ENVIRONMENTAL IMPACT STATEMENT

RED HILL
MINING LEASE

Executive Summary

Executive Summary

1 Introduction

The Red Hill Mining Lease project is located adjacent to the existing Goonyella Riverside and Broadmeadow (GRB) mine complex in the Bowen Basin, approximately 20 kilometres north of Moranbah and 135 kilometres south-west of Mackay, Queensland.

BHP Billiton Mitsubishi Alliance (BMA), through its joint venture manager, BM Alliance Coal Operations Pty Ltd, proposes to convert the existing Red Hill Mining Lease Application (MLA) 70421 to a mining lease to enable the continuation of existing mining operations associated with the GRB mine complex. Specifically, the mining lease conversion will allow for:

- An extension of three longwall panels (14, 15 and 16) of the existing Broadmeadow underground mine (BRM). Key aspects include:
  - No new mining infrastructure is proposed other than infrastructure required for drainage of incidental mine gas (IMG) to enable safe and efficient mining.
  - Management of waste and water produced from drainage of IMG will be integrated with the existing BRM waste and water management systems.
  - The mining of the Broadmeadow extension is to sustain existing production rates of the BRM and will extend the life of mine by approximately one year.
  - The existing BRM workforce will complete all work associated with the extension.
- A future incremental expansion option of the existing Goonyella Riverside Mine (GRM). Key aspects include:
  - underground mining associated with the Red Hill Mine (RHM) underground expansion option to target the Goonyella Middle Seam (GMS) on mining lease (ML) 1763;
  - a new mine industrial area (MIA);
  - a coal handling and preparation plant (CHPP) adjacent to the Riverside MIA on MLA1764 and ML1900 − the Red Hill CHPP will consist of up to three 1,200 tonne per hour modules;
  - construction of a drift for mine access;
  - a conveyor system linking RHM to the Red Hill CHPP;
  - associated coal handling infrastructure and stockpiles;
  - a new conveyor linking product coal stockpiles to a new rail load-out facility located on ML1900; and
  - means for providing flood protection to the mine access and MIA, potentially requiring a levee along the west bank of the Isaac River.

- A future Red Hill Mine (RHM) underground expansion option located to the east of the GRB mine complex to target the GMS on MLA70421, as well as development of key infrastructure including:
  - a network of bores and associated surface infrastructure over the underground mine footprint for mine gas pre-drainage (IMG) and management of goaf methane drainage to enable the safe extraction of coal;
  - the proposed mine layout consists of a main drive extending approximately west to east with longwall panels ranging to the north and south;
  - a ventilation system for the underground workings;
  - a bridge across the Isaac River for all-weather access. This will be located above the main headings, and will also provide a crossing point for other mine related infrastructure including water pipelines and power supply;
  - a new accommodation village (Red Hill accommodation village) for the up to 100 per cent remote construction and operational workforces with capacity for up to 3,000 workers; and
  - potential production capacity of 14 million tonnes per annum (mtpa) of high quality hard coking coal over a life of 20 to 25 years.

The three key project elements described above are collectively referred to as 'the project'.

The key objectives of the project are to:

- utilise BMA owned land on the GRB mine complex mining leases to minimise the environmental impacts from additional infrastructure and to provide project efficiencies;
- maximise resource recovery and sustain existing operations;
- operate a profitable project to provide high-quality hard coking coal to the export market; and
- design, construct and operate a project that minimises adverse impacts on the social environment; complies with all relevant statutory obligations; and continues to improve processes which enhance sound environmental management, including the social environment.

The conversion of the Red Hill MLA70421 is of strategic importance to the planning and development of existing operations within and around the existing GRB mine complex. It is anticipated that development work for mining associated with the Broadmeadow extension will commence in Financial Year 2016.

The Goonyella incremental expansion option refers to those project activities which are located within the existing GRB mine complex and associated with the proposed RHM underground expansion option. Timeframes for delivery of the GRM project components will be subject to the ultimate timing for commencement, the rate of development and scale of future production for the RHM underground expansion option once determined by the project owners.

The timing for commencement, the rate of development and scale of future production for the RHM underground expansion option has not been determined and is subject to the owner's approvals. The proposed mine will employ conventional thick seam longwall mining techniques and increase the potential capacity of the extended complex (GRB mine complex and RHM) up to approximately 32.5 mtpa.

The GRM incremental expansion and the RHM underground expansion option have the potential to employ approximately 2,000 workers during peak construction and up to approximately 1,500 workers during peak operations. With timing yet to be determined, these options are subject to further assessment as part of ongoing project planning.

The GRM incremental expansion and RHM underground expansion option intends to utilise an up to 100 per cent remote workforce. It will also enable the distribution of benefits to other regions across Queensland. Remote workers will travel from their point of origin to a BMA airport asset in or around Moranbah, and be transported by bus to the proposed Red Hill accommodation village. The final workforce arrangements for the GRM incremental expansion and the RHM underground expansion option will be finalised once the project scope and timing has been committed to by the owners.

On 17 June 2013, the Coordinator-General declared the project to be a 'co-ordinated project' under section 26 of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act). This declaration initiated the statutory environmental impact assessment procedure of Part 4 of the SDPWO Act, which requires the proponent to prepare an EIS for the project.

The project has been referred to the Commonwealth Minister (the Minister) for the Department of Environment (formerly the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC)). On 20 June 2013, the Minister determined that the project is a 'controlled action' under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Cwlth) due to the likely potential impacts on a matter of national environmental significance. The controlling provision under the EPBC Act is sections 18 and 18A (listed threatened species and communities).

On the 21 June 2013, the EPBC Act was amended to include an additional controlling provision relating to 'protection of water resources'. On the 17 October 2013, the Minister determined that the project has also triggered controlling provisions 24D and 24E of the EPBC Act as the proposed action is likely to have a significant impact on a water resource.

As a consequence, the project requires assessment and approval under the EPBC Act. The Commonwealth Government has accredited the EIS process, to be conducted under the SDPWO Act, under a bilateral agreement between the Commonwealth and Queensland Governments. This will enable the one EIS to meet the impact assessment requirements under both Commonwealth and Queensland legislation.

The project will require approval from the Commonwealth Government Minister for the Environment under Part 9 of the EPBC Act, before it can proceed. The Department of State Development Infrastructure and Planning (DSDIP) has invited relevant Commonwealth, state and local government representatives, and other relevant authorities, to participate in the impact assessment process as advisory agencies.

The regional location of the project is shown in **Figure 1**. The EIS study area, including the existing GRB mine complex, is shown in **Figure 2**.

2 Project Overview

The mining of the Broadmeadow extension (panels 14, 15 and 16) will utilise existing mine infrastructure and extend the life of mine by approximately one year. Installation of infrastructure associated with drainage of IMG prior to mining may be required. The existing BRM workforce will complete all work associated with the extensions. The potential environmental impacts associated with the Broadmeadow extension are presented in the EIS. A new environmental authority (EA) will be sought for MLA70421, which will describe the activities associated with the panel extensions.

2.1 Integration with Existing Operations

The GRM incremental expansion and the RHM underground expansion option have the potential to produce up to 14 mtpa of high quality hard coking coal over a life of 20 to 25 years increasing production capacity of the overall GRB mine complex to approximately 32.5 mtpa.

While the proposed future RHM underground expansion option will be operated as an independent mine in terms of workforce, the proposed mine will interface with the existing GRB mine complex in the following areas:

- Water for processing coal will be sourced from the GRB mine complex and mine water generated from the mine will be transferred to the GRB mine water management network. This interface will provide greater efficiency, maximise reuse, ensure mine water releases are managed holistically and reduce water-related risks.
- CHPP, conveyors and stockpiles will be co-located with the existing Riverside Mine coal handling facilities.
- Solid wastes from coal processing will be dewatered and disposed of in in-pit spoil.

