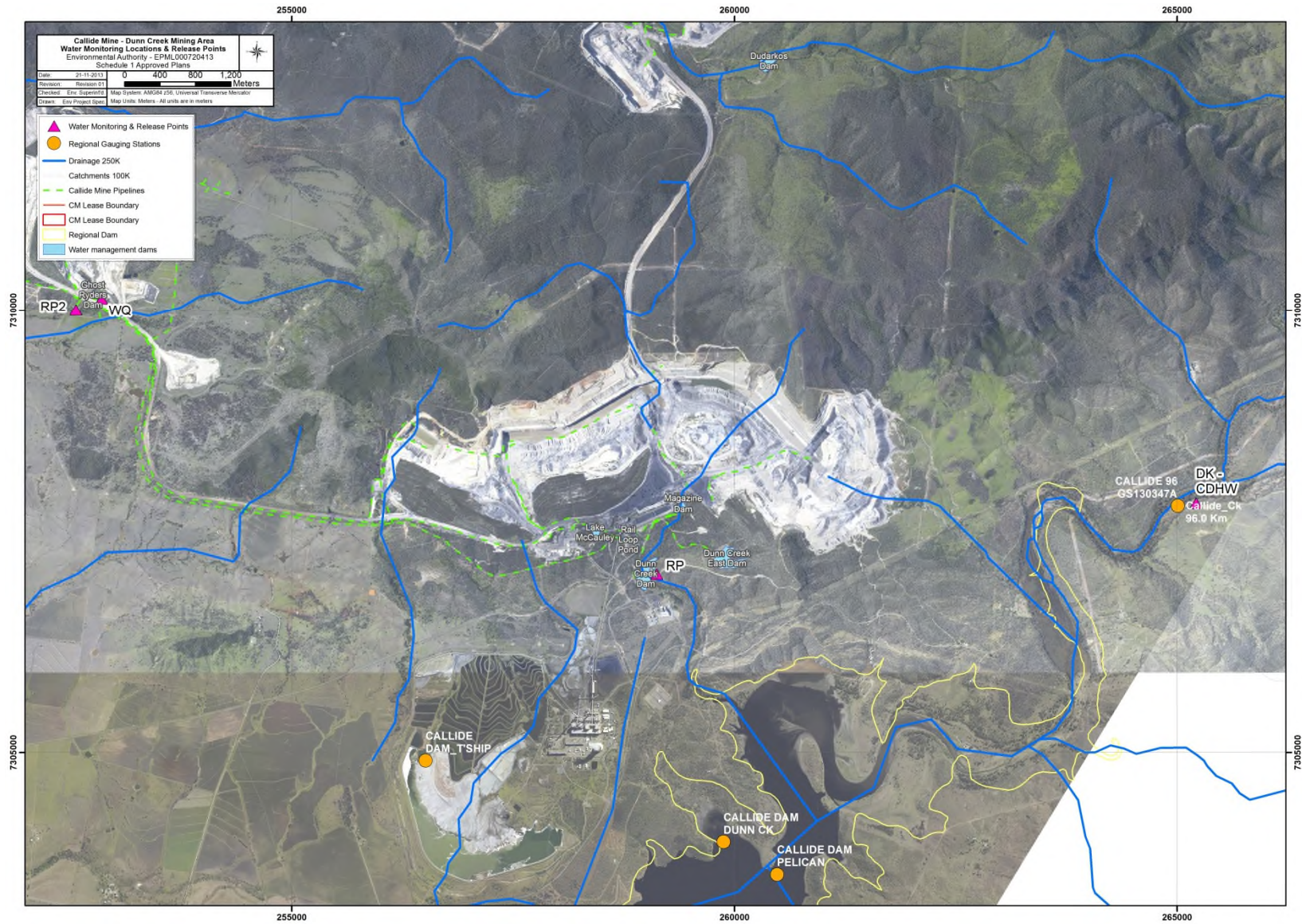
### Attachment 3 – Water monitoring locations & release points (Boundary Hill)



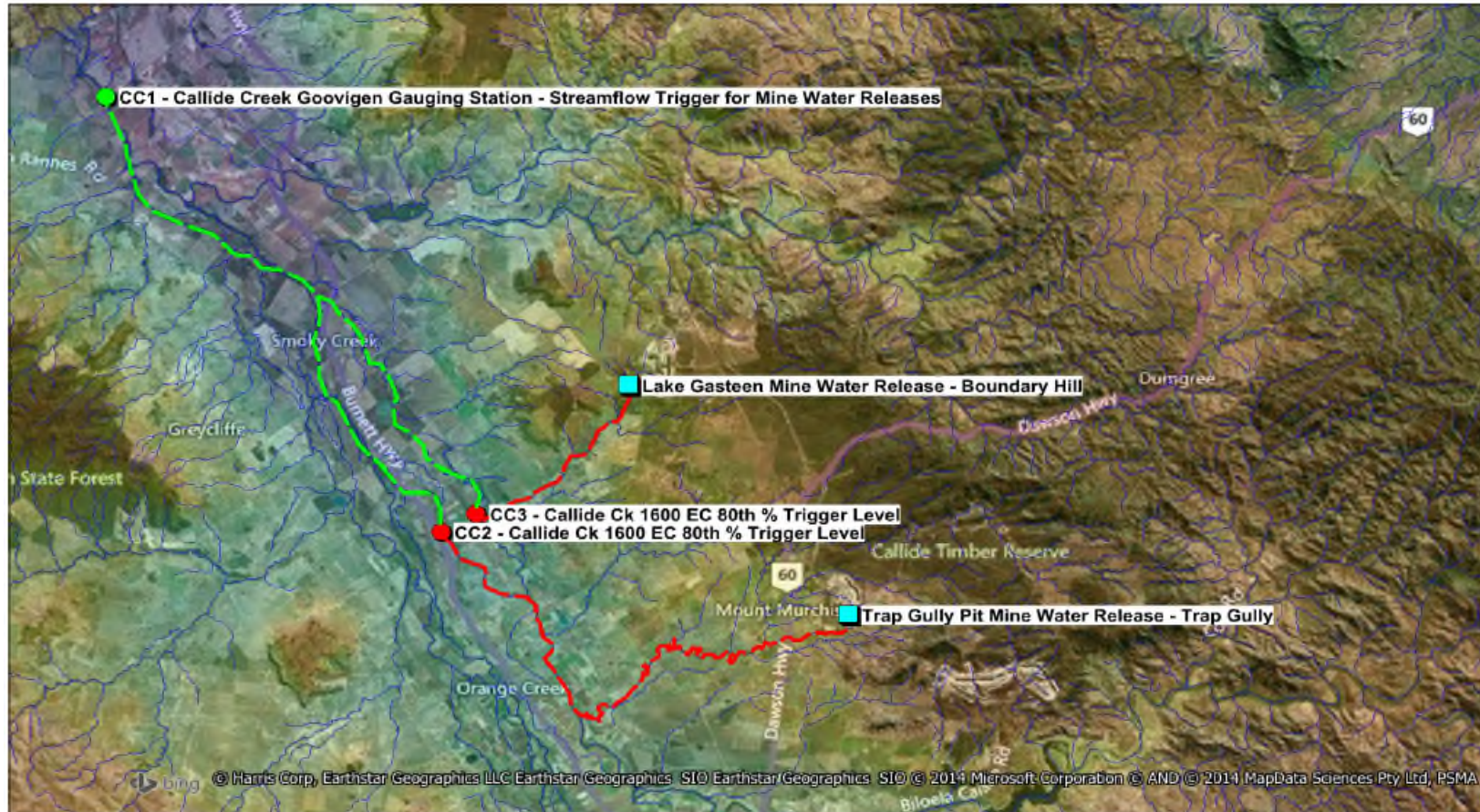
### Attachment 4 – Water monitoring location & release points (Trap Gully & The Hut)



## Attachment 5 – Water monitoring locations & release points (Dunn Creek)



Attachment 6 – Additional Callide Mine downstream monitoring network for mine water releases



**Attachment 7 – Rehabilitation requirements (Boundary Hill South)**

<b>Mine domain</b>	<b>Mine feature name</b>	<b>Rehabilitation goal</b>	<b>Rehabilitation objectives</b>	<b>Indicators</b>	<b>Completion criteria</b>

*To be provided by the environmental authority holder prior to approval of the EM Plan.*

## Appendix B Assessment of matters of national environmental significance

### 1 Matters of national environmental significance

The Boundary Hill South Project is a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The state's environmental impact statement (EIS) process was accredited under the Bilateral Agreement between the Commonwealth and the State of Queensland under section 45 of the *Environment Protection and Biodiversity Conservation Act 1999* (commonly called the bilateral agreement). The accreditation of the state's EIS process covered the assessment of impacts under Part 8 of the EPBC Act.

The submitted EIS included an assessment of the potential impacts of the Boundary Hill South Project on matters of national environmental significance (MNES) covered by the controlling provisions.

This appendix 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 Referral number and controlling provisions

The referral number for the Boundary Hill South Project is 2012/6324.

The relevant controlling provisions for the project are:

- sections 18 and 18A (Listed threatened species and ecological communities)
- sections 20 and 20A (Listed migratory species)
- sections 24D and 24E (Water resources).

#### 1.2 Stages in the process

On 21 March 2012, the project was referred to the Commonwealth Environment Minister for a decision on whether assessment and approval is required under the EPBC Act.

On 23 May 2012, the delegate of the Commonwealth Environment Minister decided under section 75 of the EPBC Act that the project is a controlled action. At that time, the relevant controlling provisions were decided to be:

- sections 18 and 18A (Listed threatened species and ecological communities)
- sections 20 and 20A (Listed migratory species).

On 25 May 2012, the state's EIS process was accredited for assessment of the project under the bilateral agreement.

On 19 November 2012, the following variations were made to the proposal:

- the project name was changed from 'Boundary Hill extension project' to 'Boundary Hill South project'
- the mining lease reference for the project was changed from MLA80121 to MLA80186, which has a smaller area.

On 17 October 2013, another variation to the proposal was accepted that further reduced the area of the project.

In June 2013, the EPBC Act was amended to include significant impacts of coal seam gas development and large coal mining development on water resources (the water trigger) as a new matter of national environmental significance under sections 24D and 24E of the EPBC Act. On 17 October 2013, the Commonwealth Environment Minister decided that water resources is a controlling provision for the Boundary Hill South project.

This EIS assessment report includes an assessment of MNES and 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.

## 1.3 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 (IESC) on Coal Seam Gas and Large Coal Mining Development 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 3 April 2014 by the Commonwealth Department of the Environment (DOE) and the Queensland Department of Environment and Heritage Protection (EHP). The IESC's advice, dated 14 May 2014, has been considered in the preparation of this assessment report. A summary of 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 3.2.6.1 of this Appendix B.

## 2 Description of the proposed action

The proponent for the project is Anglo Coal (Callide Management) Pty Ltd, a wholly owned subsidiary of Anglo American Metallurgical Coal Pty Ltd (Anglo American).

The proponent operates Callide Mine, located in the Callide Basin of Central Queensland, approximately 20km north of Biloela and 85km south-west of Gladstone. The Callide Mine consists of two mining areas: the Boundary Hill pit, and the Southern pits. The existing Boundary Hill pit is located about 500m north of the proposed Boundary Hill South project area, while the Southern pits are located about 6km south east of the project area.

The existing Boundary Hill pit has a limited life with resources expected to be exhausted by about 2016. The Boundary Hill South project would enable the continuation of the current mining rate of approximately 2.9 million tonnes a year (Mt/y) of run of mine (ROM) coal, which contributes to the Callide Mine total output of about 8.5Mt/y of ROM coal. The Boundary Hill South pit is expected to operate for approximately 20 years.

The project would be situated on land described as: Part Lot 1 SP231268; Part Lot 94 RN1524; and Part Lot 134 RN417. The project is located within mining lease application (MLA) 80186, and comprises an area of 630 hectares (ha). Approximately 477ha of MLA80186 would be subject to disturbance by mining operations, including topsoil storage, pits and overburden emplacements.

A 275kV high voltage transmission line and associated easement adjoins the eastern boundary of the project area. The Callide Timber Reserve area (TR170 on plan FTY1843) is located north east of the project area. The southern limit of the proposed mining operations would be located approximately 1.2km to the north of the Kilburnie Homestead on Argoon Road in the Leichardt Pastoral District, Biloela.

Anglo Coal plan to start construction in 2016. Construction would occur over approximately six months, if weather permits, and involve approximately 25 contractors. Construction would include the development of a central box cut. Open cut operations would be carried east and west of the boxcut from 2017. Other activities associated with the project would include:

- construction of a haul road north from the new open-cut pit to facilitate transport of overburden for backfilling into the existing Boundary Hill residual void and haulage of coal to the coal handling and preparation area
- construction of a new overburden dump area to the west of the area to be mined
- additional temporary mine infrastructure, such as crib rooms and amenities
- realignment of Inverness Road, with a drain diversion and a flood protection levee that are to the east of the proposed pit and outside the proposed mining lease
- a flood protection levee to the south east of the pit.

The operational workforce would not increase with the project as employees would be moved from existing operations to commence construction and operation of the project. The operational workforce would average, across the life of the mine, approximately 180 permanent employees per year.

The pit would be mined by conventional open-cut methods using a walking dragline supported by a hydraulic excavator and a fleet of trucks. Overburden removal would involve the use of draglines and truck and shovel pre-stripping. Initial overburden would be placed at the existing Boundary Hill pit in the initial years, in order to set up



dumping cycles at the Boundary Hill South project site. As the open cut pit develops and progresses, overburden would be placed in the western extent of the Boundary Hill South pit.

A hydraulic excavator would be used to load coal into rear dump trucks for transport to either the ROM coal stockpile located adjacent to the Boundary Hill South pit, or to the existing Boundary Hill ROM coal area. All coal would be crushed and screened at the Boundary Hill coal handling and preparation area. The product coal does not require washing prior to sale therefore, rejects and tailings would not be produced by the mine. Product coal would be transported by conveyor to the existing rail load out facility near the existing Boundary Hill pit, and then railed via Aurizon's existing Moura rail system to the Callide and Gladstone power stations for electricity generation, or to the Gladstone Port for export.

The open cut pit would extend over 390ha and to a depth of approximately 300m at its deepest point along the final highwall. As the open cut mining area progresses along the dip of the target coal seams, it would intersect several geological units including the unsaturated Biloela Formation and the saturated Precipice Sandstone and Callide Coal Measures.

Groundwater would enter the pit, which would require the workings to be pumped out. The water from the pit would be pumped to a release dam, which is known as Lake Gasteen. Dewatering of the pit would result in the groundwater levels being drawn down to pit floor level and a reduction of water pressure in surrounding rock units beyond the limit of mining excavation.

Disturbed lands at the project would be managed through a program of progressive rehabilitation scheduled based on the mine plan. This would generally involve backfilling mine voids where possible, re-contouring spoil dumps, respreading stockpiled topsoil and revegetating disturbed areas. At completion of mining, a final void would remain, which is expected to partially fill with water from groundwater inflows.

## 2.1 Project justification

The project would prolong current mining operations at Callide Mine, which in turn would extend the mine's contribution to the local, regional, state and national economies through royalties, taxes, charges and wages. In addition, the project would help sustain employment and create opportunities for small business, regional development and investment.

## 2.2 Feasible project alternatives

The EIS considered the following alternatives for the avoidance of impact to MNES:

- **Alternative coal extraction methods:** underground coal mining was not considered feasible for extracting coal in seams shallower than 100m below surface level due to poor ground stability and the economics of underground mining. Also, alternative open cut mining methods were considered. However, the geology and existing equipment fleet at Boundary Hill operation are advantageous to the mining methods chosen for the project.
- **Mine layout:** a number of design options have been considered for the project. The mine layout in the proposed mining lease has been designed to consider the potential impacts from the mining activity to surrounding sensitive receptors and reduce impacts to MNES, including:
  - revising the proposed mining lease boundary to include a one kilometre setback from the Argoon Kilburnie Road to minimise potential impacts to sensitive receptors
  - removing the Timber Reserve area situated north of the powerline easement from the proposed mining lease, as it is habitat for the threatened species listed under EPBC Act
  - maximising the use of adjacent infrastructure, and mostly using existing haul roads to minimise impacts on vegetation communities
  - reducing the total mine footprint to disturb the minimum amount of ecological communities found in and adjacent to the mining lease, while still making coal extraction feasible.
- **Rehabilitation:** out-of-pit dumping of spoil would be minimised by maximising in-pit dumping.

## **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**

#### **3.1.1 Assessment method**

Seven rounds of flora and fauna surveys were conducted over four years in the project area, including:

- reconnaissance surveys for the northern quoll—6 to 9 December 2011
- flora surveys—26 to 29 March 2012, and 3 to 6 September 2012
- fauna surveys—17 to 21 April 2012, and 6 to 10 September 2012
- targeted koala surveys—2 to 6 September 2013
- detailed northern quoll and groundwater dependent ecosystems (GDEs) surveys—7 to 16 August 2014.

The EIS stated that the assessment used the EPBC Act Matters of National Environmental Significance: Significant Impact Guidelines 1.1 (DEWHA, 2009) (the EPBC Act significant impact guidelines). Assessment against those guidelines were undertaken for EPBC Act listed species or communities that were recorded during surveys or were assessed as having a high or moderate potential to occur in the project area.

The EIS stated that a risk based approach was taken to determine the need for assessment of impacts. The approach considered the likelihood-of-occurrence of the species and the significance of potential habitat loss or disturbance (habitat quality) resulting from the project construction.

Habitat modelling was undertaken for the following EPBC Act listed fauna species: collared delma, yakka skink, squatter pigeon, red goshawk, Australian painted snipe, northern quoll, koala, grey-headed flying fox, large-eared pied bat, and south-eastern long-eared bat. Habitat modelling was based on the desktop assessment, field results, habitat assessments and the latest vegetation mapping released by the Queensland Herbarium (version 9), which included amendments resulting from the EIS's flora surveys.

The results of desktop searches were used to develop targeted surveys of potential groundwater dependent ecosystems (GDE) at 53 sites in and near the project area. The targeted surveys were undertaken from 7 to 16 August 2014.

#### **3.1.2 Existing environmental values**

##### **3.1.2.1 Threatened Ecological Communities**

The EIS stated that no Threatened Ecological Communities (TEC) were found during flora surveys, and these communities were considered unlikely to occur within the project area.