Coal extraction will cause subsidence of the land surface. Subsidence will occur along each longwall panel. The project has modelled a worst case scenario in relation to subsidence that indicates that the land above the longwall panels is likely to subside an average three to five metres up to a maximum of six metres. The degree of subsidence is largely affected by the geology of the mined strata. As the mine footprint moves from west to east, the coal seam becomes deeper. This means that subsidence at the surface is likely to be less in the eastern part of the footprint than the west.

Subsidence related impacts will be managed through a variety of mitigation measures. The extent of subsidence will be regularly monitored and the utilisation of an adaptive management approach will allow changes to be made to proposed rehabilitation methods if monitoring indicates that predicted behaviour does not occur. BMA is currently managing subsidence impacts of the BRM in this manner and will take an integrated approach to managing subsidence impacts on the Isaac River across the two mines.

Water from dewatering of the underground mine and from removal of IMG will be transferred to the GRB mine water management system. This will be used for reuse in coal handling and processing and dust suppression. Any discharges required will be undertaken in accordance with the existing GRB mine complex EA (EPML00853413). Waste from RHM in the form of rejects and dewatered tailings will also be disposed of in waste disposal areas established for the open-cut operations at the GRB mine complex.

Mining will permanently impact on the geological resources within the disturbed area. Coal, interburden, and overburden will be removed and rehabilitation (backfilling) will result in the alteration to the pre-mining geology.

The mine will develop a closure plan to minimise the impacts and rehabilitate the overburden and soils to allow for pre-mining land use where possible.

Planning for mine closure includes integrating the closure design for the entire EIS study area, identifying the timing of the planning process, considering issues that relate to specific rehabilitation methods and financial and community objectives, as well as making sure adequate financial provision has been made.

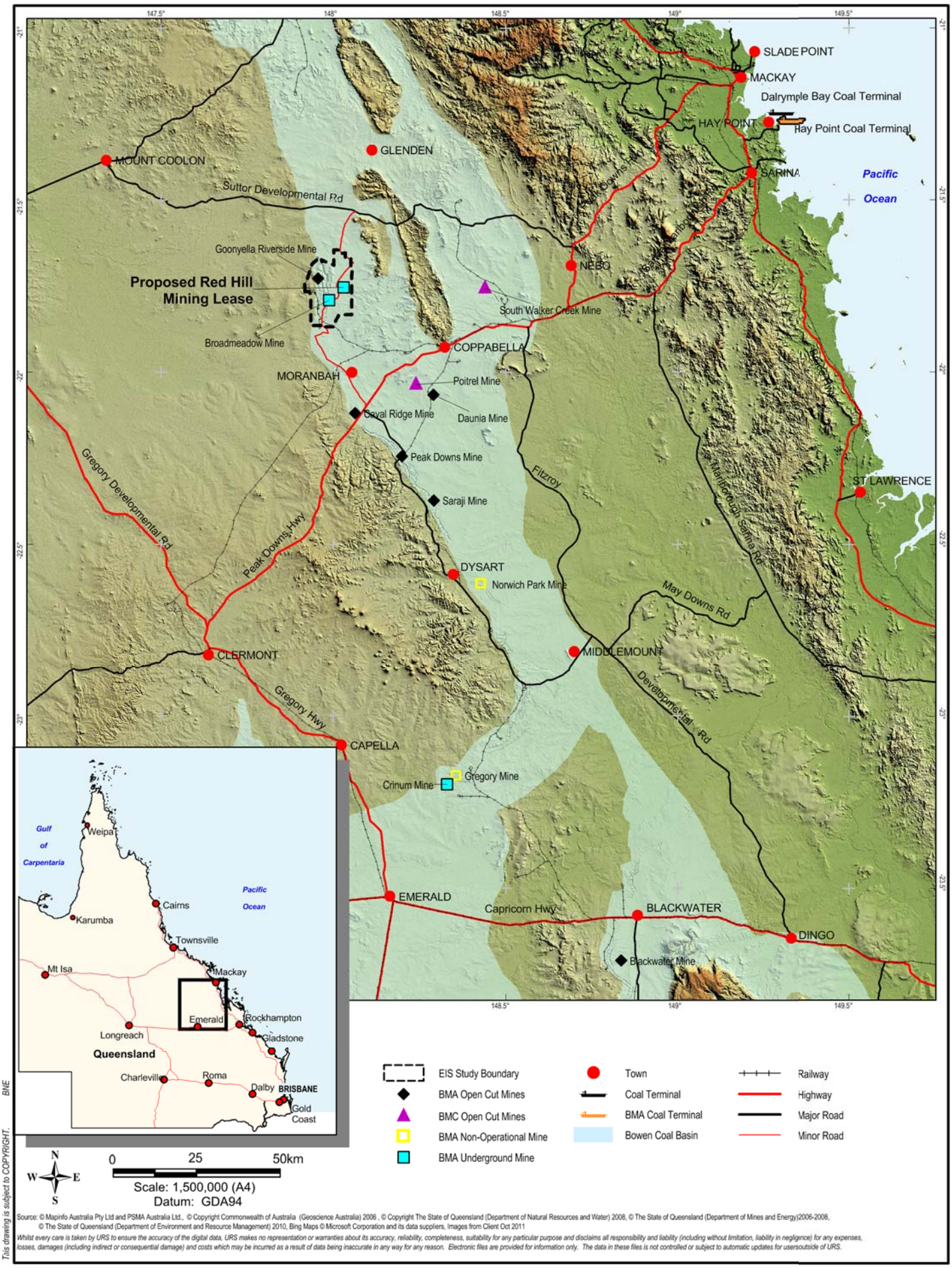
The principal rehabilitation and mine closure planning objectives incorporated into the project include:

- to provide an overall framework for mine closure, including rehabilitation and decommissioning strategies;
- to establish clear and agreed criteria with all relevant stakeholders that can be used as the standard for the final mine rehabilitation and post mining land use assessment;
- to reduce or eliminate adverse environmental effects once the mine ceases operation;
- to ensure closure is completed in accordance with good industry practice as well as meeting the statutory requirements that may be applicable; and
- to ensure the closed mine does not pose an unacceptable risk to public health and safety.

The rehabilitation objectives to be achieved for the project are as follows:

- Achievement of acceptable post-disturbance land use suitability – mining and rehabilitation should aim to create a landform with land use capability and/or suitability compatible with the land-use pre-mining, unless other beneficial land uses are pre-determined and agreed.
- Creation of stable post-disturbance landform – disturbed land and subsided areas will be rehabilitated to a condition that is self-sustaining or a condition where maintenance requirements are consistent with an agreed post-mining land use. Surface waters such as dams retained on the lease should be safe, self-sustaining and be acceptable for the post mining land uses.
- Preservation of downstream water quality – water quality of surface and ground waters that leave the mining leases should be adequate to maintain environmental values and beneficial uses downstream of the proposed EIS study area.

Following final rehabilitation, the project area will be safe, stable and sustainable.