##### **3.1.2.2 Threatened Flora**

Desktop searches carried out prior to field work identified 12 flora species listed as endangered or vulnerable under the EPBC Act that were predicted to occur within and nearby the project area. The likelihood of these species being present was assessed in the EIS based on the presence and condition of habitat within the project area and results of the field surveys. The assessment concluded that all 12 flora species have a low likelihood of occurring within the project area.

##### **3.1.2.3 Threatened fauna**

Desktop searches identified 18 threatened fauna species listed under the EPBC Act that may occur within the project area.

Of these 18 species, the squatter pigeon (southern subspecies) (*Geophaps scripta scripta*) (vulnerable) was the only species recorded during field surveys.

The collared delma (*Delma torquata*) (vulnerable), northern quoll (*Dasyurus hallucatus*) (endangered) and the koala (*Phascolarctos cinereus*) (vulnerable) were not found during surveys, but were assessed as having a high likelihood of occurring within the project area.

The EIS stated that potential low value habitat is present in the project area for the following species: yakka skink (*Egernia rugosa*), vulnerable; Australian painted snipe (*Rostratula australis*), endangered; red goshawk (*Erythrotriorchis radiatus*), vulnerable; grey-headed flying fox (*Pteropus poliocephalus*), vulnerable; large-eared pied bat (*Chalinolobus dwyeri*), vulnerable; and south-eastern long-eared bat (*Nyctophilus timoriensis*), vulnerable. These species were assessed as having a moderate likelihood of occurrence.

The remaining eight species of the 18 potentially present were assessed as having a low likelihood of occurring within the project area due a lack of suitable habitat.

#### **3.1.2.4 Migratory fauna**

The EIS stated that 19 migratory species listed under the EPBC Act possibly occur within the project area, based on the availability of suitable habitat. One of these species, the Australian painted snipe (*Rostratula australis*), is listed as endangered under the EPBC Act. The EIS assessed the likelihood of these species being present and concluded the following:

- the rainbow bee-eater (*Merops ornatus*) and rufous fantail (*Rhipidura rufifrons*) were recorded within the project area during field surveys
- the cattle egret (*Ardea ibis*), eastern great egret (*Ardea modesta*), fork-tailed swift (*Apus pacificus*), satin flycatcher (*Myiagra cyanoleuca*) and white-throated needletail (*Hirundapus caudacutus*) were assessed as having a high likelihood of occurring within the project area
- the Australian painted snipe (*R. australis*) was assessed as having a possible likelihood of occurring on site as it is within the mapped distribution for the species and a small area of habitat is located on the site.
- the remaining 11 species of the 19 potentially present were assessed as having a low likelihood of occurring within the project area due to lack of suitable habitat.

#### **3.1.2.5 Aquatic flora and fauna**

The EIS stated that no EPBC Act listed aquatic flora or fauna species were found in the project area. Furthermore, based on a review of habitat requirements and known species distributions, the EIS assessed that none of those species are likely to occur in the disturbance area.

#### **3.1.2.6 Groundwater dependent ecosystems**

The EIS addendum (p.12A-11, February 2015) discussed areas of remnant vegetation that may access groundwater because the water level is 30m or less from the surface in those locations. However, nearly all the areas of vegetation mentioned in the EIS addendum are not shown on EHP's mapping of terrestrial groundwater dependent ecosystems, except for a small patch composed of REs 11.3.11 and 11.3.1 that lies 3km northwest of the project site. That patch, which is less than a hectare in size, is labelled as Area C on Fig. 12A-18 of the EIS addendum.

However, Area C is outside the zone of groundwater drawdown that the project is expected to cause in either the surface alluvium or the Biloela Formation. The same is true of other nearby areas of vegetation that EHP has mapped as groundwater dependent ecosystems.

While some areas to the east of the Dawson Highway that EHP has mapped as groundwater dependent ecosystems coincide with the zone of drawdown in the Precipice Sandstone, they lie in narrow strips along Oaky Creek and appear to be intimately associated with groundwater in the creek's alluvium, which will not be affected by groundwater drawdown.

One property close to the project site has three springs that are fed by the Precipice Sandstone aquifer. However, those springs have been significantly modified to provide water for farming, and do not support groundwater dependent ecosystems.

In summary, EHP is satisfied that there are no significant groundwater dependent ecosystem values that could be impacted by the project.

### 3.1.3 Potential impacts on EPBC Act listed species and communities

The main impact on EPBC Act listed species would be due to vegetation clearing for construction of the mine. A number of indirect impacts are also possible, and these are discussed in section 3.1.4 along with proposed mitigation measures.

#### 3.1.3.1 Flora and threatened ecological communities

As no 'threatened ecological communities' or EPBC Act listed flora species were found or considered likely to occur in the project area the construction of the mine will not have a significant residual impact on these MNES.

However, the EIS acknowledged that habitat is present for threatened flora and that some species may not have been detected during surveys.

#### 3.1.3.2 Fauna

The EIS provided maps of fauna habitat in the project area (see Figures 10-20 Threatened Species Profile Report, October 2015). The mapping data was provided to EHP in the format of digital ArcGIS files. Table 1 lists the areas of fauna habitat that overlap with the mine development footprint. The fauna habitat is composed of both remnant vegetation (defined under the Queensland *Vegetation Management Act 1999*) and non-remnant vegetation.

**Table 1 Areas of EPBC Act threatened species habitat to be cleared for mine development**

Species	Regional Ecosystem	Total impact area (ha)	Area (ha) remnant	Area (ha) non-remnant functioning habitat
collared delma	11.10.1	9	9	0
grey-headed flying-fox	11.10.1/11.9.9/11.8.4	224	121	103
northern quoll	11.10.1/11.9.9/11.8.4	266	121	144
koala	11.10.1/11.9.9/11.8.4	257	113	144
red goshawk	11.10.1/11.9.9/11.8.4	266	121	144
yakka skink	11.9.9/11.8.4/11.3.25	110	110	0
large-eared pied bat	11.10.1/11.9.9/11.8.4	224	121	103
south-eastern long-eared bat	11.10.1/11.9.9/11.8.4	224	121	103
squatter pigeon	11.10.1/11.9.9/11.8.4	266	121	145
Australian painted snipe	wetland	3	0	3

The EIS used a habitat modelling approach to categorise fauna habitat as high, moderate or low value habitat (see section 3.3 of the EIS Addendum Part B, Appendix P, Terrestrial Ecology Report). This categorisation was used in the impact assessment process, which weighed up the likelihood-of-occurrence of a species and the potential impact of the mine on the species habitat.

The squatter pigeon was found during surveys. The habitat in the north of the mining lease was classed as high value habitat. However, the EIS assessed that the project would not have a significant impact on this species because it has broad habitat requirements and there is potential breeding and foraging habitat outside the project area. The EIS also stated that progressive rehabilitation of the project area would restore habitat during the life of the project.

The habitat for all the other species in Table 1 was classed as low value habitat. The EIS assessed that the project would not have a significant impact on the collared delma, northern quoll, and koala because no high value habitat was mapped in the project for these species, although they were regarded as having a high likelihood of occurrence.

The low value habitat for the remaining species discussed in section 3.1.2.3 would be cleared to construct the mine, but the EIS concluded that it was unlikely this habitat would sustain a population of any of the threatened species.

DOTE advised EHP that the EIS misinterpreted the significant impact guidelines when it assessed that no species would be significantly impacted by the project. In accordance with advice from DOTE, EHP believes that the habitat shown in Table 1 is important for the squatter pigeon, northern quoll, and koala, and that the project would 'modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline' (EPBC Act significant impact guidelines p.9-10). EHP considers that is also the case for the south-eastern long-eared bat. Specific information about threatened species potentially affected by the project including threats, impacts and management measures, is presented in Appendix C of this assessment report.

The maximum area of remnant vegetation impacted by the project is 121ha, and the maximum area of non-remnant functioning habitat is 145ha. These areas encompass habitat for all species affected by the project.

### 3.1.3.3 Migratory species

The EIS stated that no high value habitat was mapped in the project area for migratory species. The EIS concluded that the project would not have a residual significant impact on these species, including the Australian painted snipe. Potential low value habitat for these species is present and would be removed by the project. However, it is unlikely that the low value habitat to be removed would sustain a population of the abovementioned migratory species.

### 3.1.3.4 Groundwater dependent ecosystems

EHP agrees with the EIS's conclusion that the Boundary Hill South Project is unlikely to have any significant impacts on groundwater dependent ecosystems.

## 3.1.4 Proposed mitigation measures

Table 2 summarises the general measures proposed in the EIS to avoid or mitigate impacts on MNES (see section 12A.7, EIS, April 2014), which would result from vegetation clearing.

**Table 2 Potential impacts of the project on MNES and proposed mitigation measures**

Potential impact	Mitigation measure
Clearing and fragmentation of vegetation <ul style="list-style-type: none"> <li>• loss of habitat</li> <li>• loss of connectivity</li> <li>• edge effects</li> </ul>	Minimise vegetation and habitat loss <ul style="list-style-type: none"> <li>• limits of clearing delineated and marked clearly</li> <li>• native vegetation beyond limits of clearing left undisturbed</li> <li>• ancillary facilities located in cleared areas</li> <li>• clearing undertaken sequentially according to Permit to Disturb process</li> <li>• worker briefings on care and conservation of native vegetation</li> </ul> Vegetation conservation and management – retained native vegetation <ul style="list-style-type: none"> <li>• implement measures to manage weeds and feral animals</li> <li>• implement grazing management</li> </ul> Mine rehabilitation <ul style="list-style-type: none"> <li>• progressive rehabilitation during the life of the mine</li> <li>• staged rehabilitation of all disturbed areas</li> <li>• recreate and establish self-sustaining post-mining landscape</li> <li>• use local provenance plant species and seeds collected in study area</li> <li>• topsoil translocated from proposed mine to conserve native seed bank</li> <li>• implement Rehabilitation Management Plan</li> </ul>

Potential impact	Mitigation measure
Fauna mortality	<p>Pre-clearing surveys</p> <ul style="list-style-type: none"> <li>• prepare an inventory of trees and hollows to be removed before clearing</li> <li>• check hollow bearing trees for presence of fauna</li> <li>• safely remove fauna before clearing and relocate to adjacent woodland</li> <li>• nest boxes and salvage tree hollows provided in adjacent woodland to compensate for removal of hollows</li> <li>• boulders and large logs placed in adjacent areas of native vegetation</li> <li>• spotter-catcher with appropriate permits present at all times</li> </ul>

#### 3.1.4.1 Site management plans

The current operation of the Callide Mine includes a number of management plans to manage and protect environmental values and to monitor potential environmental impacts. The EIS proposed updating existing management plans to cover the project area throughout the design, construction and operational phases of the mine.

Existing management plans that will be updated to include the project area are:

- Erosion and Sediment Control Plan
- Biodiversity Action Plan
- Weed Management Plan

In addition, before commencement of construction activities, the proponent would submit to EHP a Species Management Program (SMP) under the Nature Conservation (Wildlife Management) Regulation 2006 that describes measures to mitigate impacts on animal breeding places. The SMP would also describe the role of the abovementioned spotter-catcher (Table 3) and the necessary permits that would be required for any relocation of fauna.

#### 3.1.4.2 Offsets

In accordance with advice from DOTE, EHP considered that even with the implementation of proposed avoidance and mitigation measures, the project will still result in significant residual impacts on the squatter pigeon (southern subspecies), northern quoll, koala and the south-eastern long-eared bat.

The proponent will need to provide an offset package in accordance with the EPBC Act Environmental Offsets Policy in order to compensate for the residual impacts on the habitat of these species.

### 3.1.5 Major issues raised in submissions

#### 3.1.5.1 Survey methods and effort

DOTE asked the proponent to explain how the results of surveys that were not done at the best times of the year to detect species were adequate to establish the likelihood-of-occurrence of species or communities, including the king blue-grass (*Dicanthium queenslandicum*), and the Brigalow Belt reptiles: yakka skink (*Egernia rugosa*) and ornamental snake (*Denisonia maculata*).

EHP considers that the surveys carried out for the EIS were not adequate to reduce uncertainty about the presence or absence of threatened species listed under the EPBC Act. Furthermore, the proponent should assume in habitat assessments that species are likely to occur if suitable habitat exists, records are present close to the site and if surveys cannot rule out their presence.

The proponent's response stated that surveys were generally in accordance with relevant survey guidelines, and that desktop assessments of likelihood-of-occurrence took into account any survey limitations (e.g. surveys undertaken outside optimal timeframes). Likelihood-of-occurrence assessments were conservative where necessary.

As the purpose of likelihood-of-occurrence assessments was to identify which species required further significant impact assessment, this conservative approach was acceptable. The ornamental snake was given a low likelihood-of-occurrence because the species's preferred habitats (moist areas such as gilgai mounds and depressions, lake margins, and wetlands) were not present or very uncommon on the project site.

The proponent was also asked to justify the assumption that bat calls recorded during surveys were from species other than the threatened south-eastern long-eared bat.

The response stated that the species was not given a high likelihood-of-occurrence because there were no confirmed recordings within the project site. The DOTE survey guidelines for this genus recommend using passive acoustic detection to confirm the presence of the genus and then trapping to identify species. Hence this conclusion is not supported by adequate field work as calls of the genus *Nyctophilus* (vesper bats) were recorded in the area. However, the species was given a moderate likelihood-of-occurrence which meant that further impact assessment was carried out.

### 3.1.5.2 Northern quoll management

DOTE requested that the proponent clarify the management outcomes for the quoll management area they proposed in the northern part of the site. In particular, DOTE asked to proponent to clarify why they considered habitat in the southwest of the site to be isolated fragments. An alternative view is that the project would fragment potentially significant quoll habitat. DOTE requested a new impact assessment that addressed the impact guidelines/recovery plan criterion of a 10ha threshold of disturbance (the project will clear 47ha).

The response stated that there is unlikely to be any high value habitat in the project site due to extensive clearing and grazing and high densities of cane toads, cats and foxes. The EIS further stated that survey work captured no quolls in and adjacent to the project site. For these reasons, the EIS concluded that the project would not have a significant impact on the quoll and no offsets were proposed.

The northern quoll is endangered nationally and is by definition uncommon. An individual was captured in 2012 in a highly disturbed environment at the Callide Power Station 12km south east of the project area. The capture site and the Boundary Hill South project area are connected by the Callide Timber Reserve, situated in a network of large tracts of remnant vegetation. The referral guidelines state that a population of northern quoll is presumed to occur in any area with recent evidence of a single animal. Due to the significant connection of remnant vegetation in the area, for the purposes of the referral guidelines it can be assumed that there is a local population adjacent to the project area to which the remnant vegetation in the project area is connected.

The original EIS proposed a quoll management plan (QMP) focussing on areas of potential good quality habitat along the creek lines in the north of the project site, to mitigate proposed impacts on 395ha of what the amended EIS calls low quality habitat. However, in the EIS Addendum the quoll habitat mapping was changed and this QMP was removed. It is recommended that the proponent should reinstate and implement a QMP as outlined in the EIS that aims to at a minimum:

- enhance the area of potential quoll habitat and management through weed control, stock exclusion, and revegetation
- implement a toad management strategy.

### 3.1.5.3 Koala impact assessment

DOTE noted that the project area contains at least two known koala food species, is connected to a larger area of likely koala habitat (large tracts of remnant vegetation to the east) and there are recent records of the koala near the site. DOTE asked that the proponent redo the koala impact assessment, given that the area is likely to be critical inland habitat for the koala.

The EIS stated that the majority of the study area does not support suitable feed tree species for the koala. Using habitat mapping and modelling the EIS concluded that there only areas of low value habitat in the area due to extensive clearing and fragmentation, a lack of preferred food trees and abundance of predators. The EIS concluded that a lack of high value habitat is supported by a lack of koala records from the study area.

However, the Queensland Herbarium verified vegetation map indicates that RE11.9.9 is the major vegetation type that would be cleared for the project. The short description of this RE is *Eucalyptus crebra* woodland. Ellis *et al.* (1995)<sup>9</sup> found that *E. crebra* was the preferred winter food species for koalas in the Springsure area and Ellis *et al.*

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<sup>9</sup> Ellis, W.A.H, Melzer, A., Green, B., Newgrain, K., Hindell, M.A. and Carrick, F.N. (1995) . Seasonal variation in water flux, field metabolic rate and food consumption of free-ranging koalas (*Phascolarctos cinereus*). Australian Journal of Zoology, 43, 59-68.

(2002)<sup>10</sup> found that *E. crebra* is the second most important food species in the Blair Athol area in central Queensland. The koala naturally occurs at low density (0.005 animals per hectare) and has a large home range in the central Queensland landscape. While the EIS's surveys did not record koalas and found no sign, there are recent records of the species to the south of the mine.

Using the EPBC Act referral guidelines for the vulnerable koala 2014<sup>11</sup>, the EIS generated a habitat score of 5 for the proposed action. Whilst the proponent concluded that the impact of clearing 257ha of habitat for this species was not significant, EHP concluded, in accordance with advice from DOTE, that it was significant.

#### **3.1.5.4 Squatter pigeon**

The EIS assessed that, although the project would remove an area of high value habitat for the squatter pigeon (southern subspecies), a significant residual impact is unlikely to occur because the species broad habitat requirements and widespread areas of potential breeding and foraging habitat would remain outside the project area.

The species has recently been relisted as vulnerable under the EPBC Act, reaffirming that the species is still subject to significant threats, and its range has contracted in NSW.

The species was confirmed as present on the site. Habitat critical to the survival of the species (foraging and dispersal; possibly breeding) is therefore present.

As outlined in the EPBC Act significant impact guidelines, a project is determined to have a significant impact if it:

- has an adverse impact on habitat critical to the survival of a species;
- is going to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

In accordance with advice from DOTE, EHP concluded that there would be a significant impact on the species and offsets will be required for the residual impacts of the project.

#### **3.1.5.5 Large Eared pied bat**

The Threatened Species Profile Report (Hansen Bailey October 2015) concluded that none of the project site meets the Commonwealth's definition of habitat for this species and that no roosts were detected. However, it also states that there is suitable woodland vegetation that is foraging habitat, that there are overhangs and crevices present in the north of the project site (but no caves, cliffs or disused mines shafts); that there are two permanent farm dams and creeks in the north of the project site; and that there are tree hollows in the woodland north of the project site.

The large-eared pied bat was not recorded from the project site during any of the field surveys and there were no records within 25km of the project site in any of the desktop searches or within 100km of the site on the Australian Museum database. Nevertheless the species is difficult to detect. Given that the north of the project site contains suitable habitat, the species has the potential to be present.