BHP Billiton Mitsubishi Alliance

RED HILL MINING LEASE
ENVIRONMENTAL IMPACT STATEMENT

REGIONAL LOCATION

URS | **EXECUTIVE SUMMARY** | Figure: **1**

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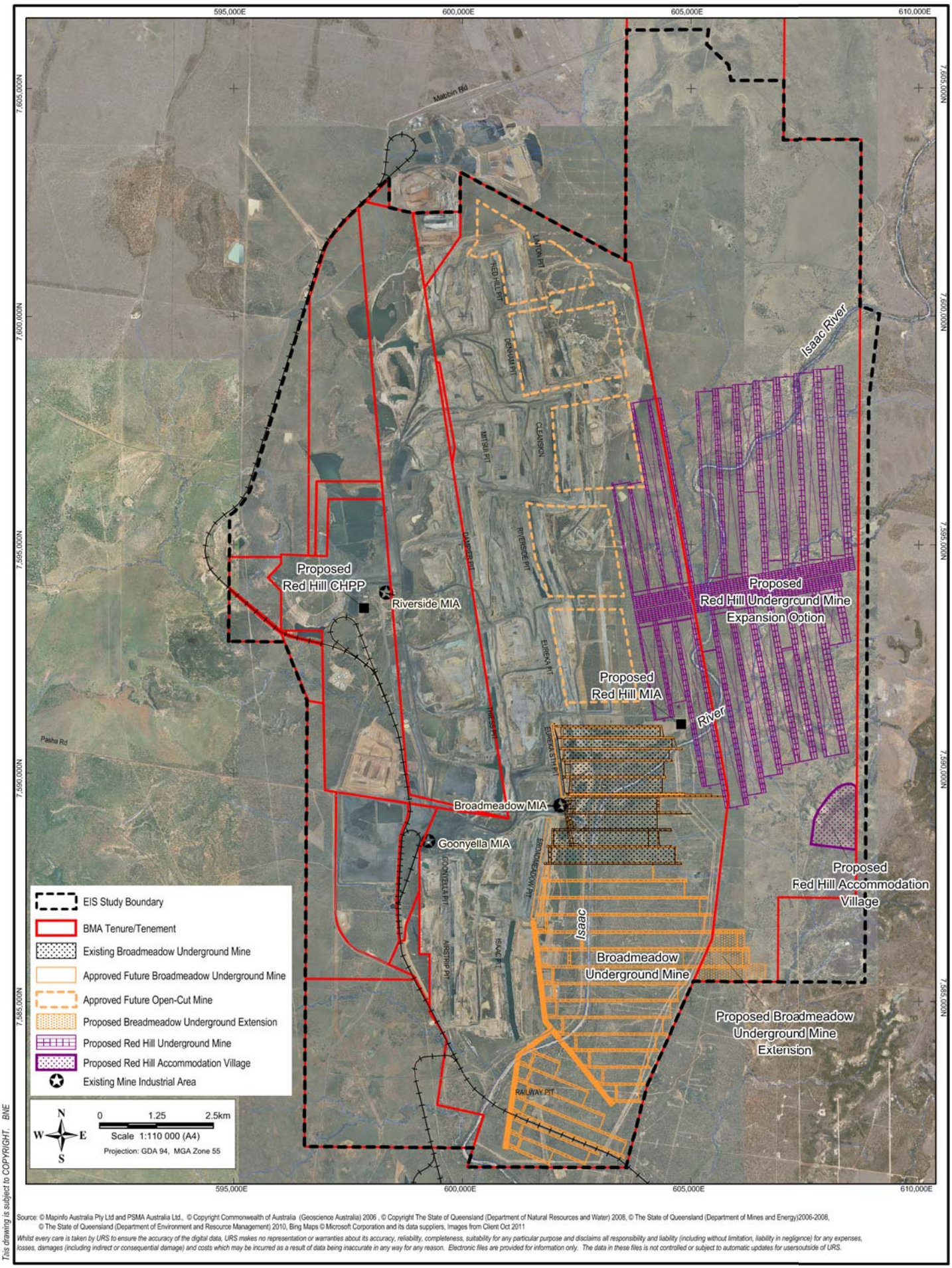

BMA
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RED HILL MINING LEASE
ENVIRONMENTAL IMPACT STATEMENT

EIS STUDY AREA

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3 The Proponent

BMA was formed in 2001 as a 50:50 unincorporated joint venture between BHP Billiton and Mitsubishi Corporation. The joint venture is known as the Central Queensland Coal Associates Joint Venture. BM Alliance Coal Operations Pty Ltd operates as the duly appointed constituted attorney for the Central Queensland Coal Associates Joint Venture Agreement and a Strategic Alliance Agreement dated 28 June 2001.

The operational mines are Blackwater, Broadmeadow, Goonyella Riverside, Peak Downs, Saraji, Crinum and Daunia. The Norwich Park and Gregory Open Cut Mines ceased production in May and October 2012 respectively, and remain in care and maintenance. BMA also owns and operates the Hay Point coal export terminal near Mackay.

BMA's seven operational mines have a combined approved production capacity of up to 68 mtpa. The Caval Ridge Mine (5.5 mtpa) will be operational in 2014.

BMA supplies high quality coking coals, pulverized coal injection coals and thermal coals to domestic and international customers.

BMA is committed to the communities in which it operates. In 2013, BMA invested around $27.5 million across the Bowen Basin townships to support local services and community development programs.

BMA is a significant contributor to the State and National economy, contributing an estimated $9.3 billion in direct spending during FY13. In addition, BMA contributed approximately $560 million in royalties, taxes and levies to the Government and invested over $100 million in the Bowen Basin over the last two years in regional infrastructure and community partnerships.

4 Project Need and Alternatives

4.1 Project Need

Based on information in the Queensland State Budget (2013/14), coal royalties make up the bulk of royalty and land rent revenue, accounting for more than 76 per cent in 2013-14. In 2011-12, the coal royalty estimate is around $2.1 billion. The industry is also a major customer of rail and port services in Queensland.

Statistics from the Commonwealth Department of Resources, Energy and Tourism (RET) (2012) show Australia produced 352 million tonnes of coal during 2010-11; of this, approximately 179 million tonnes were produced in Queensland (NRM 2012).

In 2005, the Queensland Government released the Coal Infrastructure Program of Actions detailing approximately $4.2 billion worth of coal-related infrastructure required to meet future global demand for coal transport (port and rail), water, energy, skills, and social infrastructure. With continued strong global demand, the prospects for continued growth in Queensland's coal export industry remain positive. Future development of the project elements will assist in meeting the increased global demand that may otherwise be met by competing overseas mines.

The GRM incremental expansion and the RHM underground expansion option have the potential to employ up to approximately 2,000 workers during peak construction and the potential to employ up to approximately 1,500 people during operations. However, timing has not been determined and is subject to further assessment as part of on-going project planning. There will also potentially be many more employed indirectly as a result of flow-on effects.

The EIS provides a scenario for construction and operation of the GRM incremental expansion and RHM underground expansion option. The modelling scenario assumes the commencement of construction in 2020 for a period of three years with operations commencing for Longwall 1 in 2022 and Longwall 2 in 2024. The modelling scenario is provided in order to fulfil the Terms of Reference (TOR) requirements and does not reflect a commitment by the project owners to proceed with the project. The project owners will undertake further assessment once the ML grant is finalised. The modelling scenario allows estimates to be provided of potential capital and operating expenditure, contributions to the state in rail freight and royalties and estimates and modelling of the direct and indirect employment opportunities associated with the potential project expenditure.

4.2 Project Alternatives

The location of the project is driven both by the location of a high quality hard coking coal resource and the proximity to an existing mining complex, which creates opportunities to interface in relation to a range of infrastructure items.

The Broadmeadow extension is a logical extension of an existing mining operation and will extend the life of mine by approximately one year. Undertaking the extension in line with existing mining operations will avoid potential sterilization of approximately 5 million run-of-mine (ROM) tonnes of a valuable resource. The mining of the panel extensions will be carried out by the existing BRM workforce and not require any additional mining infrastructure.

The GRM incremental expansion option refers to those project activities which are located within the existing GRB mine complex and associated with the proposed RHM underground expansion option. Timeframes for delivery of the GRM project components will be subject to the ultimate timing for commencement, the rate of development and scale of future production for the RHM underground expansion option once detremined by the project owners.

The RHM underground expansion option is directly adjacent to the existing GRB mine complex and provides potential efficiencies by capitalising on the proximity to existing infrastructure and the positioning of new infrastructure within the existing GRB mine complex.

Operating the RHM underground expansion as a separate standalone development was considered but would require duplication of existing infrastructure and equipment including rail, water and power infrastructure. It would preclude disposal of mine wastes from the RHM in waste storage areas already established for the GRB mine complex, requiring a new above ground waste dump, as well as the transfer of mine water from RHM to GRB mine complex for reuse in coal handling and preparation. The sharing of these facilities reduces the project footprint and reduces potential environmental impacts.

The underground mining method was selected based on the depth, thickness and dip angle of the coal seam. The target coal seam is too deep to mine using the open-cut methods in a cost effective manner.

Thick seam mining (TSM) methods are currently being utilised at the BRM and it is expected that the same process will be adopted at RHM. TSM increases the recovery of the coal resource and, thus, the efficiency of the mining operation.

Several coal clearance alternatives were considered based on layout and stockpile locations. Each option offered various benefits and carried different associated risks. The option chosen for the project was identified as having the lowest risk.

It was determined that the construction of a new CHPP was preferable to the expansion of the existing Goonyella and Riverside CHPPs. Advantages include:

- minimising the interruption to existing operations;
- selection and operation of optimum equipment, suitable to site conditions, based on lessons learned from GRB mine complex;
- improving yield and lowering operating costs through implementation of modern processing techniques; and
- the ability to introduce dewatering of tailings and water recirculation.

Various options for the management of tailings were considered. The chosen option was to further treat tailings produced from the Red Hill CHPP in order to remove water and produce a thickened paste. This option was selected in order to minimise the land requirement associated with disposal and also to minimise raw water consumption.

The re-use of water generated by the project presents significant project benefits and is the preferred option, when compared to a standalone approach.

Other project components, which were subject to alternative evaluation, included:

- two alternative on lease locations were investigated for the accommodation village; and
- alternatives for power supply were investigated.

5 Stakeholders and Consultation

BMA is committed to minimising impacts and maximising benefits to local communities and stakeholders, and is working with government agencies, landholders, Traditional Owners, key stakeholders and communities to achieve mutually beneficial outcomes and relationships.

An ongoing consultation program commenced at the project's inception to assist with the preparation of the EIS. The consultation program aims to:

- ensure relevant and timely information is available to all stakeholders;
- provide stakeholders with the opportunity to participate in the assessment and planning of the project;
- develop baseline assessments, impact assessments and proposed mitigation options; and
- build on established relationships with stakeholders in Bowen Basin communities.

Between November 2011 and March 2012, 560 people representing stakeholder groups potentially impacted by the project were consulted. This involved consulting with elected and agency

representatives of various levels of government, local and regional non-government organisations (including business and community groups), landholders adjacent to the project, Traditional Owners and interested parties. BMA maintains regular consultation with stakeholders and community groups in Moranbah and surrounding communities. In particular, the BCN provides a forum for regular planning, consultation and feedback from community groups on the effectiveness of existing BMA strategies being implemented in the Bowen Basin and the impact of existing and proposed project activities. Consultation activities have specifically included presentation and discussion of the proposed Red Hill Mining Lease project and enabled an ongoing forum for feedback on the project.

Details of the project's community consultation program and relevant stakeholders are provided in **Section 17** of the EIS.

BMA will continue to provide the community with opportunities to comment on and learn about the project, tailored to suit stakeholders and maximise participation in the consultation program. Stakeholder and community consultation will continue up to and including the draft EIS public comment period commencing in late 2013 and prior to execution of the RHM underground expansion option.

A Social Impact Assessment (SIA) has been undertaken for the project. It provides planned outcomes in relation to the implementation of social impact and benefit management strategies, as well as the ongoing consultation, communication and social impact monitoring prior to and during the construction, operation and de-commissioning phases of the GRM incremental expansion and the RHM underground expansion option. The social baseline monitoring, finalisation and implementation of strategies will occur alongside the owner's future decision relating to the RHM underground expansion option.

This EIS has been submitted to the DSDIP who in turn has distributed the EIS for public and advisory agency review and comment. The EIS has been placed on public display in Moranbah and at other locations. In addition, copies of the EIS have been made available to interested persons.

The DSDIP and advisory agencies will consider all public submissions when making decisions in relation to the project. The DSDIP will coordinate the consultation process between BMA, the advisory agencies, and the public, and will collate and review all comments received on the EIS. Following this process of consultation, BMA may then be required to prepare a supplementary EIS report addressing the comments submitted by the advisory agencies and the public.

6 Approval Process

At a state level, the project is undergoing assessment under Part 4 of the SDPWO Act against a TOR prepared by the Coordinator-General in September 2013. The DSDIP will be responsible for coordinating the EIS assessment process. At the end of the process the Queensland Coordinator-General will provide an assessment report on the project, conditions will be imposed by the Coordinator-General, as well as subsequent state approvals.

The project was referred to the Commonwealth Minister (the Minister) for the Department of Environment (formerly DSEWPaC). On 17 June 2013, the Minister determined that the project is a 'controlled action' under the EPBC Act (Cwlth) due to the likely potential impacts on a matter of national environmental significance. The controlling provision under the EPBC Act is sections 18 and 18A (listed threatened species and communities).

On 21 June 2013, the EPBC Act was amended to include an additional controlling provision relating to the 'protection of water resources'. On 17 October 2013, the Minister determined that the project has also triggered controlling provisions 24D and 24E of the EPBC Act as the proposed action is likely to have a significant impact on a water resource.

As a consequence, the project requires assessment and approval under the EPBC Act. The Commonwealth Government has accredited the EIS process, to be conducted under the SDPWO Act, under a bilateral agreement between the Commonwealth and Queensland Governments. This will enable the EIS to meet the impact assessment requirements under both Commonwealth and Queensland legislation.

The project will require approval from the Commonwealth Government Minister for the Environment under Part 9 of the EPBC Act, before it can proceed. The DSDIP has invited relevant Commonwealth, state and local government representatives, and other relevant authorities, to participate in the impact assessment process as advisory agencies.

Key legislation and approvals required for the project are summarised in **Table 1**. It should be noted that there are no off-lease components of the project and, hence, the only provisions of the *Sustainable Planning Act 2009* that apply are in relation to building works approvals.

Table 1 Key Approvals Required for the Project

Legislation	Relevant Authority	Action/ Approval
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999	Department of the Environment (formerly DSEWPaC)	Approval of the controlled actions
Native Title Act 1993	Commonwealth Attorney General	Native title agreements in relation to land where native title has not been extinguished
State		
State Development and Public Works Organisation Act 1971	DSDIP	Approval of the EIS and publication of Coordinator-General's report
Environment Protection Act 1994	EHP	Issue of an EA (s) to operate the project. Approval of amendments to the existing GRB mine complex EA
Mineral Resources Act 1989	Department of Natural Resources and Mines (NRM)	Grant of a mining lease over the area of MLA70421
Nature Conservation Act 1992	Department of Agriculture, Fisheries and Forestry	Interference with species listed under the Nature Conservation (Wildlife) Regulation 1994
Water Act 2000 *Chapter 3*	EHP	Licence to take water as part of mine dewatering
Water Act 2000 *(Excluding Chapters 2A, 3 and Chapter 4 to the extent it relates to category 1 Water Authorities)*	NRM	Licensing for bores constructed as part of the dewatering network Riverine protection permits
Aboriginal Cultural Heritage Act 2003	NRM	Approval of the cultural heritage management plan

7 Environmental Assessment and Management

7.1 Land Use

The EIS study area covers an estimated 26,000 hectares and interacts wholly or partially on 51 separate land parcels. Existing land uses within the EIS study area and surrounds include:

- biophysical elements, such as the Isaac River and tributaries;
- mining and coal exploration activities;
- agricultural activities, predominantly cattle grazing and associated infrastructure; and
- isolated residential development consisting of homesteads and cottages on grazing properties surrounding the proposed mine.