The EIS estimates that the project area contains 347ha of low quality habitat for the large-eared pied bat. EHP undertook an analysis of habitat shape files provided in the EIS and determined that 224ha of possible habitat will be impacted by the project.

#### **3.1.5.6 Significant impact assessment and offsets**

In the EIS Threatened Species Profile Report significant impact assessments were done for the following species:

- collared delma

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<sup>10</sup> Ellis, W.A.H., Melzer, A., Carrick, F.N. and Hasegawa, M. (2002). Tree use, diet and home range of the koala (*Phascolarctos cinereus*) at Blair Athol, central Queensland. *Wildlife Research* 29, 303-311

<sup>11</sup> EPBC Act referral guidelines for the vulnerable koala, Department of the Environment, 2014



- yakka skink
- squatter pigeon
- red goshawk
- Australian painted snipe
- northern quoll
- koala
- grey-headed flying fox
- large-eared pied bat
- south-eastern long-eared bat.

The EIS concluded that there would be no significant residual impacts on any flora or fauna species and therefore the project would not require offsets under the EPBC Act Environmental Offsets Policy.

DOTE commented that the EIS did not contain an adequate discussion of offsets. The EIS's conclusion regarding offsets was based on the proposition that the site does not contain an important population or suitable habitat for the species listed above, and is disconnected from adjacent areas because of a power easement and haul road. However, that is only one component of an assessment of impacts as outlined in the EPBC Act significant impact guidelines, and other matters are relevant.

For impacts to be significant the EPBC Act significant impact guidelines do not require the presence of an important population. The squatter pigeon was recorded on site, and the close proximity of known records of the northern quoll and koala indicates that suitable habitat on the project site is part of broader habitat in the local area. In addition, individuals of the genus *Nyctophilus* were recorded on site and foraging and roosting habitat exists across the project area for the south-eastern long-eared bat. The removal and fragmentation of this contiguous habitat is considered likely to decrease the availability of habitat and contribute to the decline of these species.

Using the EPBC Act significant impact guidelines a project is determined to have a significant impact if it:

- has an adverse impact on habitat critical to the survival of a species
- is going to modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

Although not all species were found during EIS field surveys, the detectability, the presence of suitable habitat, and the close proximity of known records of the yakka skink, squatter pigeon, northern quoll, koala, south-eastern long-eared bat, and the large-eared pied bat indicates a high likelihood of these species occurring on the project site.

EHP considered the information provided in the EIS and its addenda, including avoidance and mitigation measures, and advice provided by DOTE. In accordance with the advice from DOTE, EHP concluded that the project was likely to result in a significant residual impact on the squatter pigeon, northern quoll and koala. EHP also considered that the project was likely to result in a significant residual impact on the south-eastern long-eared bat. The species profiles in Appendix C provide more detailed analysis of each species and conclusions regarding impacts and offsets.

### 3.1.6 Conclusions and recommendations

A total of 266ha of fauna habitat, including 121ha of remnant vegetation would be removed to build the mine. The EIS contains mitigation measures including prescriptions to ensure that clearing is undertaken in a manner that limits the disturbance to the minimum area possible and minimises habitat loss.

No threatened ecological communities listed under the EPBC Act were recorded during the field survey, and none are considered likely to occur.

The EIS concluded that the impact of the project on EPBC Act threatened flora is likely to be low because species predicted to occur in the project area were given a low likelihood of occurrence. However, preclearance surveys should be undertaken to ensure that any unexpected impacts on protected plants can be avoided and managed.

Similarly, due to a lack of extensive areas of high value habitat in the project area the project is unlikely to have a significant residual impact on migratory species.

However, based on the information provided in the EIS, and in accordance with advice provided by DOTE, EHP considered that there will be a significant residual impact on the following species:

- northern quoll
- koala
- squatter pigeon (southern subspecies)
- south-eastern long-eared bat.

To compensate for the project impacts on these species, the proponent will need to submit an offsets package under the EPBC Act Environmental Offsets Policy.

No groundwater dependent ecosystems are in locations likely to be affected by drawdown of the groundwater level that would be caused by the proposed mine.

## **Recommendations**

### **1. Management of impacts on threatened species and communities**

The proponent must implement measures to avoid, mitigate and manage impacts on EPBC listed species and their habitat encountered during vegetation clearing, construction, operation, and decommissioning of the project. The proponent should undertake vegetation clearing for each project phase in a manner that avoids impacts on EPBC listed fauna species. The proponent must ensure that management actions are carried out in a manner that is consistent with relevant recovery plans, conservation advice and threat abatement plans.

As recommended in the EIS, the proponent should prepare a quoll management plan that includes mitigation measures to restore and enhance riparian habitat in the north of the mine site, including weed management, rehabilitation for soil stabilisation and feral species management.

### **2. Pre-clearing surveys**

Pre-clearing surveys should be carried out by suitably qualified persons and a spotter catcher should be present at all times during clearing.

### **3. Disturbance limits**

The Commonwealth's approval should set limits on the disturbance of habitat for EPBC listed threatened species and communities. The limits may be based on the information provided in Table 1 of this appendix.

### **4. EPBC offset requirements**

The proponent must provide an environmental offset package for residual impacts on the squatter pigeon (southern subspecies, northern quoll, koala and south-eastern long-eared bat that complies with the EPBC Act Environmental Offsets Policy. The offset package should be submitted to DOTE for approval by the Minister for the Environment prior to start of the project.

## **3.2 Water resources**

### **3.2.1 Surface water hydrology**

The project is located within the Callide Creek catchment of the Callide sub-basin, which is situated in the upper catchment of the Fitzroy Basin. The Fitzroy Basin has a total catchment area of approximately 143,000km<sup>2</sup>. The Callide sub-basin has a catchment area of approximately 8,000km<sup>2</sup>. The Callide Creek catchment comprises approximately 4,600km<sup>2</sup> of the Callide sub-basin.

There are no defined watercourses on the project site. Consequently, any surface water flow on the Boundary Hill South site, including the creeks, is considered to be 'overland flow' with regard to the provisions of the Queensland *Water Act 2000*.

Campbell (Gate) Creek is the main waterway that crosses the proposed mining lease. Numerous other ephemeral drainage channels convey surface water across the mining lease towards Campbell (Gate) Creek during periods of rainfall that are of sufficient intensity and duration to generate surface water runoff. These drainage features flow generally in a south-westerly direction across the project site, and join Campbell (Gate) Creek approximately 1km downstream of the project boundary.

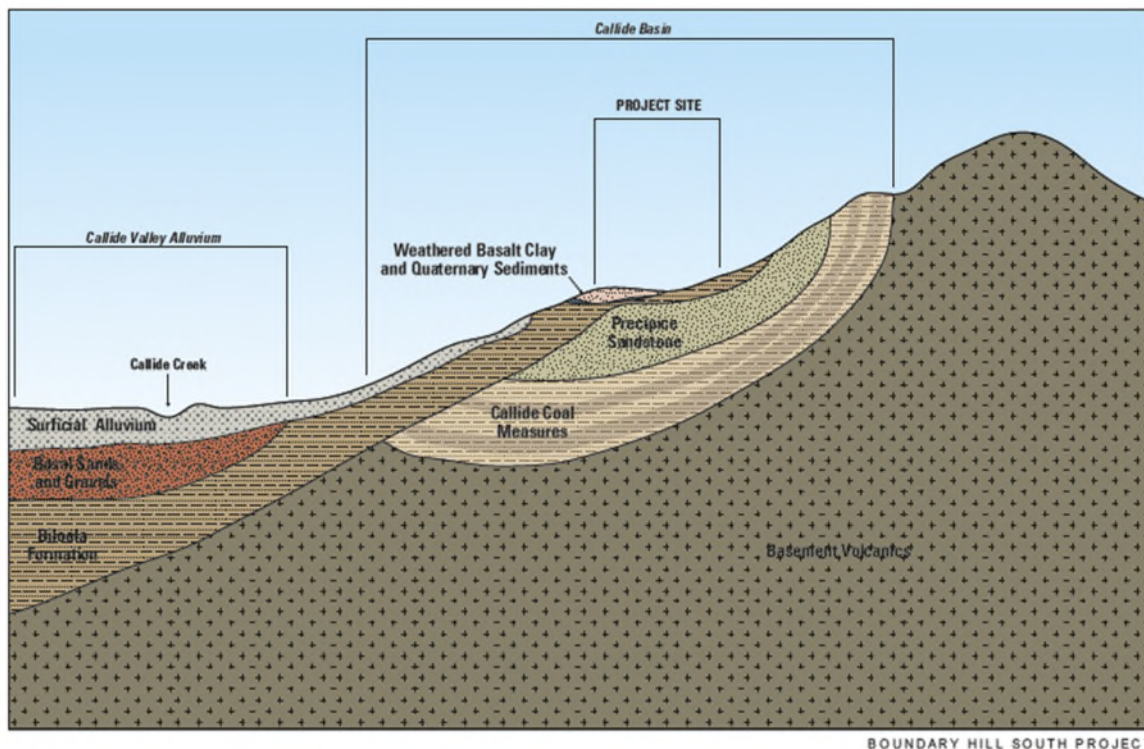
One landowner directly downstream of the project site captures ephemeral flows from Campbell (Gate) Creek into a farm dam.

### 3.2.2 Existing groundwater regime

Figure 1 shows a conceptual cross section of the geological units in the region from Callide Creek in the west, across the project site to the range in the east. The geological formations and aquifers of relevance to groundwater impacts of the Boundary Hill South Project are described in the following subsections.

#### Great Artesian Basin

The Callide Basin is not part of the Great Artesian Basin. While the Precipice Sandstone (described in more detail below) forms part of the geological structure of the Great Artesian Basin farther west, in the Callide Basin it is isolated, and not hydrologically connected with the aquifers of the Great Artesian Basin.



**Figure 1 Conceptual geological cross-section, west to east across the project area**

(Source: Figure 9B-3, EIS Addendum, Round 1)

#### Quaternary alluvium including surficial alluvium along drainage channels, and the Callide Valley alluvium

The Quaternary alluvium associated with Campbell (Gate) Creek and other drainage channels on the project site is largely unsaturated and dry. The Quaternary alluvium including surficial alluvium along drainage channels within the project site does not provide a significant groundwater resource. The Campbell (Gate) Creek alluvium becomes saturated approximately 4km downstream of the project area. Only one abandoned bore was found in the Campbell (Gate) Creek alluvium.

The Callide Valley alluvium is located 6km west of the project area along Callide Creek, and is a major source of groundwater for irrigation along Callide Creek and in the broader Callide valley.

Groundwater within the Callide Valley alluvium flows in a north-westerly direction along Callide Creek, while groundwater within the minor drainage channels (where present) flows down-gradient, in a south-westerly direction towards Callide Creek. Groundwater levels in the Callide Valley alluvium are typically about 10m below ground level.

A total of 77 private water supply bores were identified in the Callide Valley alluvium within 10km of the project area.

## **Biloela Formation**

The Biloela Formation is a confining, clay rich unit that retards the vertical and lateral flow of groundwater. This unit is up to 35m thick across the project site and 300m thick further downstream in the Callide Valley. The unit exhibits low yields of groundwater with relatively high salinity. It is unsaturated and dry across the project site and elevated areas of the Callide Basin. It does not provide a significant groundwater resource. Groundwater is only extractable from isolated, confined sandstone lenses to the west of the project site. Only three of 10 private bores sunk into the Biloela Formation within 10km of the project area are in use.

## **Precipice Sandstone**

The Precipice Sandstone is the principal aquifer under the project area. This aquifer has a moderate to high permeability. The aquifer is saturated across the project area, and is up to 95m thick. The aquifer is recharged by rainfall and surface water flows where it outcrops and forms a prominent ridgeline to the east of the project area.

Groundwater flow in this aquifer largely follows the local geomorphology, starting from where recharge occurs at the geological formation's outcrop below the ridgeline in the east, and flowing generally down towards the south-west, but also with a lower extension of flow in a south-easterly direction towards Callide Dam. Down dip, the Precipice Sandstone ends at an unconformity approximately one kilometre to the west of the project site where it is overlain by the Biloela Formation, which predominantly confines the aquifer.

Several landholders in the neighbourhood of the project site have bores that extract groundwater from the Precipice Sandstone, and one bore is artesian. Relatively high yields of up to 5L/s are obtained from the private bores. One property has three springs close together that are fed by this aquifer. However, the springs have been modified to provide and store water for farming, and have no groundwater dependent ecosystems.

Groundwater quality is fresh to brackish, and generally suitable for stock, though some bores provide water suitable for human consumption.

## **Callide Coal Measures**

The Callide Coal Measures are the oldest formation in the Callide Basin. The Callide Coal Measures comprise a siltstone dominated matrix containing upper and lower coal seams. The upper Callide Coal Measures are sporadically overlain by a coarse grained sandstone unit that is comparable to the overlying Precipice Sandstone.

The coal measures are laterally continuous across the Callide Basin and outcrop to form the ridgeline at the eastern extent of the basin. This unit dips from the ridgeline to the south-west across the basin. The thickness of the Callide Coal Measures varies across the basin and reaches 150m thick in the centre of the basin and 30m to 40m thick in the project area. The depth to groundwater in this unit is around 50m below ground level at the eastern boundary of the project area and reduces to around 5m at the western project boundary.

Groundwater levels within the Callide Coal Measures and Precipice Sandstone are similar, indicating a degree of hydraulic connectivity between these units. Also, the recharge/discharge mechanisms and flow directions in the Callide Coal Measures are similar to those for the Precipice Sandstone.

However, the hydraulic conductivity of strata within the Callide Coal Measures varies greatly between the upper sandstones with good conductivity and shales and siltstones with very low conductivity.

The EIS reported that no bores target the Callide Coal Measures directly, but some are screen to draw jointly from the Callide Coal Measures and Precipice Sandstone. Water quality from these bores is similar to that of bores extracting from the Precipice Sandstone alone.

## **Basement volcanics**

The basement volcanics underlying the Callide Basin comprise a heterogeneous and complex sequence of volcanic rocks (including basalt, andesite, breccia, tuff, agglomerate, and ignimbrite) interbedded with sedimentary rocks (including conglomerate, sandstone, and siltstone). This geological unit is located up to 230m below ground level at the project area.

This unit is highly deformed and characterised by low primary porosity, and as a result, groundwater movement is controlled by local joints and fracture sets.

A total of five private bores within 10km of the project area intersect saline to highly saline groundwater within localised fractures of the weathered basement volcanics. However, the basement volcanics are not used for groundwater supply, due to the saline groundwater and low yields.

### 3.2.3 Water quality

#### 3.2.3.1 Existing surface water quality

The water quality objectives (WQOs) for the project were derived from the 'Callide Creek Catchment Environmental Values and Water Quality Objectives' (EHP 2011). WQOs for the waters were based primarily on the guidelines developed for aquatic ecosystem environmental value (EV) protection in moderately disturbed waters.

The existing background water quality upstream, downstream and at the site was assessed at three surface water monitoring locations. A description of the three locations, together with a summary of the water quality results at each location, is outlined below:

- **Upstream:** Bell Creek at Craiglands, located approximately 7.35km north-east of Lake Gasteen, was selected to represent local, background water quality. The reference conditions in Bell Creek (at monitoring location 130319A) are characterised as slightly alkaline, fresh to brackish waters with generally low turbidity and suspended solids. Metals (including copper, iron, manganese and zinc), fluoride and nitrogen oxides are also shown to be present in the regional drainage network at elevated concentrations slightly above the trigger values. The elevated levels have been investigated and can be traced back to catchment soil and geology characteristics.
- **Downstream:** Callide Creek at Goovigen, located approximately 21km downstream of the confluence of Campbell (Gate) Creek and Callide Creek was selected to represent the receiving water quality. The water quality shows a generally similar physico-chemical profile to Bell Creek; that is, slightly alkaline, fresh to brackish waters with slightly elevated metals (including copper, iron, manganese and zinc) and fluoride. The site is generally low in turbidity and suspended solids. The downstream conditions also indicate increased agricultural input, with elevated nitrogen oxides, ammonia, and total nitrogen.
- **At the site:** Lake Gasteen, located approximately 1.4km from the project area, represents the mine affected water that may be discharged into Campbell (Gate) Creek. The water quality at Lake Gasteen is characterised as typically neutral, fresh to brackish water. A range of metals, including copper, iron, manganese, nickel, uranium and zinc are slightly elevated relative to the trigger values. Ammonia is also present at marginally elevated concentrations, although all other nutrient indicators are within the trigger values.

#### 3.2.3.2 Existing groundwater quality

Groundwater within the alluvium, Precipice Sandstone and Callide Coal Measures is suitable for stock water supply.

Groundwater within the surficial alluvium, Biloela Formation, Precipice Sandstone, Callide Coal Measures and basement volcanics is generally not suitable for human consumption. However, the EIS noted that some properties reported using groundwater from the Precipice Sandstone for drinking, although it may not always meet the Australian Drinking Water Guidelines 2011 (NHMRC, 2011).

The proportions of the major anions and cations show that there are two distinct groundwater types, being:

- water from the surficial alluvium with no dominant ionic composition
- sodium chloride/bicarbonate type groundwater from the deeper sequences.

The EIS assessed that groundwater associated with the surficial alluvium near the project site is predominantly derived from rainfall and surface water runoff. The Precipice Sandstone and Callide Coal Measures coarse grained sandstone, siltstone and shale recorded a sodium chloride/bicarbonate type groundwater. The assessment found that the Biloela Formation and basement volcanics show higher proportions of sodium and chloride, indicating lower recharge rates.

### 3.2.4 Assessment of potential surface water impacts

#### 3.2.4.1 Surface water hydrology

The main drainage channel of Campbell (Gate) Creek will not be disturbed.

Smaller ephemeral drainage channels to the south of the main channel will be mined. Those drainage channels presently flow into Campbell (Gate) Creek a few hundred metres east of the project boundary. After mining ceases, those drainage channels will largely be filled by a spoil dump, but the dump will still shed runoff towards Campbell (Gate) Creek.

A final void will be left on part of the area presently covered by the smaller ephemeral drainage channels. The final void will not be permitted to capture overland flow, and will be prevented from doing so by surrounding bunds and drains. The bunds will truncate and divert approximately 449ha of the Campbell (Gate) Creek catchment. That reduction of the Campbell (Gate) Creek catchment is expected to reduce surface flows downstream of the project site. The effect would be experienced most immediately downstream of the project site, then to a lesser extent further downstream as other unaffected tributaries join the main channel.

The property immediately downstream of the project on Campbell (Gate) Creek would likely experience a 6% to 8% reduction in catchment yield as a result of the diversion works. The landholder has an existing beneficial reuse agreement with the proponent to supplement any loss of water supply as a result of the reduction in catchment yield caused by the currently approved operations of the Callide Mine. The proponent has committed to amending the existing agreement to supplement any additional impacts to water supply as a result of diversion works associated with the Boundary Hill South project.

The EIS assessed that reductions in catchment yields to other properties farther downstream on Campbell (Gate) Creek would be insignificant, and not warrant mitigation measures.

Some of the truncated Campbell (Gate) Creek catchment would be diverted into the catchment of Callide Creek. That diversion would increase the flows into two neighbouring properties.

#### **3.2.4.2 Surface water quality**

The potential impacts of the Boundary Hill South project on surface water quality are typical for open cut coal mines in Central Queensland. That is, mining operations may increase sediment and salinity in surface waters. In particular, local landholders expressed concerns that increased fine sediments loads flowing from Campbell (Gate) Creek into Callide Creek (Old Channel) would clog the sides of the channel and reduce recharge to groundwater in the Callide Valley alluvium.

The EIS made reference to the study conducted by EHP in 2009 that 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 EIS stated that salinity levels within the mine's storages would remain generally well below discharge criteria requirements and increases in storage salinity would only occur during extended dry periods when environmental releases are not required. Also, the EIS made reference to the water balance modelling results that indicated that discharges from the mine would be relatively small in proportion to natural stream flows, which would ensure adequate dilution of mine water discharges. There is also the potential for accidental spills of contaminants at the mining operations to impact on water quality.

#### **3.2.4.3 Great Barrier Reef**

The catchment of Campbell (Gate) Creek comprises 0.01% of the Great Barrier Reef catchment. Furthermore, the Boundary Hill South site is 410km upstream of the Great Barrier Reef lagoon, and there are four minor weirs and one major weir between the site and coast that can trap sediment. Consequently, it is unlikely that the Boundary Hill South project would have any impact on the Great Barrier Reef.

#### **3.2.4.4 Flooding**

Along the eastern side of Boundary Hill South operations, the EIS proposed a levee and diversion drain that would be integrated into the proposed realignment of Inverness Road. The levee would provide the operating pit with immunity from flooding up to the 1 in 1,000 year ARI event, plus a minimum 0.5m freeboard. This level of flood protection meets the minimum level required for a regulated levee under the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EHP, 2013).

Another similar levee would be constructed along the eastern part of southern boundary of the pit to prevent water on the floodplain from entering the pit.

The EIS undertook hydrologic and hydraulic modelling of the levees for the 2 year, 100 year and 1,000 year ARI flood events. The assessments concluded that the project would not create major changes to existing downstream or upstream flood levels or flow velocities, and that no residential or industrial properties would be adversely affected by afflux.

#### **3.2.4.5 Water demand**

The EIS stated that current operations at Boundary Hill use water from the mine affected water circuit, which is supplemented by inflow from the Kilburnie borefield and transfers from the Ghost Ryders storage. Also, inflows at

the current Boundary Hill pit would continue after cessation of existing operations, providing an additional water resource.

Water balance modelling was undertaken to assess the potential for additional water demand over the life of the project. The water balance model results indicated an average annual deficit of 1.4ML. The EIS stated that this deficit could be managed by short term alterations to site management operations, and would not require additional water demand from the local water resource.

#### **3.2.4.6 Final void**

The final void will not capture overland flow, so inflow will come only from aquifers intersected by the void's walls and floor, and from rain falling directly into the void. Evaporation will keep the water level in the void below the level of groundwater in the adjacent aquifers. Modelling undertaken for the EIS indicates that the water level in the void should fluctuate over a range of a few metres, averaging about 40m below the lip of the void. Consequently, there is negligible risk of the void overflowing or contaminating surface waters.

### **3.2.5 Mitigation measures for surface water impacts**

The Boundary Hill South project would be an extension of existing mining operations, and those operations already have mitigation measures that can be applied to the new works.

As occurs with the current operations at Boundary Hill, all mine affected water from the Boundary Hill South operations would be pumped to a release dam called Lake Gasteen. Releases from Lake Gasteen are covered by the existing mine's environmental authority that was amended and issued in December 2014. The environmental authority includes flow criteria for the release of mine affected water into receiving waters, and trigger levels for contaminant investigation. The provisions of the current environmental authority are design to protect downstream environmental values during discharge events. Furthermore, the EIS stated that discharges would be undertaken in accordance with the model water conditions developed as a result of the Fitzroy River Basin cumulative study.

The EIS also proposed the following measures for the mitigation of the potential impacts on water quality:

- the existing erosion and sediment control plan (ESCP) will be reviewed and updated
- disturbance to land and creeks will be avoided or minimised
- temporary and permanent drainage structures will be constructed to minimise catchment size, reduce runoff velocity, enhance infiltration and divert water from undisturbed areas
- construction activities will be undertaken during the dry season, as much as possible, to reduce runoff from disturbed areas
- the existing site management plan will be updated to inform staff about spill containment protocols and handling of potential surface water contaminants
- areas used for storing and handling fuel, waste and paints will be bunded to withstand a 100-year average recurrence interval (ARI) design storm event
- regulated site water containment structures will be regularly inspected and assessed by suitably qualified and experienced persons in accordance with the 'Manual for Assessing Consequence Categories and Hydraulic Performance of Structures' (DEHP, 2013).

Control measures to manage surface water quality and quantity, drainage lines and sediment movements would be detailed in a water management plan for the project.

Monitoring would be necessary to ensure that operational plans are effective at reducing potential impacts to within acceptable control limits. Three monitoring programs are proposed to address the surface water components, including:

- monitoring background water quality to assess whether downstream water quality variations are a product of natural processes or mining operations
- monitoring water quality on site to assess its suitability for release, and to identify processes contributing to any variation in water quality that may require operations to be modified to address any issues of concern
- a Receiving Environment Monitoring Plan to identify any variation in water quality and associated impacts on aquatic ecosystems.

## **3.2.6 Assessment of potential groundwater impacts**

### **3.2.6.1 Independent Expert Scientific Committee (IESC)**

The EIS for the Boundary Hill South project was provided to the Independent Expert Scientific Committee (IESC) for their review. On 14 May 2014, IESC provided a submission about the EIS.

The concerns raised by the IESC in their advice were related to the following issues:

- a perceived lack of monitoring data
- an inadequate groundwater model
- limitations on the prediction of impacts due to the inadequacy of the model
- a need for an improved groundwater monitoring plan.

The proponent responded to this advice in their response to submissions, and made amendments to the EIS. Firstly, additional data will be obtained from the existing monitoring network, and from the expanded network when it is established. Secondly, the proponent provided an improved and adequate model with their response to submissions. Thirdly, the improved model allowed the proponent to make better predictions of potential impacts, and furthermore, the model will be run again on other occasions, when sufficient additional data is obtained, to further improve predictions. And lastly, the proponent has committed to expanding the water management plan to include the project area, and to undertaking macro-invertebrate sampling under the Receiving Environment Monitoring Plan for early detection of any project related impacts.

EHP considers all issues raised by the IESC have been adequately addressed by the proponent.

### **3.2.6.2 Modelling of groundwater impacts**

The Queensland Department of Natural Resources and Mines (DNRM), which is the state's lead regulatory authority of water resources, was satisfied that the modelling undertaken in amendments to the EIS was adequate. Calibration of the transient model with existing data demonstrated that it provided an adequate match between observations and predictions, which gives confidence that its predictions of future impacts are reasonable.

Nevertheless, assuming the project goes ahead, DNRM will require the proponent to gather additional data about inflows to the pit, and apply the model to the larger database to improve the predictions of impacts during mining and the subsequent recovery of the water table after mining ceases.

The following sections of this report summarise the assessment of the Boundary Hill South Project's potential impacts on groundwater resources.

### **3.2.6.3 Quaternary alluvium including surficial alluvium along drainage channels, and the Callide Valley alluvium**

As noted above, the Quaternary alluvium associated with Campbell (Gate) Creek and other drainage channels on the project site is largely unsaturated and dry, and does not provide a significant groundwater resource. Furthermore, the project will not take water from, and have no direct impact on, groundwater resources further downstream in the Callide Valley alluvium. Consequently, the project would not have a significant impact on alluvial groundwater resources.

Some stakeholders were concerned about the potential of the project to have an indirect impact by reducing recharge to the Callide Valley alluvium due to silt deposition downstream of the mine in Callide Creek. Erosion and sediment control measures at the mine will adequately manage that risk of an indirect impact.

### **3.2.6.4 Biloela Formation**

As with the Quaternary alluvium, the Biloela Formation across the project site is largely unsaturated and dry, and does not provide a significant groundwater resource. The formation is predominantly an aquitard. Consequently, the project would not have a significant impact on groundwater resources in the Biloela Formation.

Groundwater inflows to the mine pit from the Biloela Formation are predicted to be less than 0.3ML per day.

### **3.2.6.5 Precipice Sandstone**

The Boundary Hill South Pit must dig through the Precipice Sandstone to reach the coal resource. Groundwater from the Precipice Sandstone aquifer will consequently flow into the pit, and during operations must be pumped out to Lake Gasteen. Groundwater inflows to the mine pit from the Precipice Sandstone are predicted to increase to a



peak of 4.8ML per day in Year 10 operations. Inflows to the pit will cause lowering of the saturated water level in the aquifer. That lowering is known as drawdown.

Because of the dip of the Precipice Sandstone formation, drawdown of more than 1m will not extend more than approximately 500m to the north, directly west, or directly east of the project boundary. However, drawdown of more than 1m will extend beyond the project site up to 6km to the southeast, 5km to the south, and 3km to the south-west.

Drawdown of up to 70m is predicted immediately adjacent to the site. Drawdown would reduce to about 20m within approximately 2km to the south-east, south and south west of the southern boundary of the site. Drawdown of up to 10m would extend approximately 5km to the south-east of the project boundary, but only to about 2.5km to the south-west.

In private bores accessing the Precipice Sandstone, the Boundary Hill South operations are predicted to add as much as 24.9m of drawdown to the drop already caused by existing nearby operations. The maximum cumulative drawdown in a private bore is predicted to be 37.2m. Some bores may become dry. The three springs fed by the Precipice Sandstone aquifer are predicted to stop flowing.

After mining ceases, a pond will form in the final void and greatly reduce inflows from the Precipice Sandstone, but evaporation will nevertheless cause a net extraction from the aquifer. Groundwater levels would recover by approximately 75% within 10 years, but equilibrium may take 50 years. The water levels in some bores are predicted to fully recover, but some would experience an ongoing, cumulative drawdown of up to 7.1m. Also, the three springs are not expected to recover due to a residual drawdown of between 1.3m and 2.4m, so pumping would be required for their continued use as a water supply for farming.

#### **3.2.6.6 Callide Coal Measures**

The Boundary Hill South Pit must dig through the upper sandstone strata of the Callide Coal Measures to reach the coal resource. Groundwater from those strata would flow into the pit, and add to that flowing from the Precipice Sandstone aquifer. The EIS predicted inflows to the pit from the Callide Coal Measures would peak at 2.3ML per day in Year 12 of the operations.

The EIS predicted that drawdown of more than 1m in the Callide Coal Measures would extend as far from the project boundary as that in the Precipice Sandstone, but would not be continuous; rather it would occur in pockets. Drawdown within the project boundary would be as much as 110m, but outside the boundary only small pockets would experience drawdown of more than 20m.

Private bores drawing water jointly from the Precipice Sandstone and Callide Coal Measures would experience drawdown of up to 34.2m during operations. Most of those bores would recover after mining ceases, but one is predicted to experience ongoing drawdown of 2.4m.

#### **3.2.6.7 Basement volcanics**

The basement volcanic rocks lie below the depth that will be excavated for the Boundary Hill South Pit. Furthermore, a layer of low permeability rock of the Callide Coal Measures will be left on top of the basement volcanics. Consequently, the EIS assessed that the Boundary Hill South project would have no direct impact on groundwater in the basement volcanics.

#### **3.2.6.8 Potential impacts on groundwater quality**

The EIS addressed the following potential sources of groundwater contamination from the project:

- The risk of contaminated run-off from hydrocarbon and chemical storage areas was found to be negligible if those areas are properly bunded and maintained as would be required by the environmental authority.
- The seepage of leachate from overburden emplacement areas was assessed as unlikely to present any significant environmental risks of groundwater contamination.
- The gradually increasing salinity of the final void pond is not predicted to pose a risk to the surrounding groundwater resources because water will flow into the void to replace evaporation rather than percolating into the aquifers.

#### **3.2.6.9 Impacts on surface drainage features**

The EIS predicted that groundwater drawdown would not extend to the perennial reaches of any streams or the saturated extents of alluvium associated with the streams.

Drawdown in the Precipice Sandstone is predicted to extend to ephemeral reaches of Campbell (Gate) Creek, and may result in a decrease in baseflow of up to 9.7ML/y. However, the volume of reduced baseflow would be negligible in terms of total surface water flows in the creek, and would be imperceptible at downstream locations.

### **3.2.6.10 Cumulative impacts**

Modelling undertaken for the EIS predicted that there would be no cumulative impacts on the Callide Valley alluvium or groundwater levels in the saturated alluvium, neither will there be cumulative impacts on surface water bodies.

The project would contribute to cumulative depressurisation of the Precipice Sandstone and Callide Coal Measures during and after mining. The project is predicted to cause additional drawdown of water levels in 14 bores and three springs used by landholders.

## **3.2.7 Mitigation measures for groundwater impacts**

### **3.2.7.1 Make good agreements**

There are no mitigation measures that could be undertaken to avoid the drawdown of levels of groundwater in landholders bores. Consequently, the only option to mitigate impacts is by *make good measures* under *make good agreements* between the proponent and the affected groundwater users. Make good measures and make good agreements are regulated under the Queensland *Water Act 2000*.

The EIS stated that the proponent has entered into legally binding make good agreements with groundwater users affected by existing mine operations. These existing make good agreements have been negotiated between the proponent and potentially affected landholders to manage the impacts on private bores and other groundwater supplies due to the current approved Callide Mine operations. The agreements require the proponent to monitor and assess whether the existing approved Callide Mine is impacting on water supply and quality. If monitoring data indicates adverse impacts on groundwater supplies or quality, the proponent is legally required to implement the agreed make good mitigation and/or remediation measures. The proponent would be required to enter into amended make good agreements with landholders of any bores subject to additional impacts due to the project.

### **3.2.7.2 Avoidance of contamination**

The proponent committed to minimising the risk of potential contamination to groundwater from fuel storage by ensuring all mine refuelling activities would occur in areas with adequate bunding and provision for immediate clean-up of spills.

All chemicals would be transported, handled and stored in accordance with Australian Standards.

The proponent made the following commitments to minimise the risk of contamination to groundwater from the seepage of any leachate from the overburden dumps:

- conduct ongoing geochemical characterisation of overburden, interburden and floor rock
- selectively place material in engineered overburden dumps, according to its chemical and physical properties.

Furthermore, the proponent proposes monitoring of groundwater bores for potential seepage and contamination as part of the groundwater monitoring program, which is described in the following section.

### **3.2.7.3 Groundwater monitoring program**

The current groundwater monitoring program comprises 12 monitoring bores and three vibrating wire piezometers (VWPs) located across the project area and its surrounds. Five of these bores are currently monitored under the existing approved Callide Mine environmental authority. The groundwater monitoring program would be expanded to include nine additional monitoring bores around the Boundary Hill South mining operations.

Recording of groundwater levels from the monitoring bores and VWPs would continue throughout the life of the project to enable natural seasonal variations to be distinguished from water level impacts caused by mining activities. Groundwater would be sampled to detect changes in groundwater quality during and after mining.

Existing groundwater data would be reviewed prior to construction to establish the appropriate frequency of groundwater sampling and decide which water quality parameters should continue to be monitored.

## 3.2.8 Conclusions & recommendations

### 3.2.8.1 Surface water

EHP is satisfied that potential impacts on surface water resources have adequately assessed.

The Boundary Hill South pit would use the existing infrastructure for the management of mine affected water, and the management measures detailed in the Callide Mine's existing environmental authority for the storage and discharge of mine affected water are adequate. Consequently, no further recommendations are needed in that regard.

Conditions of the environmental authority should require that Campbell (Gate) Creek is excluded from the disturbance area, and that levees are constructed to protect the pit from flooding, as proposed in the EIS.

The reduction of Campbell (Gate) Creek's catchment area may have an impact on one downstream landholder who extracts water from the creek. That landholder has an existing beneficial reuse agreement that would be amended to manage any additional impacts to water supply as a result of the project. Impacts on catchment yield for other downstream landholders were not considered likely to result in a significant reduction in water supply, and would increase surface runoff at two properties along Callide Creek.

### 3.2.8.2 Groundwater

EHP is satisfied that potential impacts on groundwater resources have adequately assessed.

The Great Artesian Basin would not be impacted as the geological strata to be mined have no connection with the aquifers of the Great Artesian Basin.

Alluvial groundwater resources of the Callide Valley would not be significantly impacted.

The EIS predicted that drawdown in the Precipice Sandstone and Callide Coal Measures would extend beyond the project site up to 6km to the south-east, 5km to the south, and 3km to the south-west, but no more than approximately 500m to the north, directly west, or directly east of the project boundary. The drawdown would significant impact on 14 supply bores and three springs, and may cause some to become dry.

Drawdown at those bores and springs cannot be avoided, and direct mitigation measures would not be available. Groundwater users would be compensated by make good agreements. Make good agreements are currently regulated under the *Water Act 2000*. Conditions about make good agreements are not imposed in the environmental authority, which is issued under the *Environmental Protection Act 1999*. The content of make good agreements is a matter for negotiation between the proponent of the project and the affected groundwater users. Consequently, this EIS assessment report makes no recommendations about the amendment of existing make good agreements, or the content of new agreements.

After mining ceases, the water table is predicted to recover by about 75% within 10 years and reach equilibrium after about 50 years.

The final void would partially fill with water due to inflows of groundwater, but there is negligible risk that the void would fully fill and overflow. Evaporation will cause water quality in the final void's pond to gradually deteriorate over time and become more saline. However, evaporation would also cause the final void to act as a sink. Consequently, groundwater would flow into the void, and saline water would not percolate into surrounding aquifers.