The nearest urban land use is Moranbah town, approximately 20 kilometres south of the project.

Baseline biophysical and social, environmental values associated with land use were established. The potential impacts of the proposed project on land use within and adjacent to the project area were assessed.

The project will alter current land uses and land use conditions within the project footprint, both during the mine operation and post-mining, as a result of:

- the establishment of an IMG management network across the mine footprints for the Broadmeadow extension and the proposed RHM;
- potential subsidence and associated changes to topography across the mine footprints for the Broadmeadow extension and the proposed RHM; and
- the establishment of the proposed Red Hill MIA and flood levee, CHPP, conveyor, Red Hill accommodation village and services associated with the GRM incremental expansion and the RHM underground expansion option.

The project will preclude use of active mining areas from grazing activities during the life of the mine. Land management and rehabilitation measures will be required to restore the site to a post mining land use of grazing. However, about 550 hectares of land across the RHM footprint is predicted to become unsuitable for grazing due to ponding of some of the subsidence troughs formed by coal extraction.

Impacts on adjacent land use are not expected due to the isolated location and because the project involves underground mining with minimal noise and dust emissions. Mitigation measures are therefore not required for sensitive receptors on adjacent land.

7.2 Soils

The soil and land suitability assessment involved soil and land suitability field surveys undertaken at a scale of 1:50,000 for the EIS study area and 1:25,000 for BRM and RHM footprints. This is in accordance with the *Guidelines for Surveying Soil and Land Resources* (NCST 2008).

Soil samples were analysed for various physical and chemical soil attributes. Results of the analysed field and laboratory data showed that eight major soil units occurred throughout the EIS study area (including the RHM underground expansion option footprint), which consist of 11 soil types, as listed below:

1.	Lithic Rudosol	4.	Brown Kurosol	8a.	Shallow Vertosol
2.	Tenosol	5.	Brown Chromosol	8b.	Deep Vertosol
3a.	Red Kandosol	6.	Brown Sodosol	8c.	Deep Salic Vertosol
3b.	Brown Kandosol	7.	Brown Dermosol		

The majority of these soils are relatively resilient to disturbance and can be stripped and reused in rehabilitation, with the exception of the vertosol soils where disturbance will be minimised.

Testing for erodibility parameters indicated that the soils are relatively susceptible to erosion when left unprotected by vegetation or subjected to concentrated flows. This could occur during construction of surface infrastructure and facilities and the IMG management network. Drainage, erosion and sediment controls will be required during these phases to minimise loss of topsoil and subsoil resources, and to prevent degradation of water quality if soils are mobilised to surface waters. Erosion and sediment control will be based on:

- diverting clean flows around disturbed areas wherever possible;
- minimising exposure of soils to erosive forces; and
- where erosion is unavoidable, devices will be installed to minimise release of sediment laden water from disturbed areas.

Subsidence may cause formation of cracks in some areas which may need to be infilled and repaired as part of subsidence management. The edges of subsidence troughs may also be more vulnerable to erosion and this will be monitored and managed through the life of the mine.

Land suitability classification across the EIS study area ranges from land suitable for rainfed broadacre cropping and beef cattle grazing. There is potential strategic cropping land (SCL) in areas in the north-eastern section of the EIS study area, outside planned disturbance. Consequently, no direct impact on any possible SCL resources is expected. The post mining land use is proposed to continue as beef cattle grazing and soil management and land rehabilitation management strategies have been developed to facilitate this.

It is expected that the majority of the mine area can be restored to a sustainable grazing land use with minimal impact on stocking rates, provided that ongoing management of soils and vegetation is carried out.

7.3 Land Contamination

A land contamination preliminary site investigation was undertaken for the project. This comprised of historical and current title searches, review of historical aerial photographs, searches of the Environmental Management Register (EMR) and Contaminated Land Register (CLR), and an inspection of the EIS study area. A review of available aerial photographs (to 1966) indicated that the EIS study area consisted of cattle grazing grasslands until the development of the Riverside (1971), Goonyella (1982) and Broadmeadow mines (2005).

Thirteen lots within the EIS study area are listed on the EMR as a consequence of notifiable activities including: chemical storage, mine wastes, landfill, oil or petroleum storage, abrasive blasting, or livestock dip/spray race being carried out on these lands.

Direct disturbance to some of these areas may arise from installation of IMG management infrastructure. These areas may also be disturbed as a result of subsidence. In both cases, depending on the nature and quantity of contaminants that may be present, there is potential that contaminants may be released to the wider environment. Management measures therefore focus on investigating any of these areas more closely should disturbance be required and, if contamination is identified, remediation of the area prior to disturbance. Draft guidelines published by Queensland Department of Environment (1998) provide guidance on acceptable contaminant levels and management approaches. If soil is removed, it will be managed in accordance with soil disposal procedures as specified in the *Environment Protection Act 1994* (EP Act).

Mining activities will also involve use of fuels and other potential contaminants which may cause soil contamination if accidentally released to land. The nature, quantity and proposed usage of potential contaminants to be stored and used on the site means that the likelihood of significant contamination occurring is low. A range of management measures are proposed including storage and handling procedures that align with Australian standards to minimise the likelihood of a spill occurring. These measures include procedures in relation to spill response and clean up, in the event that spills occur.

Land parcels affected by the proposed mining activity will be registered on the CLR/EMR.

7.4 Mineral Waste

The Broadmeadow extension will not generate additional quantities of overburden.

The underground mining activities at RHM will not generate any substantial quantities of overburden. Some overburden material will be removed during the construction of drifts and the main headings. If this cannot be reused during construction, it will be disposed of into the GRB mine complex overburden waste disposal areas. Coarse rejects and fine materials (tailings) will be produced from coal processing, with an estimated one million tonnes from the Broadmeadow extension and 43 million tonnes to be produced over the life of the RHM. Fine tailings will be dewatered and all mineral waste will be disposed of into the GRB mine waste management areas. This means that RHM does not need to create stand-alone waste storage facilities.

All overburden and almost all potential reject samples tested are non-acid forming, with very low sulfide-sulfur concentrations (<0.1 per cent) and high acid neutralising capacity. Run-off and seepage water quality associated with the project mineral waste is predicted to contain low dissolved metal and salt concentrations when compared to government water quality guidelines. As guidelines are met, no special management measures are likely to be required to manage potential acid generation within spoil rejects waste storage facilities. Ongoing, routine testing of mineral wastes will be carried out throughout operations.

Mineral wastes are considered to have limited suitability for use as a vegetation growth medium or final cover material. Root zone salinity is not expected to cause adverse effects on plant growth.

7.5 Surface Water

7.5.1 Introduction

The EIS study area is located within the headwaters of the Isaac-Connors sub-catchment, of the greater Fitzroy Basin. The project activities span across the Isaac River and tributary catchments of Goonyella Creek and 12 Mile Gully. Other tributaries in the area include Eureka Creek, Fisher Creek, and Platypus Creek, all of which flow into the Isaac River downstream of the proposed RHM underground footprint.

The Isaac River and tributaries in and around the project area are ephemeral. Base flow appears to be sustained by surface base flow stores rather than distinct groundwater contribution as levels recede rapidly after rainfall events. It is typically limited to a few days up to approximately one or two weeks after surface runoff (quick flow) has drained from contributing sub-catchments.

A range of interrelated studies were undertaken to assess potential impacts on surface water resources including:

- a geomorphological study focussing on the impacts of subsidence on surface water resources;
- flood studies, incorporating hydraulic and hydrological studies; and
- a surface water quality study.

7.5.2 Geomorphology and Subsidence Impacts on Watercourses

The Isaac River is an ephemeral sand bed stream that is largely alluvial downstream of the Burton Gorge. Geomorphologically, the Isaac River features a slightly-to-moderately winding channel which is largely sand and sediment based, with minimal bedrock present. Flooding has cut a confined alluvial terrace above the channel and then a broader floodplain exists beyond this terrace which is inundated in major events.

Goonyella Creek is an ephemeral, slightly-to-moderately winding channel located largely at the Isaac River terrace-valley margin. The channel is relatively narrow and deep and features some bedrock upstream of Red Hill Road. Downstream, the channel runs parallel to the Isaac River and in large flood events, overflows from the two streams may converge.

12 Mile Gully is also ephemeral and is more winding in nature than Goonyella Creek and Isaac River, with a smaller catchment.

A number of drainage lines contribute to these three major waterways. Drainage lines include confined channels and broader overland flow and chains of ponds form as flows recede.

Sediment is transported naturally in the Isaac River sub-catchment. Land disturbance has resulted in increased levels of sediment in this area. The Isaac River and tributaries have a smooth horizontal profile because natural ponds have filled in with sediment over time.

Subsidence will result in a range of geomorphic impacts in the Isaac River and tributaries as a result of the future RHM. Initially, the horizontal profile of the Isaac River and 12 Mile Gully will change, with subsidence troughs alternating with unsubsided areas. Troughs will be gradually filled in over time and a more uniform bed level will form. The rate of infilling depends on river flows as more sediment is transported in flood events. Geomorphologic modelling has shown that subsidence troughs in the

Isaac River will infill within 40 years. However, there is a 36 per cent chance that this could occur during the 25 years of mining (based on the timeframes for production presented in the EIS project scenario for assessment purposes).

While infilling is ongoing, subsided streams are more vulnerable to bed and bank instability and erosion. Potential geomorphic impacts following subsidence together with options for management and mitigation are shown in **Table 2** and **Table 3**.

Some subsidence troughs in the 12 Mile Gully catchment may not infill with sediment, or may infill very slowly. These troughs may form permanent ponds. Depending on the volume and depth of these ponds, it may be appropriate to partly drain these ponds. The ponds will also provide some potential aquatic habitat values.

7.5.3 Flooding

A study of the hydraulic and hydrological conditions of watercourses within the EIS study area was undertaken. The key objectives of this investigation were to identify adverse flooding impacts from the project on the environment, and to estimate the likely flood risk to the project development and operations.

The flood modelling results shows that flow velocity and stream power are generally within a similar hydraulic range to the pre project conditions base case. Localised higher velocities and stream power are likely at the upstream end of the subsidence areas and unsubsided pillar areas, and lower velocities and stream power within the subsided panels.

The modelling results also show that the project would not increase flood levels for flood events in the range of 1:50 to 1:2,000 annual exceedence probability (AEP). The Broadmeadow extension will have no impact on flood levels. However, a potential minor increase in flood levels of 100 to 200 millimetres is estimated for 1:10 and 1:20 AEP events in a localised area near the proposed Red Hill MIA levee to be constructed as part of the GRM incremental expansion in association with the RHM underground expansion option. This increase is not significant as flooding in these events is contained in the river channel and it will not impact on third party premises or other existing infrastructure. Therefore, no mitigation is required.

7.5.4 Surface Water Quality

Water quality of the Isaac River and tributaries is generally suitable for most beneficial uses, the streams are highly ephemeral. As a result limited use is made of the water because of this limited flow.

Surface water quality testing has been undertaken as part of a receiving environment monitoring program carried out by the GRB mine complex. Results indicate that salinity is well within guideline levels but suspended solids and turbidity are both above guidelines. This is related to catchment storm water runoff. There are some naturally elevated metal concentrations due to the local geology. Metal concentrations are generally within government guidelines.

Table 2 Summary of the Predicted Geomorphic Response for the Isaac River, Impacts, Mitigation Options and Risk

Feature / Environmental Value	Geomorphic Response	Potential Impact	Mitigation Options
Isaac River within the RHM footprint	Upstream deepening, occasional natural bedrock controls will limit the progression of deepening upstream.	• Bed and bank instability.	Implement toe of bank protection measures near upstream limit of subsidence.
	Downstream deepening through BRM due to medium term loss/reduction of bed sediment supply due to RHM subsidence.	• Bed and bank instability through the natural reach of Isaac River. • Further destabilisation of the Isaac River diversion.	Bank protection measures already implemented over pillar zones through the natural reach of Isaac River at BRM will reduce the risk of bank erosion as a result of downstream deepening. These measures will continue as part of BRM and RHM impact management. Develop and implement a management strategy for the diversion that takes into account risks posed by BRM and RHM. The strategy will need to account for the potentially reduced sediment supply conditions that the RHM is predicted to generate.
	Deepening/erosion over the pillar zones.	• Bed and bank instability.	Implement toe of bank protection measures over pillar zones.
	Accelerated erosion processes due to creation of flow paths with suitable hydraulic conditions for avulsion development by RHM subsidence.	• Avulsion / meander cut-off leading to loss of existing river channel environmental values. Potential for change in system behaviour, multi channel system for a period of time. • Accelerated input of suspended sediment that will be transported beyond the EIS study area.	High density vegetation cover should be maintained where potential for avulsion or cut-off identified. Monitor these areas following flood events. Actions need to be consistent with the panel catchment management component of the subsidence management plan for ponding and overland flow. Earthworks such as broad fill areas within the panel which mitigate avulsion risk pathways to be considered as part of subsidence management plan. A meander cut-off of Isaac River in RH205 (upstream subsidence trough) is highly likely. Given the location, this should be allowed to occur and managed to minimise any potential negative impacts (none foreseen).

Table 3 Summary of the Predicted Geomorphic Response for Tributaries and Panel Catchments, Impacts, Mitigation Options and Risks

Feature / Environmental Value	Geomorphic Response	Potential Impact	Mitigation Options
Tributaries within the RHM footprint	Deepening/erosion at upstream limit of subsidence and over pillar zones.	• Bed and bank instability.	No mitigation recommended prior to subsidence. Monitoring of risk areas proposed. Grade control (e.g. rock chutes) and bank protection techniques may need to be implemented immediately after full subsidence has occurred and prior to wet season where practical.
	Accelerated erosion processes.	• Avulsion of Goonyella Creek into the Isaac River in RH205.	High density vegetation cover should be maintained. Options to maintain the lower end of Goonyella Creek in current channel include filling part of north end of panel RH205 to prevent capture of the creek by this longwall or diverting around the panel with associated levee.
Unchannelised waterways and flow paths with the BRM and RHM footprints	Incision and erosion head-cut instigation.	• Substantial sediment generation. • Loss of inherent environmental values.	Treated with appropriate grade control and flow management immediately after any head-cuts are instigated following subsidence. Standard gully management grade control rock chute techniques are appropriate.
Ephemeral wetland areas within the RHM footprint	Panel catchments (low energy, fill and spill environment) created in areas of overland flow or unchannelled flow paths	• Vegetation changes (more wetland species). • Increased water storage on the floodplain.	None proposed for geomorphic impacts, may be required due to overall impacts on low flow regime of Isaac or due to impacts on flora/fauna by extended ponding. Constructed drainage may cause more environmental harm than benefit (5th order impact) and should be considered on a case by case basis for best environmental and operational safety outcome.
	Creation of pools in channel from subsidence voids.	• Aquatic habitat. • Temporary due to excess sediment inputs.	Maintaining the positive impact in the long term would require reduction in sediment inputs on a catchment scale, beyond the project lease and beyond the control of the proponent.