The water level in the Precipice Sandstone and Callide Coal Measures would be permanently drawn down by about 5m close to the void. Several private bores would experience permanent drawdown of between 2m and 5m; a few bores would experience permanent drawdown of about 1m; others would effectively recover. The three springs are predicted to stop flowing due to drawdown of between 1.3m and 2.4m.

The EIS stated that groundwater monitoring would be conducted over the life of the mine to confirm the actual extent of groundwater impacts, validate the model predictions, and establish the basis for implementing the make good agreements with any affected groundwater users.

Recommended draft EA conditions for groundwater are in Appendix A of this EIS assessment report.

### 3.2.8.3 Water licence

The inflows of groundwater to the pit will require the proponent to obtain a water licence under the *Water Act 2000*.

The Department of Natural Resources and Mines has informed EHP that the water licence under the *Water Act 2000* will include conditions that require the proponent to gather additional data about inflows to the pit, and apply

the groundwater model to the larger database to improve the predictions of impacts during mining and the subsequent recovery of the water table after mining ceases.

## Appendix C Species profiles

This attachment provides detailed descriptions of the threatened fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) that have the potential to be impacted by the Boundary Hill South Project. These species were either recorded during surveys or were assessed as having either a high or moderate likelihood of occurring in the project area.

### Northern quoll (*Dasyurus hallucatus*)

**EPBC Act Status:** endangered

The northern quoll is the smallest of the four Australian quoll species and also the most arboreal and aggressive. It has a pointy snout, reddish brown fur with a cream underside, white spots on its back and rump and a long, sparsely-furred, unspotted tail. The northern quoll weighs up to 1.2kg: males are larger than females.

The northern quoll occupies a range of habitats including rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beach scrub, grasslands and desert. Habitat critical to the survival of the species is defined as any habitat within the modelled distribution of the species where denning or shelter habitat, or both, occurs (EPBC Act referral guidelines for the endangered northern quoll, *Dasyurus hallucatus* (quoll referral guidelines)). Critical habitat for the species includes the following types:

- rocky habitat such as ranges, escarpments, mesas, gorges, breakaways, boulder fields, major drainage lines or treed creek lines
- structurally diverse woodland or forest areas containing large diameter trees, termite mounds or hollow logs
- off shore islands where the northern quoll is known to exist.

Recent surveys in Queensland suggest the northern quoll is more likely to be present in high relief areas that have shallower soils, more boulders, are less fire affected, and are closer to permanent water.

In Queensland, the northern quoll is known to occur as far south as Gracemere and Mt Morgan near Rockhampton, as far north as Weipa, and west to around Carnarvon National Park. The species' distribution is highly fragmented in Queensland, and surveys indicate severe reductions from its former range. Local populations still persist in north and central Queensland coast areas despite the presence of cane toads. There are recent records from around Proserpine, Midge Point, Eungella, and Cape Upstart.

### Survey requirements and survey effort

For the purposes of referral and assessment under the EPBC Act, surveys for the northern quoll should involve a reconnaissance survey and, if necessary, subsequent detailed surveys (*Survey guidelines for Australia's threatened mammals*, Commonwealth of Australia, 2011).

#### Reconnaissance survey

A reconnaissance survey can be conducted at any time of the year, and should assess whether a project site may provide denning, shelter, dispersal, and foraging habitat for the northern quoll.

#### Targeted survey

A targeted survey is recommended for any project within the modelled distribution of the species where the reconnaissance survey identifies the presence of the northern quoll, or habitat critical to the survival of the species, or both.

The objective of targeted surveys should be to determine the relative abundance and distribution of the northern quoll likely to be impacted by a proposed development. A survey during May, June, July or August (primarily to avoid disturbing breeding quolls) using wire cage or large Elliot traps should be undertaken before a project begins.

#### Survey effort

Trapping effort should be determined by the formula  $y = 50x^{0.5}$ , where  $y$  is the number of trap-nights and  $x$  is the area of potential northern quoll habitat in hectares in the project area. Trapping effort is calculated as the number of trap-nights, where for example, five traps set for two nights would be 10 trap-nights. For linear habitat, e.g. gorges, major drainage lines, breakaways less than 100m wide, one trap per 100m is recommended.

Using the formula above the trapping effort for the project site is over 700 trap-nights. This figure is based on 200ha of potential northern quoll habitat in the project footprint.

### *Project survey effort*

Reconnaissance surveys were conducted over four days and nights in December 2011. The survey regime included diurnal searches for quoll signs such as scats, latrines, dens and bones (20 person hours), hair sampling for a minimum of four nights using 20 hair tubes spaced 100m apart, and camera traps set for a minimum of four nights running continuously.

Additional targeted surveys were conducted over three nights in 2014 at ten survey locations using 20 large (Type B) Elliott traps and four cage traps at each site. Two infra-red cameras were deployed for the duration of the survey and daytime searches for quoll signs were conducted.

The EIS states that when all the quoll surveys and detailed fauna surveys were combined, the total trapping effort was 1094 trap-nights.

Fauna surveys were limited to the late-wet season and late-dry season. They were not conducted during the height of the wet season, when foods like amphibians would have been more abundant.

### **Occurrence within the project area**

The EIS stated that no northern quolls were captured in the project area during field surveys. A scat was found less than one kilometre east of the project site that could possibly be attributed to a northern quoll, but this could not be confirmed.

An individual was captured and positively identified at Callide Power Station approximately 18km from the project site on 17 May 2012. Also, Callide Power Station staff reported seeing a quoll a number of weeks earlier, as well as regularly observing scats. This capture site is part of the large block of remnant vegetation adjoining the eastern boundary of the project area, and is connected to the two creeks running east-west through the project area. It was in one of these creeks that the abovementioned scat was found.

The EIS stated that the project is near a 'known/likely to occur' area in the species distribution map in the quoll referral guidelines, and that suitable habitat occurs across roughly half of the project area, approximately 200ha of which is considered medium to high suitability (EIS Feb 2014, p.12A-33). A fire that occurred prior to field work would have potentially affected quoll food resources on the project site. Therefore, on the basis of habitat suitability the EIS initially considered it appropriate to assume that the northern quoll is likely to occur on the project site. However, when the proponent amended the EIS, the habitat areas initially considered to be medium to high suitability were reclassified as low value based on further survey work and habitat assessment.

Habitat of medium or higher suitability is likely to provide dens or shelter for the species, and is associated with vegetated creeks, rocky habitats or structurally diverse woodland. On this basis, medium or higher suitability habitat meets the criteria for critical habitat. Low suitability habitat does not meet the criteria for critical habitat as it is unlikely to provide denning or shelter habitat.

### **Impacts of the proposed action**

The project may have the following potential project impacts on the northern quoll:

- the loss of habitat by clearing woodland vegetation for the construction and operation of the mine
- disturbance from light, noise and vibration, which may influence breeding and foraging behaviour
- dust generated by the mine, which may further reduce foraging grounds by affecting plant communities
- mortality due to construction activities and vehicle strike—particularly exacerbated at night, when many species move across the landscape
- increased fire frequency related to increased human presence.

### **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

#### *Minimise vegetation and habitat loss:*

- vegetation clearing will be limited to the extent necessary for the project
- native vegetation outside identified clearing areas will remain undisturbed
- staff will be briefed on the care and conservation of the project site's native vegetation.

*Pre-clearing surveys and actions:*

- prepare an inventory of trees and hollows that would be removed
- prior to clearing, check hollow bearing trees for the presence of birds and arboreal mammals
- safely remove any fauna, and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat.

*Management and monitoring plans:*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

*Indirect impacts:*

- manage project noise and light impacts on adjacent areas of native vegetation.

The EIS initially proposed habitat improvement along the two riparian corridors in the project site containing medium and high suitability quoll habitat (northern quoll mitigation management area (EIS Feb 2014, Chapter 12A (Figure 12A-7)). Currently, these areas show signs of weed incursion, erosion, clearing, and the presence of pest species. The species management plan developed as part of the EIS should include mitigation measures to restore and improve riparian habitat along these two corridors including weed management, rehabilitation for soil stabilisation, and feral species management. The species management plan should also require work that will facilitate the movement of quolls under the proposed haul road located immediately west of these riparian corridors. Construction of this haul road should aim to minimise potential impacts on adjacent northern quoll habitat.

**Residual impact**

The EIS concluded that the mitigation measures proposed in the EIS would avoid the project having a significant residual impact on the northern quoll. However, after considering an opinion from DOTE that was contrary to the EIS, EHP does not accept the EIS's conclusion.

The EIS identified 266ha of vegetation that is potential quoll habitat. However, the EIS assessed this area as low suitability habitat that may be used for foraging, but is unlikely to be denning or shelter habitat. The EIS also assessed this habitat as unlikely to be used by dispersing quolls because it is on the edge of the available remnant vegetation, and does not provide connectivity to any other habitat. If it were low suitability habitat it would not meet the criteria for critical habitat in the quoll survey guidelines as it is unlikely to provide denning or shelter habitat. However, in accordance with DOTE's advice, EHP does not accept the assessment that it is low suitability habitat, rather it is medium or high suitability habitat.

The EIS also assessed that quolls would not use the site because cane toads are present. DOTE advised that although the cane toad is a known threat to the quoll, the cane toad is widespread through areas known to contain quolls. The Callide Timber Reserve also contains cane toads and the northern quoll has been recorded nearby.

DOTE and EHP note the project site has the following attributes:

- It is located near a 'known/likely to occur' area shown in the quoll distribution map of the quoll referral guidelines
- habitat of medium or higher suitability occurs in the site (EIS Feb 2014, p.12A-40) and may support denning or shelter habitat
- there is a recent record from a site connected by contiguous vegetation.

After considering the impacts the project would have on those attributes, and the advice provided by DOTE, EHP concluded that the project will modify, destroy, remove or isolate or decrease the availability or quality of habitat for the northern quoll resulting in a significant residual impact on the species. This 266ha of northern quoll habitat overlaps with habitat for other listed species covered by this report.

## Cumulative impacts

The size and dynamics of the northern quoll population in the region are not well known. It is therefore difficult to assess the potential cumulative impact of the project on the recovery of this species. Cane toads, foxes, cats, and the loss of suitable habitat have placed significant pressure on northern quoll populations. EHP considered that suitable habitat will be lost as a result of the project. The retention and management of the existing suitable habitat to the north of the mine footprint will help to mitigate impacts. Progressive rehabilitation of the mine site will also reduce cumulative impacts by possibly restoring dispersal and foraging opportunities for the species.

In addition, the provision of offsets for project impacts on the northern quoll will further reduce the potential cumulative impacts of the project on biodiversity.

## Offsets

The EIS concluded that the project would not have a residual impact on the northern quoll and did not propose offsets.

However, following advice provided by DOTE, EHP concluded that:

- there is quoll habitat within the project site
- the project will have a significant residual impact on the species
- 266ha of modelled habitat will need to be offset in accordance with the Environment Protection and Biodiversity Conservation Act 1999 Environmental Offsets Policy (EPBC Act offsets policy).

## Consideration of plans, agreements, and conservation advice

*Listing and conservation advice:*

Threatened Species Scientific Committee (2005). Listing Advice on *Dasyurus hallucatus* (Northern quoll), Commonwealth of Australia, Canberra. <<http://www.environment.gov.au/node/16356>>.

*Recovery plan:*

Hill B.M and Ward S.J. (2010). National recovery plan for the northern quoll *Dasyurus hallucatus*. Department of Natural Resources, Environment, the Arts and Sport, Darwin. <<http://www.environment.gov.au/resource/national-recovery-plan-northern-quoll-dasyurus-hallucatus>>

*Threat abatement plans:*

The Department of Environment, Water, Heritage and the Arts (2008). Threat Abatement Plan for Predation by the European Red Fox. Commonwealth of Australia, Canberra. Department of the Environment (2015). Threat Abatement Plan for Predation by Feral Cats, Commonwealth of Australia, Canberra.

The Department of Sustainability, Environment, Water, Population and Communities (2011). Threat Abatement Plan for the biological effects, including lethal toxic ingestion, caused by cane toads, Commonwealth of Australia, Canberra.

The Department of Sustainability, Environment, Water, Population and Communities (2012). Threat Abatement Plan to reduce the impacts on northern Australia's biodiversity by the five listed grasses, Commonwealth of Australia, Canberra. Threats identified in the approved recovery plan include cane toads, feral predators, fire management, habitat degradation and destruction, weeds, disease and population isolation.

The following recovery actions identified in the recovery plan are relevant to the project site:

- **Foster the recover or subpopulations that persist with cane toads**
  - determine factors that affect survival and recovery in cane toad areas
    - assist populations to recover in the presence of cane toads.
- **Reduce the risk of quoll populations being impacted by disease**
  - increase knowledge and monitoring of disease in quoll populations.
- **Reduce the impact of feral predators**
  - assess the impacts of predators on quoll populations



- implement efforts to protect key northern quoll populations.

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment, and in making the recommendation that the proposed action be approved.

The EIS proposed several mitigation measures to minimise the project's impacts on the species, including the creation of a northern quoll management area in the north of the mine site. This area covers vegetation that was initially mapped as medium and high quality habitat, but was subsequently reassessed as low quality habitat.

### **Conclusion**

The project would result in clearing of 266ha of vegetation (121ha remnant plus 145ha non remnant functioning habitat) that, in agreement with advice from DOTE, EHP considered contains good quality habitat. There are also records of the northern quoll within the broader landscape. This area of northern quoll habitat overlaps with habitat for other listed species covered by this report.

The northern quoll is an endangered species, and again in agreement with advice from DOTE, EHP considered the proposed action would have a significant impact on quoll habitat because the activity will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline (significant impact guidelines p.10). Therefore, project impacts on these areas should be offset in accordance with the EPBC Act Environmental Offsets Policy (EPBC Act offsets policy).

### **Koala (*Phascolarctos cinereus*)**

#### **EPBC Act Status:** vulnerable

The koala is a distinctive, medium-sized, arboreal marsupial with a stocky, grey body and large rounded ears. It inhabits a range of temperate, sub-tropical and tropical forest, woodland and semi-arid communities dominated by eucalypt species. It is a leaf-eating specialist with a diet restricted mainly to foliage of eucalypt species.

For the combined population subject to the EPBC Act listing, the range extends from approximately Cairns to the New South Wales-Victoria border, and includes some island populations. The distribution is not continuous across this range, with populations isolated by cleared land or unsuitable habitat. The distribution of the koala is also affected by altitude (limited to <800m ASL), temperature, and leaf moisture (at the western and northern extremes of the range).

#### **Survey requirements and survey effort**

The EPBC Act referral guidelines for the vulnerable koala (koala referral guidelines) require initial desktop surveys to determine if on-ground surveys are required.

When required, the purpose of on-ground surveys is to: ground-truth vegetation data; determine species presence or absence; estimate the age of koalas that are observed (i.e. whether juveniles or adults); and to characterise vegetation condition and structure. Surveys should be undertaken by a suitably qualified and experienced specialist. The koala referral guidelines contain a habitat assessment tool using criteria that can be addressed with a basic survey methodology.

On-ground surveys should be conducted:

- between August and January (which is the optimum time to observe resident breeding females with back-young)
- during the drier parts of the year (when koala faecal pellets degrade less readily)
- in riparian areas, upper/mid-slope areas and other potential dry-period refugia in drier areas
- by a suitably qualified specialist (tertiary educated/trained in ecology or environmental science), with demonstrated skill and experience conducting koala surveys.

Surveys that are not conducted at optimal times must take into account that koala detectability may be lower.

Direct survey methods include diurnal strip transect surveys, spotlighting, call playback and remote sensor activated cameras. Indirect methods can also provide complementary information for assessing the occurrence of koalas. Faecal pellet searches, and a spot assessment technique (SAT), or regularised grid-based spot assessment technique, are recommended indirect survey methods. These techniques can help to determine local

food tree preferences and to estimate koala densities. However, they are only appropriate where faecal pellet persistence is high (in drier regions).

### **Project survey effort**

The following koala surveys, which are consistent with the EPBC Act referral guidelines for the vulnerable koala (Commonwealth of Australia 2014) (koala referral guidelines) for proponents (Australian Government), were carried out in 2013:

- detailed habitat assessments and line transect surveys—2 people traversed 80km of transects over 5 days (50 person-hours)
- SAT surveys—2 person-mins/tree for 30 trees at each of 5 SAT sites during koala surveys (5 person-hours)
- spotlighting searches—2 people, each 1 hour at 47 sites during koala surveys (94 person hours)
- call playback—2 people (5 mins listening/3 mins call play back and 2 mins listening/5 mins spotlighting) conducted twice at each of 47 sites during koala surveys (47 person-hours).

In 2014, further terrestrial ecology surveys were undertaken and included fauna habitat assessments and records of incidental fauna observations. Suitable habitat for koala was identified during flora surveys, regional ecosystem mapping and habitat assessments.

### **Occurrence within the project area**

The project site is within the modelled distribution of the koala (koala referral guidelines), and in a 'known/likely to occur' area on the species distribution map. The site is in the coastal koala habitat context as shown on Map 2 of the koala referral guidelines.

Surveys and habitat assessments undertaken by AECOM for the EIS (p.12A-33 and Table 7, Appendix P2) stated that habitat is present on the project site, including woodland with mature eucalypts (*Corymbia citriodora* and *Eucalyptus crebra*) predominantly in the east and north east as well as in the south west corner of the project area.

The koala was not recorded during surveys for the EIS, but a previous survey at the Callide Mine confirmed the presence of koala adjacent to the southern operations, which are south east of the project site. The koala has also been recorded in the Callide Timber Reserve.

In the project area, REs 11.3.25, 11.9.9, 11.10.1, and 11.10.13 all provide suitable habitat for the koala. The koala would also readily disperse through cleared and disturbed woodland. Extensive areas of high value regrowth vegetation would provide habitat for the koala in the project site.

### **Impacts of the proposed action**

Potential direct impacts of the project on the koala include:

- removal of, and reduction in, the extent of native vegetation
- habitat fragmentation
- mortality during operational works or vehicle strikes.

Potential indirect impacts include:

- spread of introduced plants and plant diseases
- increased pest fauna
- increased incidence and intensity of fire
- dust generation
- erosion, sedimentation and contamination
- disturbance due to light, noise and vibration.

### **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

*Minimise vegetation and habitat loss:*

- limit vegetation clearing to the extent necessary for the project

- native vegetation outside identified clearing areas to remain undisturbed
- staff will be briefed on the care and conservation of the project site's native vegetation.