During construction and installation of IMG management infrastructure for the project, there is potential for water quality impacts to occur if sediments or other contaminants such as fuels are mobilised to streams by surface runoff. Controls proposed by BMA in relation to erosion and sediment control, as well as management of fuels and other chemicals should prevent any impacts to water quality values.

There are no direct releases of mine water proposed from the project. Water from mine dewatering and IMG management will be transferred to the adjacent GRB mine complex. This water will be reused in coal handling and preparation activities as well as dust suppression. A water balance model was established for the combined mining activities to test whether mine water from the project would have any impact on discharges from the GRB mine complex and compliance with the GRB mine complex EA in relation to discharges.

The results indicated that the project will have a negligible contribution to GRB mine complex compliance and negligible change to salt inputs to the Isaac River.

In most years of operation, water generated from the project gas drainage activities and underground mine dewatering will be taken from within the GRB mine complex to operate the new Red Hill CHPP. In some years, there will be a surplus, and the water balance model has determined that there is adequate storage within the GRB mine water management network to contain all waters from the short terms impacts of the BRM and longer term impacts of the RHM.

7.6 Groundwater

Groundwater occurs in the unconsolidated and consolidated alluvial and sedimentary rocks within and adjacent to the EIS study area. Groundwater quality is characterised as brackish to saline and this is not expected to change through the operation of the Broadmeadow extension and the RHM underground expansion option.

There are seven registered groundwater supply bores within 10 kilometres of the EIS study area. Four bores are used for stock watering (beef cattle) and domestic purposes. The remaining bores are used either for monitoring or are coal seam gas exploration bores.

The development, operation, and closure of the underground mine have the potential to impact on the groundwater resources, by altering groundwater flow patterns and causing drawdown of groundwater levels.

An estimated 35 gigalitres of groundwater will be extracted before and during mining for gas drainage and mine dewatering, with average extraction of 1.4 gigalitres per annum and a maximum annual extraction of two gigalitres. This is required for mine safety and to maintain dry working conditions. This dewatering will also mitigate any movement of potentially lower quality groundwater away from the mine and into the surrounding aquifers. Aquifers outside the mine will continue to receive recharge via the current pre-mining processes.

Mine dewatering, IMG management, and ingress into the mine workings will cause drawdown of regional groundwater levels. Predictive groundwater modelling indicates that drawdown of five metres could occur approximately four kilometres from the RHM boundary, within the target coal seam, the GMS. Groundwater drawdown will also occur in the units above the GMS.

No impacts on groundwater users are predicted. Should an impact on landholder groundwater supplies be detected, and shown to be as a direct result of the project operations, then BMA will

negotiate agreements for the provision of alternate supplies (make-good agreements) throughout the mine life, and after mine closure.

A monitoring bore network will be maintained for the Broadmeadow extension and the future RHM mine to enable the long term monitoring of groundwater levels and groundwater quality, as well as to provide data for regular (three year) updates of the predictive groundwater model. Routine monitoring will provide early warning of any variation in response of the groundwater system to predictions. This will enable BMA to undertake mitigation measures to minimise impact on surrounding groundwater users and the environment. In addition, the groundwater monitoring will enable the identification of any cumulative groundwater level drawdown impacts as a consequence of other mining operations in the area.

7.7 Ecology

7.7.1 Terrestrial Flora

Systematic flora surveys were carried out during 2005, 2006, 2009, and 2011 within and adjacent to the project following guidelines established by the Queensland government. The aim of the flora study was to document the flora values with particular reference to the occurrence of conservation significant vegetation communities and species.

The ecological values of the EIS study area are considered typical for the northern Bowen Basin with large areas of land historically cleared for grazing. Although some areas of remnant vegetation remain, most have been modified to some extent by historical and current land management practices. The most common modification across the project area has been the removal of the shrub and ground layers and replacement with pasture grass species and effects of cattle grazing.

A literature review identified that two EPBC Act threatened ecological communities (TECs) are potentially present on site. These include the *Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* and *Brigalow (Acacia harpophylla dominant and co-dominant)* TECs. The presence of both these communities has been confirmed within the EIS study area. The flora survey identified a total of 20 regional ecosystems (REs), including five listed as endangered, eight of concern, and seven least concern under Queensland vegetation management legislation.

The literature review identified seven species of conservation significance as potentially occurring in the study area. Of those seven, field surveys confirmed the presence of two:

- *Dichanthium setosum* (bluegrass) - listed as vulnerable under the EPBC Act; and
- *Cerbera dumicola*, which is listed as near threatened under the *Nature Conservation Act 1992* (NC Act).

Additional species of conservation significance; *Dichanthium queenslandicum* (king bluegrass) and *Digitaria porrecta* (finger panic grass), were identified as being potentially present given the types of habitat available on site, but were not recorded.

Of the 46 exotic species described, five species were identified as being of management concern: *Eriocereus martinii* (harrisia cactus), *Parthenium hysterophorus* (parthenium), *Sporobolus fertilis* (giant Parramatta grass), *Opuntia stricta* var. *stricta* (prickly pear) and *Opuntia tomentosa* (velvety tree pear).

These species are currently declared as Class 2 pest species under the *Land Protection (Pest and Stock Route Management) Act 2002.*

Approximately 1,669 hectares of remnant vegetation communities may be impacted by the proposed underground mining, surface facilities and infrastructure associated with the Broadmeadow extension (57.7 hectares), future GRM incremental expansion and RHM underground expansion option. This includes the indirect disturbance of remnant vegetation associated with subsidence from underground mining operations.

Clearing will cause direct loss of some remnant native vegetation as well as fragmentation of some vegetation communities. The grassland TEC, which is also of concern RE will not require direct clearing, although it may be mown for fire control and to allow limited vehicle access across it.

Subsidence and gas drainage infrastructure may also impact on remnant native vegetation, particularly taller trees where ground movements and tension cracking may affect root zones. Grasses (native and introduced) and smaller shrubs are expected to survive subsidence without intervention; however, taller trees may be affected and will need to managed and potentially replaced to maintain the Isaac River riparian zone. Subsequent to subsidence, some areas may become ponded and this will change the nature of vegetation in these areas.

Disturbance to key biodiversity values including TECs and endangered and of concern REs will be avoided and managed wherever possible. However, it is inevitable that some remnant native vegetation will be lost and offsets are proposed in accordance with the Queensland Biodiversity Offsets Policy (October 2011).

7.7.2 Terrestrial Fauna

Fauna surveys were carried out during 2005, 2009, and 2011 across the EIS study area. The aim of the fauna surveys was to document the terrestrial vertebrate fauna and habitat, with particular reference to the occurrence of conservation significant fauna and to undertake an assessment of potential impacts.

A comprehensive literature review was undertaken prior to each field survey to assist in targeting survey effort. Systematic fauna surveys were then conducted using methods including trapping, systematic searches, animal call recording and incidental sighting.

The results of the literature review and field surveys identified 16 fauna species listed under the EPBC Act and/or the NC Act that are known to occur within the EIS study area. This includes three threatened and eight migratory/marine bird species, two reptile and three mammal species. The literature review also identified the potential presence of a further six conservation significant species. Of these, surveys in the EIS study area identified ornamental snake (*Denisonia maculata*) and squatter pigeon (*Geophaps scripta scripta*) to be present. A single sighting of koala (*Phascolarctos cinereus*) was also made to the south-west of the study area in an earlier survey.