*Pre-clearing surveys and actions:*

- prepare inventory of trees and hollows to be removed
- prior to clearing check hollow bearing trees for the presence of birds and arboreal mammals
- safely remove fauna and relocate to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat.

*Management and monitoring plans:*

- update the existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

*Indirect impacts*

- manage project noise and light impacts on adjacent areas of native vegetation.

General measures to reduce the potential impacts on fauna habitats did not specifically address mitigation measures for the koala. The species management plan, rehabilitation management plan and other mitigation strategies should require the proponent to take certain actions that specifically benefit the koala, including: provide fencing to guide the safe movement of the species away from hazards and into safe corridors; provide signs to warn workers of the possible presence of koalas; and educate workers to manage potential impacts on koala from vehicle strike and unnecessary clearing of habitat. These actions will also benefit other species. The rehabilitation plan for the mine site and the management plans for the northern areas of the site should incorporate planting of koala habitat trees.

**Residual impact**

The EIS identified 257ha of vegetation that was considered to be potential koala habitat. It concluded that the project would not have a significant impact on the koala because this habitat was assessed as low quality habitat, and also because the site does not contain an important population as defined in the EPBC Act significant impact guidelines. However, following advice provided by DOTE, EHP does not accept that conclusion.

The EIS Threatened Species Profile Report includes an assessment using the koala referral guidelines habitat assessment tool (Table 4, p.27) to determine whether the project impact area contains habitat critical to the survival of the koala. The assessment tool produced a habitat score of five. Impact areas that score five or more contain habitat critical to the survival of the species.

The 257ha of vegetation, composed of 113ha of remnant vegetation and 144ha of non-remnant functioning habitat, contains more than two known koala forage species (*E. crebra*, *E. tereticornis* and *Corymbia citriodora*) and there are recent records of the species near the project area. Therefore, in accordance with advice from DOTE, EHP determined that it is an area of critical inland habitat for the koala. This area of koala habitat overlaps with habitat for other listed species covered by this report.

The koala referral guidelines state that loss of more than 2ha of even marginal quality habitat (habitat score of 5) may be a significant impact. DOTE and EHP concluded that the project will modify, destroy, remove, isolate or decrease the availability or quality of habitat resulting in a residual impact on the koala.

**Cumulative impacts**

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS stated that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the Vegetation Management Act 1999. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat and further reduce potential cumulative impacts of the project.

### **Offsets**

The EIS concluded that the project would not have a significant residual impact on the koala and did not propose offsets.

However, after considering an opinion from DOTE that was contrary to the EIS, EHP concluded that the project will have a significant residual impact on the species, and that an offset package will be required to compensate for the loss of 257ha of koala habitat.

### **Consideration of plans, agreements, and conservation advice**

#### *Listing and conservation advice:*

Threatened Species Scientific Committee (2012). *Commonwealth Conservation Advice on Phascolarctos cinereus (combined population in Queensland, New South Wales and the Australian Capital Territory)*, Commonwealth of Australia, Canberra.  
<http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-conservation-advice.pdf>

Threatened Species Scientific Committee (2011). Listing advice for *Phascolarctos cinereus* (koala).  
<<http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-listing-advice.pdf>>.

*Recovery plan:* No national recovery plan has been approved for the koala.

*Threat abatement plans:* There are no threat abatement plans relevant to the koala.

The main threats identified in the approved conservation advice include: the loss and fragmentation of habitat, vehicle strike, disease, and predation by dogs. The following priority recovery and threat abatement actions are identified in the conservation advice and are relevant to the project site.

#### *Habitat loss, disturbance and modification:*

- development planning in areas of koala populations to prevent loss of important habitat, koala populations or connectivity options
- development plans to address ways to mitigate risk of vehicle strike within, and adjacent to, koala habitat
- monitor recovery progress, including effectiveness of management actions, and the need to adapt them if necessary
- identify populations of high conservation priority.

#### *Animal predation:*

- develop and implement a management plan to control adverse impacts of predation.

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment and in making the recommendation that the proposed action be approved.

### **Conclusion**

There are koala records in the vicinity of the project site, and the disturbance area contains vegetation communities with koala food tree species. The project will result in a loss of 257ha of koala habitat. This area of koala habitat overlaps with habitat for other listed species covered by this report. In accordance with advice from DOTE, EHP considered that the project is likely to have a significant residual impact on the koala because it will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. An offset to compensate for the loss of koala habitat will be required.

### **Squatter pigeon (southern) (*Geophaps scripta scripta*)**

## **EPBC Act Status:** vulnerable

The squatter pigeon (southern) is a medium-sized (about 30cm long), ground-dwelling pigeon. The northern and southern subspecies are similar, with a mainly grey-brown body with black and white stripes on the face and throat and white on the flanks and lower belly. The upper wings are dark-brown with patches of iridescent green or violet. The southern subspecies is slightly larger and has blue-grey skin around the eyes.

The distribution of the squatter pigeon (southern) extends from the Burdekin-Lynd divide in central Queensland, west to Charleville and Longreach, east to the coast from Proserpine to Port Curtis, and south to scattered sites in south-eastern Queensland. The subspecies is considered to be resident in at least some parts of its range, but also appears to undertake some local movements. It is thought to occur as a single, contiguous breeding population.

The species prefers open forest to sparse, open woodlands and scrub, within 3km of water, and with a canopy mostly dominated by *Eucalyptus*, *Corymbia*, *Acacia* or *Callitris* species. The squatter pigeon (southern) also uses regrowth or partly modified vegetation communities. Breeding habitat occurs on stony rises on sandy or gravelly soils within 1km of permanent water. Nests are located on the ground, and are sheltered by vegetation such as short, dry grass, grass tussocks or bushes.

### **Survey requirements and survey effort**

Surveys for the squatter pigeon (southern) should start with a desktop assessment to gather information for effective on-ground habitat assessments. The recommended methods (p.197, *Survey Guidelines for Australia's Threatened Birds*, Commonwealth of Australia, 2010) for on-ground surveys for the squatter pigeon (southern) are: area searches or transect surveys in suitable habitat; flushing surveys also likely to be useful.

#### *Habitat assessment*

If foraging, breeding or dispersal habitats are identified in the desktop assessment, an on-ground habitat assessment must be conducted. The extent of each vegetation type and the quality of potential foraging, breeding or dispersal habitat for the squatter pigeon should be assessed in each vegetation type. Stratification of sampling effort should be based on the extent of each vegetation type in the study area. Opportunistic surveys for the subspecies should be done during habitat assessments, particularly along dirt roads and other patches of bare ground adjacent to areas of native vegetation identified as suitable for foraging, breeding or dispersal.

Habitat assessments must be conducted by a suitably qualified botanist or ecologist with demonstrated skill and experience in squatter pigeon (southern) habitat assessments.

#### *Targeted surveys*

Targeted surveys are required to detect the subspecies in suitable habitats and to identify how the subspecies may be using those areas. Surveys must be conducted by suitably qualified ecologists with demonstrated skill and experience in conducting squatter pigeon surveys, and must be undertaken in a manner which maximises the chance of detecting the species.

#### *Survey timing*

The optimal period of the year to detect the squatter pigeon is the mid to late dry season from May to the end of October when it is actively foraging for grass seed. June is the optimal period to observe juvenile squatter pigeons, which would indicate breeding habitat in the area. The best times of day to detect squatter pigeons are the first half hour after sunrise and the last half hour before sunset when the birds are most active. They are most commonly detected between sunrise and 9am, and between 3:30pm and sunset.

#### *Survey methods*

Squatter pigeons are difficult to detect, but are commonly seen foraging for seed on bare, dusty ground adjacent to natural habitats. The subspecies often occurs around dirt tracks and frequents water bodies or water courses. Driving in a vehicle along dirt tracks is likely to flush squatter pigeons from the ground and allow easier detection. Two driving surveys should be conducted in the following manner:

- at a constant speed of approximately 20km/h
- along the same route, in the same manner, on consecutive days
- adjacent to areas of natural habitat throughout the study area
- along unsealed roads, tracks and other dusty areas, such as stockyards
- along sealed roads around the perimeter of the study area.

The route to be taken should be designed to survey all unsealed roads in the study area during the optimal periods stated above. Return surveys should be conducted along each road.

Waterbody surveys should be conducted on the two consecutive days following driving surveys. Dawn and dusk surveys should be done at all natural and artificial waterbodies and watercourses that are suitable for use by the squatter pigeon.

The recommended survey effort for areas less than 50ha is 15 hours (using area searches or transect surveys) over three days. Flushing surveys (ten hours over three days) are also likely to be useful.

#### *Project survey effort*

The EIS stated that bird surveys were undertaken during April and September as part of the general EIS detailed fauna assessments carried out at five detailed and two secondary fauna survey sites. Diurnal bird surveys (observations and vocalisations) involved searching two hectares over 20 minutes at detailed fauna survey sites. Surveys were undertaken on four mornings and completed within four hours of dawn. This survey effort amounts to 1.3 hours searching at each site (section 12A.3.2.2 p.12A-7). However, these searches were general bird surveys rather than squatter pigeon surveys.

In addition to the general detailed survey program, incidental observations of birds were made while ecologists were on the site.

There is insufficient information in the EIS to determine whether the survey effort was consistent with the Commonwealth survey guidelines. However, as the species was detected during surveys DOTE and EHP accept that the survey approach used was adequate.

#### **Occurrence within the project area**

The EIS addendum (Feb 2015, 12A Terrestrial Ecology) identified high value squatter pigeon habitat in the north of the project site (Fig. 12A-10). Subsequently, the EIS's Threatened Species Profile Report provided a reassessment of squatter pigeon habitat that 'indicated that none of the site meets the Commonwealth's definition of squatter pigeon (southern subspecies) habitat' (p.87).

However, the project site is within the mapped distribution of the species, and it was recorded during field surveys. Most of the project site is regarded as potential squatter pigeon habitat as it lies within 3km of water bodies or water courses, consists of vegetation dominated in the overstorey by *Eucalyptus* and *Corymbia* species, and consists of remnant and regrowth communities. In the project site, open grassy areas, cleared areas and regrowth areas near water, dirt tracks and the power line easement contained suitable habitat. The regional ecosystems on site that provide suitable habitat for the squatter pigeon are RE11.3.25, RE11.9.9, and RE11.10.1.

#### **Impacts of the proposed action**

Potential impacts of the project on the squatter pigeon include:

- removal native vegetation
- habitat fragmentation
- mortality
- decline in habitat quality in adjacent vegetation due to edge effects
- increased surface water flows and resultant decrease in separation distance between permanent water and foraging habitats.

#### **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

##### *Minimise vegetation and habitat loss:*

- limit vegetation clearing to the extent necessary for the project
- native vegetation beyond identified clearing areas to remain undisturbed
- staff will be briefed on the care and conservation of project site native vegetation.

#### *Pre-clearing surveys and actions:*

- prepare an inventory of trees and hollows to be removed
- prior to clearing, check trees with hollows for the presence of birds and arboreal mammals
- safely remove fauna and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat

#### *Management and monitoring plans:*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

#### *Indirect impacts:*

- manage project noise and light impacts on adjacent areas of native vegetation.

### **Residual impact**

The EIS identified 266ha of vegetation regarded as potential squatter pigeon habitat. However, the EIS concluded that the project would not have a significant residual impact on the species, although the project would remove an area of high value habitat. The EIS cited broad habitat requirements, widespread areas of potential breeding and foraging habitat outside the project area, and progressive rehabilitation to restore habitat, as justification for this conclusion.

The species has recently been relisted as vulnerable under the EPBC Act, reaffirming that the species is still subject to significant threats. The species was confirmed to be present on the site and habitat critical to the survival of the species (foraging and dispersal; possibly breeding) is present.

In accordance with advice from DOTE, EHP concluded that there will be a significant residual impact on the species because the project will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline (p.9, significant impact guidelines). The total area of disturbed habitat (remnant and non-remnant) for squatter pigeon is 266ha, including 121ha of REs 11.10.1, 11.9.9, and 11.8.4. This area of squatter pigeon habitat overlaps with habitat for other listed species covered by this report.

### **Cumulative impacts**

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS states that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the *Vegetation Management Act 1999*. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat and further reduce potential cumulative impacts of the project.

### **Offsets**

The EIS did not propose offsets for project impacts on the squatter pigeon because it concluded that the project would not have a significant residual impact on the species.

However, after considering an opinion from DOTE that was contrary to the EIS, EHP concluded that a residual impact will occur, and that 266ha of habitat will need to be offset in accordance with the EPBC Act offsets policy.

## Consideration of plans, agreements, and conservation advice

### *Listing and conservation advice:*

Threatened Species Scientific Committee (2015). Conservation Advice for *Geophaps scripta scripta* (squatter pigeon (southern)). Commonwealth of Australia, Canberra.

*Recovery plan:* No recovery plan has been prepared for the squatter pigeon (southern subspecies).

*Threat abatement plans:* The following threat abatement plans are relevant to the squatter pigeon (southern):

Department of Environment, Water, Heritage and the Arts (2008). Threat Abatement Plan for Predation by the European Red Fox. Commonwealth of Australia, Canberra.

Department of the Environment (2015). Threat Abatement Plan for Predation by Feral Cats, Commonwealth of Australia, Canberra.

Department of the Environment, Water, Heritage and the Arts (2008). Threat Abatement Plan for Competition and Land Degradation by Rabbits. Commonwealth of Australia, Canberra.

Department of Environment and Heritage (2006). Threat abatement plan to reduce the impacts of tramp ants on biodiversity in Australia and its territories, Commonwealth of Australia, Canberra.

The main threats identified in the approved conservation advice include clearing of habitat for farming and development purposes, grazing of habitat by livestock and feral herbivores, and predation by feral cats and foxes.

The following priority recovery and threat abatement actions, which were identified in the conservation advice to support the recovery of the squatter pigeon, are relevant to habitat management on the project site:

### *Habitat Loss, Disturbance and modification:*

- monitor known populations to identify key threats
- monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary
- manage threats to areas of vegetation that support important populations of the squatter pigeon (southern).

### *Animal predation or competition:*

- implement the appropriate recommendations outlined in the Threat abatement plan for predation by feral cats, and the Threat abatement plan for predation by the European red fox, in areas inhabited by the squatter pigeon (southern).

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment, and in making the recommendation that the proposed action be approved.

## Conclusion

The total area of squatter pigeon habitat in the project site is 266ha, including 121ha of remnant vegetation. This area of squatter pigeon habitat overlaps with habitat for other listed species covered by this report. In accordance with advice from DOTE, EHP concluded that the project is likely to have a significant residual impact on the squatter pigeon because it will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Project impacts on squatter pigeon habitat should be offset in accordance with the EPBC Act environmental offsets policy.

The EIS proposed several measures to mitigate impacts on fauna species including the preparation of a species management plan to provide 'clear and practical process for management of potential impacts to threatened species' (p.12A-53).

## Grey-headed flying-fox (*Pteropus poliocephalus*)

**EPBC Act status:** vulnerable

The grey-headed flying-fox is one of the largest bats in the world, weighing 600–1000g, with a head–body length of 230–289mm. It is the only Australian flying-fox that has a collar of orange/brown around its neck. The head is



covered by light grey fur, and belly fur is grey, often with flecks of white and ginger. The fur on the back shows two morphs, which could be related to age, moult or sub-population. One morph has dark grey fur and the other has a pronounced silver or frosted appearance. Winter fur is darker than summer fur with a pronounced moult occurring in June.

The grey-headed flying-fox is Australia's only endemic flying-fox. It occurs in the coastal belt from Rockhampton in central Queensland to Melbourne in Victoria. However, only a small proportion of this range is used at any one time, as the species selectively forages where food is available. It is a highly colonial species, forming daytime camps of up to 70,000 individuals. Some of these camps can be permanent, but most are temporary and seasonal.

Grey-headed flying-foxes feed on eucalypt nectar and pollen, and fleshy subtropical rainforest fruits. Camps form in response to the timing and location of flowering and fruiting events.

### **Survey requirements and survey effort**

The grey-headed flying fox occupies most areas in their distribution in highly irregular patterns, and therefore surveys based on animal sightings are unlikely to be reliable. A more effective survey method is to search appropriate databases and other sources for the locations of camps, and to conduct vegetation surveys to identify feeding habitat (*Survey Guidelines for Australia's Threatened Bats*, Commonwealth of Australia, 2010).

The survey protocol involves a review of databases of known flying fox camps, daytime field surveys to locate camps, surveys for the presence of known core vegetation communities and food plants, and night surveys looking for feeding and flying bats.

#### *Survey effort*

Consultants should demonstrate that they have sought information about the location of historic camps from the appropriate authoritative sources as outlined above. They should also demonstrate that a comprehensive vegetation survey has been completed for the survey area.

### **Project survey effort**

Surveys for the grey-headed flying-fox were done during April and September as part of the general EIS detailed fauna surveys done at five detailed and two secondary survey sites. In addition, terrestrial ecology surveys were conducted in August 2014, when day time searches for camps, day roosts and suitable food species were carried out. Detailed flora and vegetation surveys were conducted in March 2012 and August-September 2014.

### **Occurrence in the project area**

The grey-headed flying fox was not recorded during surveys, but potential foraging habitat associated with riparian forest and flowering eucalypts was confirmed. The EPBC Act Protected Matters Search Tool predicted the grey-headed flying fox would occur in the area, and there is a record in the Queensland Museum database from Peaks Range (about 89km south-east from the project site boundary).

The EIS concluded that no roosting habitat critical to the survival of the species was present and that potential foraging habitat in the area was also not defined as critical to the survival of the species. The EIS conservatively assessed that the species had a moderate likelihood-of-occurrence due to the presence of potential habitat and the fact that it is known to occur in the wider region.

### **Impacts of the proposed action**

Impacts of the project on the grey-headed flying-fox include:

- removal of native vegetation
- habitat fragmentation
- decline in habitat quality in adjacent vegetation due to edge effects.

### **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

#### *Minimise vegetation and habitat loss:*

- limit vegetation clearing to the extent necessary for the project
- native vegetation outside identified clearing areas to remain undisturbed
- staff would be briefed on the care and conservation of project site native vegetation.

*Pre-clearing surveys and actions:*

- prepare an inventory of trees and hollows to be removed
- prior to clearing check trees with hollows for the presence of birds and arboreal mammals
- safely remove fauna and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat.

*Management and monitoring plans:*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

*Indirect impacts:*

- manage project noise and light impacts on adjacent areas of native vegetation

**Residual impact**

The EIS concluded that 224ha of vegetation in the disturbance area identified as potential habitat was low quality habitat because of a lack of flying-fox camps within and surrounding the project site and the local modification of land for agricultural development (Threatened species profile report, p.172). The EIS concluded that there is no habitat critical to the survival of the species within the project site.

After considering a similar opinion from DOTE, EHP is satisfied with the assessment provided in the EIS, and conclude that the project is not likely to have a significant residual impact on the species.

**Cumulative impacts**

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS states that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the Vegetation Management Act 1999. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets for other species, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat and further reduce potential cumulative impacts of the project.

**Offsets**

The EIS concluded that project will not have a significant residual impact on the grey-headed flying-fox, and no offsets were proposed. EHP agreed with that conclusion.

**Consideration of plans, agreements, and conservation advice**

*Listing and conservation advice:*

Threatened Species Scientific Committee (2001). Listing advice on *Pteropus poliocephalus* (Grey-headed Flying-fox). Commonwealth of Australia, Canberra. <<http://www.environment.gov.au/node/16466>>

*Recovery plan:*

Department of Environment, Climate Change and Water NSW (2009). Draft national recovery plan for the grey-headed flying-fox *Pteropus poliocephalus*. Prepared by Dr Peggy Eby. DECCW NSW, Sydney.

*Threat abatement plans:* There are no threat abatement plans relevant to the main threats to the grey-headed flying-fox.

The main threat identified in the approved listing advice is clearing of habitat resulting in destruction or disturbance of roosting and foraging habitat. Habitat loss results in a decrease in the variety of flowering and fruiting tree species. Important winter flowering species are in habitat targeted for intensive residential development along the coastal strip. Habitat clearing also affects energy expenditure, as flying-foxes need to travel further between roosting and foraging areas to satisfy their dietary needs.

Flying-foxes feed on commercially grown fruit in Queensland and NSW; crop protection measures include sanctioned destruction of the bats by shooting.

The recovery objectives in the draft recovery plan for the grey-headed flying-fox are to:

- reduce the impact of threatening processes and arrest decline throughout the species's range
- conserve functional roles of the species in seed dispersal and pollination
- improve the standard of information available to guide recovery.

The following priority recovery and threat abatement actions identified in the draft recovery plan are relevant to habitat management on the project site:

- identify and protect foraging habitat critical to the survival of the species
- identify, protect and enhance roosting habitat critical to the survival of the species.

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment and in making recommendations that the proposed action be approved.

### **Conclusion**

The EIS concluded that there was no roosting or important foraging habitat of the grey-headed flying-fox on site. The potential habitat was assessed as being low quality habitat. As a result of this assessment, the EIS concluded that the project would not result in a significant residual impact on the species.

After considering a similar opinion from DOTE, EHP is satisfied that the project is unlikely to have a significant residual impact on the species.

### **Yakka skink (*Egernia rugosa*)**

**EPBC Act Status:** vulnerable

At 40cm long, the yakka skink is one of the largest skinks in sub-humid to semi-arid eastern Queensland. It has a broad dark brown to black stripe from the nape to the tail, bordered on both sides by a narrow, pale fawn stripe. The flanks are dark brown, pale brown to reddish-brown giving it a faintly variegated pattern. The throat is cream-yellow with blackish flecks, and the chest and abdomen are yellow-orange.

The yakka skink occurs from Cape York to South East Queensland. The core habitat of this species is in the Mulga Lands and Brigalow Belt South bioregions. The species occurs in a wide variety of vegetation types including open dry sclerophyll forest, woodland, and scrub. Microhabitats preferred by the species include dense ground vegetation, rocks, logs or tree stumps, root cavities, and abandoned animal burrows. Colonies of presumably related individuals share a system of burrows dug under, or between, partly buried rocks or logs, or at the base of large trees or stumps.

### **Survey requirements and survey effort**

The preferred survey method is to search for burrow systems and communal defecation sites. Elliott trapping around burrows, distant observation with binoculars or searching burrows at night are methods to confirm the species presence. The survey guidelines (*Survey guidelines for Australia's threatened reptiles*, Commonwealth of Australia, 2011) provide no advice about how much search effort is sufficient.

The species is most active in the early morning and late afternoon. Peak activity may be in late spring and summer, although this is not confirmed.

The EPBC Act *Draft referral guidelines for the nationally listed Brigalow Belt reptiles* (Commonwealth of Australia, 2011) (Brigalow Belt reptiles referral guidelines) state that important habitat can be used as a surrogate for important populations in significant impact assessment. This is because the species are difficult to detect, and

population information is limited. Suitable habitat for any one of the listed Brigalow Belt reptiles is considered important if it is:

- habitat where the species has been identified during a survey
- near the limit of the species' known range
- large patches of contiguous, suitable habitat and viable landscape corridors (necessary for the purposes of breeding, dispersal or maintaining the genetic diversity of the species over successive generations) or
- a habitat type where the species is identified during a survey, but which was previously thought not to support the species.

#### **Project survey effort**

Reptile surveys were done at five detailed and two secondary survey sites during April and September as part of the general detailed fauna surveys for the EIS. In addition, incidental observations of reptile species during other survey work were recorded.

Reptile surveys involved 30 minute daytime searches by two people on three days at each detailed fauna survey site, with a total search effort per site of three hours. At the secondary sites one daytime reptile search was done.

#### **Occurrence in the project area**

The project area is in the mapped distribution of the species. The species was not detected during field surveys, but it has been recorded in the Callide Timber Reserve about 1.5km from the project site.

Suitable habitat (RE11.9.9, *Eucalyptus crebra woodland*) is present in the west of the project impact area, and the species was given a moderate likelihood-of-occurrence in the EIS. However, the EIS did not rank the habitat as high value because there is a lack of species records, a lack of the majority of preferred forest/woodland types, and the area is disturbed by cattle grazing and clearing.

#### **Impacts of the proposed action**

The project area is described in the EIS as having remnant and non-remnant vegetation that contains a range of habitat features for foraging, shelter and breeding opportunities for fauna. The main potential impact of the proposed action on the yakka skink is the clearing of potential habitat and the removal of important microhabitat features, such as fallen logs, debris and leaf litter, and possibly rocky outcrops. The EIS states that the open forest has woody vegetation and fallen timber providing fauna habitat.

#### **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

##### *Minimise vegetation and habitat loss:*

- limit vegetation clearing to the extent necessary for the project
- native vegetation outside identified clearing areas to remain undisturbed
- staff would be briefed on the care and conservation of project site native vegetation.

##### *Pre-clearing surveys and actions:*

- prepare an inventory of trees and hollows to be removed
- prior to clearing check hollow bearing trees for the presence of birds and arboreal mammals
- safely remove fauna, and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat

##### *Management and monitoring plans:*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan

- manage fire and grazing on the project site to avoid impacts on habitat.

#### *Indirect impacts*

- manage project noise and light impacts on adjacent areas of native vegetation

#### **Residual impact**

The EIS stated that 110ha of potential yakka skink habitat identified in the disturbance area was only low quality habitat, and the area was isolated from adjacent better quality habitat. The EIS concluded that the project would not have a residual impact on the species.

After considering a similar opinion from DOTE, EHP is satisfied with the assessment provided in the EIS, and agrees that the project is not likely to have a significant residual impact on the species.

#### **Cumulative impacts**

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS states that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the *Vegetation Management Act 1999*. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets for other species, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat, and further reduce potential cumulative impacts of the project.

#### **Offsets**

The EIS concluded that project will not have a significant residual impact on the yakka skink and no offsets were proposed. EHP accepted that conclusion.

#### **Consideration of plans, agreements, and conservation advice**

##### *Listing and conservation advice:*

Threatened Species Scientific Committee (2014). *Commonwealth Conservation Advice for Egernia rugosa (Yakka Skink)*. Commonwealth of Australia, Canberra.

<<http://www.environment.gov.au/biodiversity/threatened/species/pubs/1420-conservation-advice.pdf>>

*Recovery plan:* No recovery plan has been prepared for the yakka skink.

*Threat abatement plans:* The following threat abatement plans are relevant to the yakka skink:

Department of Environment, Water, Heritage and the Arts (2008). Threat Abatement Plan for Predation by the European Red Fox. Commonwealth of Australia, Canberra.

Department of the Environment (2015). Threat Abatement Plan for Predation by Feral Cats, Commonwealth of Australia, Canberra.

Department of the Environment, Water, Heritage and the Arts (2008). Threat Abatement Plan for Competition and Land Degradation by Rabbits. Commonwealth of Australia, Canberra.

The approved conservation advice identifies the main threats to yakka skink as the continued legacy of past broad-scale land clearing and habitat degradation. Other threats include inappropriate roadside management, removal of woody debris and rock microhabitat features, ripping of rabbit warrens and predation by feral animals.

Priority recovery and threat abatement actions identified in the conservation advice that are relevant to the project site and would support the recovery of the yakka skink include;

- monitoring known populations
- identifying populations of high conservation priority

- discouraging removal of fallen logs, leaf litter and rock from known and potential habitat sites
- ensuring that road widening, maintenance activities and rabbit warren ripping does not adversely impact on known populations
- developing and implementing a management plan for foxes and feral cats
- developing a suitable fire management strategy for yakka skink habitat.

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment and in making recommendations that the proposed action be approved.

## Conclusion

The project area contains 110ha of potential, low quality yakka skink habitat. The EIS assessed the likelihood-of-occurrence of the yakka skink in the project area as moderate because there is some potential habitat on site and the species has been recorded in the surrounding area. The EIS concluded that the project would not have a significant residual impact on the species due to the low quality of the potential habitat that would be disturbed.

EHP is satisfied with the information provided in the EIS and its addenda and accepts the assessment that the project is unlikely to have a significant residual impact on the species.

## Collared delma (*Delma torquata*)

**EPBC Act Status:** vulnerable

The collared delma is a small, generally uniform brown legless lizard with a blunt snout. The head and neck have broad dark-brown bands separated by narrower cream-yellow spaces. Maximum snout-vent length is 7cm and total length is 19cm.

The collared delma occurs from south-east Queensland to around Rockhampton, west to Roma and into northern NSW. It occurs primarily in woodland including dry open eucalypt woodland dominated by narrow-leaved ironbark (*E. crebra*, *E. intermedia* and *E. maculata*) with an understorey of grasses on stony soils or rocky ridges. Collared delmas are mainly found under stones or coarse woody debris, and are sometimes associated with termite nests.

## Survey requirements and survey effort

The recommended approach (*Survey guidelines for Australia's threatened reptiles*, Commonwealth of Australia, 2011) to finding the collared delma is one-off hand searches (including raking through leaf litter) in appropriate habitats, together with pitfall trapping during late spring to summer (from October to February).

Searching and turning rocks is the most effective way to find this species. A study<sup>12</sup> found that in their habitat, collared delmas are typically encountered during dedicated rock turning searches approximately every 1.75 hours (or every 150-200 rocks).

The recommended arrangement for pitfall traps is a series of trap lines consisting of six buckets and funnel traps along a 15m fence. Pitfall trapping requires 300 trap-nights per capture.

## Project survey effort

Reptile surveys were done during April and September 2012 as part of the EIS's detailed fauna surveys at five detailed and two secondary survey sites. In addition, incidental observations of reptile species during other survey work were recorded. The surveys were not done at the recommended time of year but the EIS stated that ambient temperatures were consistent with survey conditions recommended in the Brigalow Belt reptiles referral guidelines.

Searches targeted suitable microhabitat features for reptiles. Pitfall trapping was also conducted, with traps open for four days and four nights during April, and three days and four nights during September, totalling 120 pitfall trap-

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<sup>12</sup> Porter, R. 1998. Observations on a large population of the vulnerable pygopodid, *Delma torquata*. *Memoirs of the Queensland Museum* 42(2): 565-572

days and 120 pitfall trap-nights. Funnel traps were open for three days and four nights, totalling 30 funnel trap-days and 40 funnel trap-nights

Reptile searches involved 30 minute daytime searches by two people at each site on three days during the detailed fauna surveys, with a total search effort per site of 3 hours. At the secondary sites one daytime reptile search was done. Searches were conducted in the late afternoon to early evening.

Because of the specialized nature of searching for this species, and the low encounter rates with different methods, the EIS survey approach and effort was not adequate to draw conclusions about the presence of the species in the project area.

### **Occurrence in the project area**

The project area is in the mapped distribution of the collared delma according to the Brigalow Belt reptiles referral guidelines. The species was not detected during field surveys. However, the EPBC Act Protected Matters Search Tool predicted it should occur in the area. Also, there is a recent record from Kroombit Tops National Park about 43km south-east from the project site.

The EIS's Threatened Species Profile Report states that RE11.10.1 (lemon scented gum (*Corymbia citriodora*) open forest on coarse-grained sedimentary rocks) was assessed as potentially suitable habitat for the collared delma as it had previously been recorded in this vegetation community. The EIS states that RE11.9.9 and RE11.9.13 lack essential microhabitat features suitable for the collared delma. However, suitable habitats are associated with ridges or slopes dominated by narrow-leafed ironbark in eastern parts of the species' distribution. The collared delma normally inhabits eucalypt dominated woodlands and open forests in land zones 3, 9 and 10 in Queensland.

Based on the EIS assessment that RE11.10.1 is the only vegetation with potentially suitable habitat characteristics, the project would result in the loss of 8.7ha of potential collared delma habitat. This area of collared delma habitat overlaps with habitat for other listed species covered by this report. However, the EIS concluded that the project site contains no areas that are necessary for the foraging, breeding or dispersal of the collared delma.

### **Impact of the proposed action**

The main impact of the proposed action on the collared delma is the clearing of potential habitat.

### **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

#### *Minimise vegetation and habitat loss:*

- limit vegetation clearing to the extent necessary for the project
- native vegetation outside identified clearing areas to remain undisturbed
- staff would be briefed on the care and conservation of project site native vegetation.

#### *Pre-clearing surveys:*

- prepare an inventory of trees and hollows to be removed
- prior to clearing check trees with hollows for the presence of birds and arboreal mammals
- safely remove fauna, and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat.

#### *Management and monitoring plans:*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with prescriptions for pre-clearing surveys and use of a spotter catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

### *Indirect impacts*

- manage project noise and light impacts on adjacent areas of native vegetation.

### **Residual impact**

The EIS stated that the project site contained only low quality habitat for the collared delma, and that the area was isolated from adjacent better quality habitat. The area of potential habitat identified in the disturbance area was 9ha. The EIS concluded that the project would not have a residual impact on the species.

After considering a similar opinion from DOTE, EHP is satisfied with the assessment provided in the EIS, and agrees that the project is not likely to have a significant residual impact on the species.

### **Cumulative impacts**

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS states that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the *Vegetation Management Act 1999*. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets for other species, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat and further reduce potential cumulative impacts of the project.

### **Offsets**

The EIS concluded that the project would not cause a significant impact on the collared delma so no offset was proposed.

### **Consideration of plans, agreements, and conservation advice**

#### *Listing and conservation advice:*

Threatened Species Scientific Committee (2008). *Commonwealth Conservation Advice for Delma torquate (Collared Delma)*. Commonwealth of Australia, Canberra.

<http://www.environment.gov.au/biodiversity/threatened/species/pubs/1656-conservation-advice.pdf>

*Recovery plan:* No recovery plan has been prepared for the collared delma.

*Threat abatement plans:* There are no threat abatement plans relevant for main threats to the collared delma.

The principal threats to the collared delma are habitat modification that results in removal of surface rocks, such as by urban and agricultural development. Other threats include fire and invasive weeds.

The following recovery and threat abatement actions are identified in the conservation advice are relevant to the project:

#### *Habitat loss, disturbance and modification:*

- protect areas of habitat that contain populations/occurrences of the species
- ensure road widening and maintenance activities in areas where the species occurs do not adversely impact on known populations.
- fire
- develop and implement a suitable fire management strategy for the species
- provide for a 50m buffer during prescribed burns in known species habitat
- include mitigation measures in bush fire risk management plans, risk register and/or operation maps.



The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment and in making the recommendation that the proposed action be approved.

## **Conclusion**

EHP is satisfied with the information provided in the EIS and the significant impact assessment and accepts the conclusion that the project is unlikely to have a significant residual impact on the collared delma.

## **South-eastern long-eared bat (*Nyctophilus corbeni*)**

**EPBC Act Status:** vulnerable

The south-eastern long-eared bat (*Nyctophilus corbeni*) is a member of the Vespertilionidae family (vesper bats), and is distinguished from other long-eared bats by its larger size and broader skull and jaw. Females are larger than males; body and tail lengths range from 50–75mm and 35–50mm respectively.

*Nyctophilus corbeni* is most common in box/ironbark/cypress pine woodland on sandy soils, although it also occurs in bull oak (*Allocasuarina luehmannii*), brigalow (*Acacia harpophylla*) and belah (*Casuarina cristata*) communities, dry sclerophyll forests with *Corymbia citriodora*, and semi-evergreen vine thickets. The species prefers areas with a distinct canopy and a dense understorey. Most records are from large tracts of vegetation (>5000ha), although the species has been recorded from smaller tracts of 600ha. Roosting has been recorded in hollows of live trees, cracks in tree limbs, occasionally under exfoliating bark, and even within foliage. Bats usually roost alone, but females may form roosting colonies.

In Queensland, the distributional limits are uncertain. The species is mainly recorded in the Brigalow Belt South, with records from less than 30 locations, extending eastwards to the Bunya Mountains National Park and north to near Duaringa. The Dawson River area may be the limit of its northern range. However, the most northerly record of the species is from 80km west of Taroom.

### **Survey requirements and survey effort**

The recommended survey technique (Survey Guidelines for Australia's Threatened Bats, Commonwealth of Australia, 2010) is harp trapping or mist netting on warmer nights from October to April. Passive acoustic detection can be used to determine if bats in the *Nyctophilus* genus are present in an area, but trapping is required to confirm the species's presence.

The species forages below the tree canopy, often to ground level, so mist nets and harp traps should be placed in wooded areas both in open fly-ways and within cluttered vegetation. Effort should be focussed on trapping over any open water bodies (earth dams, fire dams, open top tanks and watercourses) in a project area. For project sites where there is no surface water, mist nets can be set over temporary water pools specifically constructed for the purpose of the survey.

#### *Survey effort guide*

Both harp traps and mist nets are effective for this species. For large project areas with landscape complexity, major habitat types should be adequately represented in a sampling design.

Trapping should be conducted for a minimum of five nights and a total effort of 20 trap-nights (either mist net or harp trap). However, for this species, it is important to consider that failure to capture would not necessarily mean that a significant population of this species does not occur in the area.

#### *Project survey effort*

The only survey method used was passive acoustic detection. Bats in the genus *Nyctophilus* were recorded, but no follow up trapping was carried out to determine which species were present.

### **Occurrence within the project area**

The species was not recorded as present in the EIS because no trapping was conducted to confirm its presence. The genus was recorded using call detection, but no follow up trapping was conducted to determine which species occur on site. The EIS gives the species a moderate likelihood of occurrence.

The project site has suitable foraging habitat in the form of open woodlands in the northern part of the mining lease and the western part of the project impact area.

### **Impact of the proposed action**

The main impact of the proposed action on the south-eastern long-eared bat is the clearing of foraging and potential roosting habitat and death or injury of bats potentially roosting in the area during clearing.

### **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

#### *Minimise vegetation and habitat loss:*

- limit vegetation clearing to the extent necessary for the project
- native vegetation outside identified clearing areas to remain undisturbed
- staff would be briefed on the care and conservation of project site native vegetation.

#### *Pre-clearing surveys and actions:*

- prepare an inventory of trees and hollows to be removed
- prior to clearing check trees with hollows for the presence of birds and arboreal mammals
- safely remove fauna, and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat.

#### *Management and monitoring plans:*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

#### *Indirect impacts*

- manage project noise and light impacts on adjacent areas of native vegetation

### **Residual impacts**

The EIS cannot rule out the presence of the species in the area because vesper bats were recorded during surveys, but species were not identified by trapping. However, the EIS conservatively assessed the species as having a moderate likelihood of occurrence.

The EIS concluded that the project would not have a significant residual impact on this species. The rationale for this decision is that habitat for the species in the project area was assessed as low quality and there is a lack of records in the surrounding area.

EHP concluded that the EIS has not provided sufficient evidence to rule out the presence of the species and that the project contains suitable habitat. The clearing of 224ha of suitable habitat is considered to be a significant residual impact on this species.

### **Cumulative impacts**

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS states that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the *Vegetation Management Act 1999*. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets for other species, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat and further reduce potential cumulative impacts of the project.

### Offsets

The EIS concluded that the project would not have a significant residual impact on the species and therefore no offsets were proposed.

### Consideration of plans/agreements/conservation advice

#### *Listing and conservation advice:*

Threatened Species Scientific Committee (2015). *Approved Conservation Advice for Nyctophilus corbeni (south-eastern long-eared bat)*. Commonwealth of Australia, Canberra.

<[http://www.environment.gov.au/biodiversity/threatened/species/pubs/83395-conservation\\_advice-01102015.pdf](http://www.environment.gov.au/biodiversity/threatened/species/pubs/83395-conservation_advice-01102015.pdf)>

*Recovery plan:* No recovery plan has been prepared for the south-eastern long-eared bat.

#### *Threat abatement plans:*

Department of Environment, Water, Heritage and the Arts (2008). *Threat Abatement Plan for Predation by the European Red Fox*. Commonwealth of Australia, Canberra.

Department of the Environment (2015). *Threat Abatement Plan for Predation by Feral Cats*, Commonwealth of Australia, Canberra.

Little is known of the ecology of this species but clearing is likely the major threat leading to habitat loss and fragmentation, in addition to fire, grazing and competition for roosting sites such as tree hollows.

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment and in making the recommendation that the proposed action be approved.

### Conclusion

EHP concluded that the project is likely to have a significant residual impact on the south-eastern long-eared bat because it will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline. Project impacts on south-eastern long-eared bat habitat should be offset in accordance with the EPBC Act environmental offsets policy.

### Large-eared pied bat (*Chalinolobus dwyeri*)

**EPBC Act Status:** vulnerable

The large-eared pied bat is a medium-sized insectivorous bat with large ears, glossy black dorsal fur and a white band of fur along the sides of the belly adjacent to the wing membrane. As with other *Chalinolobus* species, it has a lobes extending from the corners of the mouth to the bottom of the ears.

Habitat requirements are poorly understood. The species is known to roost in mines, caves, and rock overhangs, especially in sandstone outcrops and gorges, and also uses fairy martin nests and possibly tree hollows. The species occurs in a range of habitats, including wet and dry sclerophyll forest, Cyprus pine dominated forest, tall open eucalypt forest with a rainforest sub-canopy, sub-alpine woodland, but typically in association with sandstone relief. In south-east Queensland, it has been recorded primarily at higher altitude, moist, tall open forest adjacent to rainforest.

The species is known from scattered localities in south-east Queensland and central western New South Wales (NSW), mid to north-east NSW, and as far south as Nowra. In Queensland, records exist from sandstone escarpments in the Carnarvon and Expedition Ranges and Blackdown Tablelands, and from volcanic rock types in the Scenic Rim area near the NSW/Queensland border. Populations in north-east NSW, south-east Queensland, Shoalwater Bay and Blackdown Tablelands are likely to be isolated from each other.

## **Survey requirement and survey effort**

### *EPBC Act survey requirements/techniques*

The use of electronic bat detectors is the best means of non-invasive survey, and the most efficient in terms of data collection and area coverage (*Survey Guidelines for Australia's Threatened Bats*, Commonwealth of Australia, 2010). Trapping with harp traps and mist nets, and roost searches in caves, mines, rock overhangs, culverts and crevices could be undertaken to confirm presence or roosting.

### *Survey effort guide*

The following methods are recommended for a project area of less than 50ha:

- unattended bat detectors – 16 detector-nights over a minimum of 4 nights
- attended bat detectors – 6 detector-hours over a minimum of 3 nights
- harp traps and/or mist nets – 16 trap-nights over a minimum of 4 nights

### *Project survey effort*

Microbats were surveyed using acoustic bat detectors. One bat detector was deployed at each detailed survey site and placed in a likely flyway or close to water features, such as ephemeral drainage lines, farm dams or remnant pools. No trapping was undertaken.

## **Occurrence within the project area**

This species is known to occur in the wider area. Potential roosting sites are limited, but potential foraging habitat is present in the project site in the form of intact woodland and riparian areas associated with the creek lines.

The EIS's Threatened Species Profile Report concluded that none of the project site meets the Commonwealth's definition of habitat for this species. However, it also states that: there is suitable woodland vegetation that is foraging habitat; there are overhangs and crevices present in the north of the project site, (but no caves, cliffs or disused mines shafts); there are two permanent farm dams and creeks in the north of the project site; and there are tree hollows in the woodland north of the project site.

The large-eared pied bat was not recorded from the project site during any of the field surveys undertaken and was not recorded within 25km of the project site in any of the desktop searches or within 100km of the site in the Australian Museum database. However, they are difficult to detect. Given that the north of the project site contains suitable habitat, the species has the potential to be present and the EIS conservatively gave the species a moderate likelihood of occurrence.

## **Impacts of the proposed action**

Evidence suggests that this species is absent from small patches of vegetation, occurring most often in patches approximating 5,000ha. However, the effect of fragmentation and disturbance associated with the construction of tracks and linear clearing is uncertain. Possible project-related impacts include:

- the loss of foraging habitat due to the mine and construction of infrastructure
- fragmentation of existing large, intact and contiguous habitats, but the species does occur in large forests that are traversed by management tracks, suggesting that they could be tolerant of some disturbance
- increased fire frequency associated with increased human activity and machinery.

## **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

### *Minimise vegetation and habitat loss:*

- limit vegetation clearing to the extent necessary for the project
- native vegetation outside identified clearing areas to remain undisturbed
- staff would be briefed on the care and conservation of project site native vegetation.

### *Pre-clearing surveys:*

- prepare an inventory of trees and hollows to be removed
- prior to clearing check trees with hollows for the presence of birds and arboreal mammals

- safely remove fauna, and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat.

*Management and monitoring plans:*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

*Indirect impacts:*

- manage project noise and light impacts on adjacent areas of native vegetation.

**Residual impact**

The EIS habitat assessment concluded that potential habitat for the large-eared pied bat in the project site (224ha) is low quality because there is limited roosting habitat and a large part of the site has been modified by agricultural development. The EIS assessment indicated that none of the project site meets the Commonwealth's definition of large-eared pied bat habitat.

After considering a similar opinion from DOTE, EHP is satisfied with the assessment provided in the EIS, and agrees that the project is not likely to have a significant residual impact on the species.

**Cumulative impacts**

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS states that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the *Vegetation Management Act 1999*. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets for other species, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat and further reduce potential cumulative impacts of the project.

**Offsets**

The EIS concluded that the project would not have a significant residual impact on the large-eared pied bat and no offsets were proposed for the removal of potential habitat identified in the EIS. EHP is satisfied with that assessment.

**Consideration of plans, agreements, and conservation advice**

*Listing and conservation advice:*

Threatened Species Scientific Committee (2012). *Commonwealth Listing Advice on Chalinolobus dwyeri (Large-eared Pied Bat)*. Commonwealth of Australia, Canberra.

*Recovery plan:*

National recovery plan for the large-eared pied bat (*Chalinolobus dwyeri*), <<http://www.environment.gov.au/resource/national-recovery-plan-large-eared-pied-bat-chalinolobus-dwyeri>>

*Threat abatement plans:*

Department of Environment, Water, Heritage and the Arts (2008). *Threat Abatement Plan for Predation by the European Red Fox*. Commonwealth of Australia, Canberra.

Department of the Environment, Water, Heritage and the Arts (2008). *Threat Abatement Plan for competition and land degradation by unmanaged goats*. Commonwealth of Australia, Canberra.

Key threats identified by the national recovery plan include: destruction of and interference with maternity and other roosts; mining of roosts; mine induced subsidence of cliff lines; disturbance from human recreational activities; habitat disturbance by livestock and feral animals; introduced predators; vegetation clearing and fire near roosts; and loss of genetic diversity.

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment, and in making the recommendation that the proposed action be approved.

### **Conclusion**

EHP is satisfied with the assessment of project impacts provided in the EIS, and accepts the conclusion that the project is unlikely to have a significant residual impact on the large-eared pied bat.

## **Red goshawk (*Erythrothorichis radiatus*)**

**EPBC Act Status:** vulnerable

### **Description**

The red goshawk is a large, swift and powerful rufous-brown hawk, growing to a length of 45cm to 60cm, with a wingspan of 100cm to 135cm. The red goshawk is boldly mottled and streaked, with rufous scalloping on the back and upper wings, rufous underparts, boldly barred underwings, and with massive yellowish legs and feet. Females are larger, more powerfully built, paler and more heavily streaked below, showing some white on the under body.

Habitat of the red goshawk is coastal and sub-coastal tall open forest and woodlands, tropical savannas with rivers lined with timber, and along rainforest edges. Nests are located in tall trees (>30m) that are usually within groups of the tallest trees in an area. Further inland, the tallest trees available for nesting are along major rivers.

The red goshawk is solitary and very thinly dispersed. It is usually observed singly, or occasionally in pairs. Red goshawk pairs are believed to remain within the nesting territory all year, but some may expand their home range when not breeding. The red goshawk is endemic to Australia. It is very sparsely dispersed across coastal and sub-coastal Australia, from the western Kimberley to north-east NSW, and occasionally on continental islands. It has probably always occurred in central Australia, where three widely-spaced, recent confirmed sightings corroborate earlier, previously doubted records. The distribution of the red goshawk is not severely fragmented.

### **Survey requirements and survey effort**

The recommended method of finding the red goshawk is to search for characteristic nests within patches of the tallest forest (*Survey Guidelines for Australia's Threatened Birds*, Commonwealth of Australia, 2010). In sub-coastal woodland, these areas can initially be identified from aerial photos, and then searched during follow-up ground surveys. Further inland ground searches along river banks for nests in the tallest trees are recommended. Driving slowly through tropical woodland tracks and scanning groups of tall trees for nests can also be effective. In eastern Australia's ranges, searching for nests is more difficult, but soaring birds can sometimes be located from vantage points such as mountain tops. Some success has been had surveying this species using call playbacks during the breeding season.

#### *Survey effort guide*

The use of vehicles may be warranted in some instances to cover large areas. The effort required is 50 hours over eight days.

#### *Project survey effort*

Field surveys for the red goshawk undertaken during the EIS studies included general bird surveys (2ha searched over 20min at five survey sites over four days).

The EIS stated that bird surveys were undertaken during April and September as part of the general EIS detailed fauna assessments carried out at five detailed and two secondary fauna survey sites. Daytime bird surveys (observations and vocalisations) involved searching two hectares over 20 minutes at detailed fauna survey sites. Surveys were undertaken on four mornings and completed within four hours of dawn. This survey effort amounts to 1.3 hours searching at each site (section 12A.3.2.2 p.12A-7).

In addition to the detailed survey program, incidental observations of birds or nests were made while ecologists were on the site, particularly driving along roads and tracks.

## **Occurrence within the project area**

The red goshawk was not recorded during EIS surveys. The EIS states that the absence of recent records and restricted amount of permanent water and extensive woodland habitat for nesting and foraging within the project area suggest this species is unlikely to be resident. Potential exists for dispersive individuals to move through the project area. The EIS concludes that habitat for this species within the project area is marginal. Suitable nesting and foraging habitat such as extensive woodlands within the range of permanent water are largely absent within the project area. Typically, watercourses within the project area do not support permanent water, and adjacent vegetation or riparian zones have been extensively disturbed during historical grazing practises.

DOTe and EHP note that the project area is situated close to large tracts of vegetation (Callide Timber Reserve) and the absence of species records is a function of survey effort, which for this project was not consistent with EPBC Act survey guidelines.

## **Impacts of the proposed action**

Within the project area, the loss of potentially suitable foraging and nesting habitat may impact on this species. Potential impact on the species may also occur where avifauna species richness is reduced because of habitat fragmentation.

## **Avoidance and mitigation measures**

The EIS proposed the following mitigation and management measures to minimise impacts on all fauna species.

### *Minimise vegetation and habitat loss*

- limit vegetation clearing to the extent necessary for the project
- native vegetation outside identified clearing areas to remain undisturbed
- staff would be briefed on the care and conservation of project site native vegetation.

### *Pre-clearing surveys*

- prepare an inventory of trees and hollows to be removed
- prior to clearing check trees with hollows for the presence of birds and arboreal mammals
- safely remove fauna, and relocate them to adjacent woodland
- boulders and large logs would be placed in nearby areas of retained vegetation to maintain fauna habitat.

### *Management and monitoring plans*

- update existing Callide Mine management and monitoring plans to cover the project site, including an erosion and sediment control plan, biodiversity action plan, and weed management plan
- implement a species management plan with requirements for pre-clearing surveys and the use of a spotter-catcher
- implement a rehabilitation management plan
- manage fire and grazing on the project site to avoid impacts on habitat.

### *Indirect impacts*

- manage project noise and light impacts on adjacent areas of native vegetation

## **Residual impacts**

The EIS identified 266ha of vegetation in the disturbance area as potential goshawk habitat. However, the habitat assessment identified this as low quality because the site has been modified by agricultural development. In addition, areas of potential nesting habitat near water were surveyed during the breeding season. No nests or individuals were found, and it was considered unlikely that the project site contains suitable nesting habitat for the species.

After considering a similar opinion from DOTe, EHP is satisfied with assessment of project impacts on the red goshawk, and accepts the conclusion that the project is unlikely to have a significant residual impact on the species.

## Cumulative impacts

The EIS discussed cumulative impacts of the project on biodiversity (EIS addendum, Part B, Appendix P, Terrestrial Ecology Report, section 5.4). The main impact of the project on biodiversity will be loss and fragmentation of fauna habitat from clearing native vegetation. The EIS stated that the area is already extensively cleared for agriculture and other mining projects. Most remnant vegetation within 20km of the project site is in the Callide Timber Reserve that extends south to Kroombit Tops National Park.

The EIS states that the study area does not contain any REs that have already been extensively cleared across the bioregion, and all REs in the study area are 'least concern' under the Vegetation Management Act 1999. The EIS stated that the clearing for the project will result in the loss of less than 1% of each 'least concern' RE. Based on this analysis the EIS concluded that clearing for the project would not contribute significantly to cumulative impacts.

The provision of offsets for other species, mitigation measures and progressive rehabilitation of the mine site will help to compensate for the loss of wildlife habitat and further reduce potential cumulative impacts of the project.

## Offsets

The EIS concluded that the project would not have a significant residual impact on this species, and no offsets were proposed for the removal of potential red goshawk habitat identified in the EIS. EHP is satisfied with that assessment.

## Consideration of plans, agreements, and conservation advice

### *Listing and conservation advice:*

Threatened Species Scientific Committee (2015). *Approved Conversation Advice for Erythroriorchis radiatus (red goshawk)*. Commonwealth of Australia, Canberra.  
<<http://www.environment.gov.au/biodiversity/threatened/species/pubs/942-conservation-advice-31102015.pdf>>

### *Recovery plan:*

Department of Environment and Resource Management (2012) *National recovery plan for the red goshawk (Erythroriorchis radiatus)*, Report to the Department of Sustainability, Environment, Water, Population and Communities, Canberra. Queensland Department of Environment and Resource Management, Brisbane.  
<<http://www.environment.gov.au/resource/national-recovery-plan-red-goshawk-erythroriorchis-radiatus>>

*Threat abatement plans:* There are no threat abatement plans relevant to the red goshawk.

The national recovery plan for the red goshawk states that the main cause of the decline of the red goshawk in north-east New South Wales and eastern Queensland is widespread clearing of native forests and woodlands for agriculture. Other threats to the species include fragmentation and degradation of habitat, direct disturbance and/or loss of nesting sites and changes in prey availability.

Recovery plan objectives for the maintenance of red goshawk populations across their range that are relevant to the project site include:

- monitoring of red goshawk habitat and determining territory occupancy and productivity
- conducting searches to identify previously unknown pairs of red goshawks, nest sites, and habitats critical for red goshawk survival
- identifying important populations and nest sites, and using this information to inform monitoring programs and state and Australian government planning frameworks
- providing specific information and advice to assist with the identification, acquisition and management of important habitat for the red goshawk.

The priority threat abatement and recovery actions identified in the approved conservation advice have been considered in undertaking this assessment, and in making the recommendation that the proposed action be approved.

## Conclusions

EHP is satisfied with the EIS assessment of project impacts on the red goshawk, and accepts the conclusion that the project is unlikely to have a significant residual impact on the species.