The Isaac River is identified in Queensland biodiversity mapping as a wildlife corridor of state biodiversity significance. Common arboreal animals were observed in woodlands along the Isaac River including common brushtail possum (*Trichosurus vulpecula*), sugar glider (*Petaurus breviceps*) and greater glider (*Petauroides volans*), as well as a number of common bird species were also observed in this area.

Habitats on the site were generally degraded by land clearing, introduced pasture grasses and grazing. Seven habitat types were defined; brigalow, riparian and alluvial woodlands, poplar box woodlands, laterite ridges, Dawson gum woodland, modified grassland and water bodies (natural and artificial).

Impacts on native animals using the site will include habitat loss and fragmentation from direct vegetation clearing, as well as disturbance to animals using remnant habitat from noise, light and general activity and possible mortality during vegetation clearing or from vehicle strike. Mitigation measures are proposed to address these impacts and these measures are expected to be effective in avoiding or minimising impacts.

In the longer term, some habitat modification will also occur due to subsidence and ponding in some areas. The animals using the site are generally resilient to disturbance and do not have highly specialised habitat requirements, and so it is envisaged that these animals will be able to adapt reasonably well to the habitat changes and also be able to utilise adjacent similar habitat.

Subsidence management rehabilitation will include a focus on retaining and enhancing the Isaac River riparian corridor so that this can continue to provide opportunities for fauna dispersal.

Offsets proposed to address loss of flora biodiversity will also provide habitat for native species, including threatened species present on or around the proposed mine.

7.7.3 Environmentally Sensitive Areas

The EP Act and its subordinate legislation Environmental Protection Regulation 2008 (EP Regulation) place environmentally sensitive areas (ESAs) into two categories; Category A and Category B. Category A and B ESAs are enshrined in Queensland legislation and are easily determined as they are typically based on land tenure. Category C ESAs are defined in the EHP Code of Environmental Compliance for Mining Lease Projects.

The review of ESAs determined that there are no Category A ESAs in the EIS study area. There are a number of Category B ESAs and Category C ESAs within the EIS study area. In addition there is a range of Category A, B and C ESAs within 100 kilometres of the EIS study area. Desktop analyses and field surveys carried out by URS Australia Pty Ltd determined that the riparian and alluvial woodlands fringing the Isaac River are of ecological importance, and thus considered an environmentally sensitive feature for the purposes of this report. The proposed project may impact on ESAs. Mitigation measures are presented to reduce potential impacts to ESAs.

7.7.4 Aquatic Fauna and Flora

The Isaac River and its tributaries 12 Mile Gully, Goonyella Creek and Eureka Creek traverse the RHM underground footprint. These streams are all ephemeral and aquatic habitat structures have also been affected by high sediment load which has tended to infill natural ponds and cover over riffle zones.

An aquatic ecology survey was undertaken to identify aquatic ecology values of the EIS study area. Results were statistically analysed using acknowledged statistical packages. No aquatic fauna of special conservation significance were recorded during surveys of the EIS study area and immediate surrounds. The macroinvertebrate community structures were typical of seasonal streams in central Queensland. Seven fish species were collected during the survey. No exotic fish species were

collected and no fish collected exhibited any signs of disease. Groundwater samples were also analysed for stygofauna; however, no taxa were found.

The aquatic fauna assemblages indicate taxa are resilient and are opportunistic species which is consistent with the ephemeral nature of streams in the EIS study area. Aquatic animals must be able to rapidly colonise newly inundated areas and then retract as flows recede. Primarily, flow and connectivity of waterways are the driving forces behind the maintenance of these populations.

Potential for impact caused by barriers to movement may occur during the construction of the bridge and also any IMG management infrastructure if construction activities occur during flow events. However, any disruption to flow would be short term and impacts are considered minor as connectivity will be restored once construction is completed. Construction will take place in no flow conditions if possible.

Sediment releases to surface waters may degrade water quality and excessive sedimentation may also change habitat structure. Control of erosion and sediment loading in the waterways is essential to ensure the maintenance of aquatic ecological habitat structure. BMA will carefully manage this through drainage, erosion and sediment controls as detailed in **Section 7.2**.

There is a potential that contaminants such as fuels and oils may be mobilised into streams and may have an impact upon the aquatic fauna. During high flow events, pollutants may be transported into the Isaac River and Fitzroy River systems, although resultant concentrations from pollutants may be diluted and well below tolerance thresholds of the fauna. Mitigation measures proposed for storage, handling and management of fuels and chemicals will be effective in minimising this impact.

Subsidence from underground mining activities at BRM and RHM will also modify aquatic habitat, leading to the introduction of pools in stream channels and on the floodplain. As streams in the area are highly ephemeral, any short term changes in flow conditions are not expected to impact on aquatic animals. Some ponds will infill with sediment while others will remain in the longer term. The pools are expected to provide additional and new refuge habitat for both macroinvertebrates and fish compared with current conditions and may therefore be considered a positive outcome of the project. No significant change in water quality is expected from subsidence.

Fish and macroinvertebrate community structure within pools formed through subsidence will be monitored. This is particularly important for determining the distribution and population sizes of Sleepy Cod (*Oxyeleotris lineolata*) that, as large predators, have been shown to cause the loss of other species. It may be necessary to remove these predator species in order to maintain taxa richness.

7.8 Air Quality

The Broadmeadow extension is excluded from the air quality assessment as the proposed underground mining activities will not generate significant levels of dust.

An air quality assessment was undertaken for the GRM incremental expansion and the RHM underground expansion option. Due to the nature and scale of the proposed activities, the focus of the air quality assessment was on quantifying impacts of emissions of dust from project-related emission sources at receptor locations. Receptors include isolated homesteads and cottages, some of which are owned or managed by BMA or BHP Billiton Mitsui Coal (BMC).

Using the regulatory approved California Plume Dispersion Model dispersion model (Scire 2000b) and three years of hourly, three dimensional meteorological wind fields, ground level impacts from a number of dust emissions scenarios were assessed including:

- **Project-Only Scenario**: RHM underground expansion option based on a single worst-case dust emissions scenario.
- **Existing Environment Scenario**: GRB mine complex based on current approvals for FY2015, FY2030, FY2040 and FY2050 mining operations. Included in the existing environment scenario is an estimate of naturally occurring dust levels based on continuous monitoring data from BMA's Moranbah Airport monitoring station.
- **Future Environment Scenario**: GRB mine complex, RHM and an estimate of naturally occurring background levels of dust. Results for the four mine configurations for GRB mine complex (i.e. FY2015, FY2030, FY2040, and FY2050) are presented.
- **Cumulative Future Environment Scenario**: GRB mine complex, RHM underground expansion option, and naturally occurring dust levels, have been considered in combination with impacts associated with non-BMA emission sources: Eaglefield Mine (Peabody Energy), Grosvenor Mine (Anglo Coal), and Moranbah North Mine (Anglo Coal).

For each of the aforementioned scenarios, the following results have been presented:

- the maximum and fifth highest 24-hour average concentration of particulate matter less than 10 microns in diameter (PM_{10}) and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) at receptor locations;
- number of predicted exceedences of the 24-hour average concentration of PM_{10} and $PM_{2.5}$ at receptor locations;
- annual average concentration of total suspended particulates (TSP) and $PM_{2.5}$ at receptor locations; and
- regional contour plots which include background estimates of particulate matter due to natural sources of dust.

Dust emissions from the proposed GRM incremental expansion and the RHM underground expansion option are minor and are not expected to impact on any receptors in the vicinity of the EIS study area. The cumulative future environment scenario indicates that dust levels at some receptors may exceed the air quality objectives in the *Environment Protection (Air) Policy 2008*, however, the GRM expansion and RHM underground expansion option do not make any significant contribution to cumulative dust levels.

7.9 Greenhouse Gas

A detailed inventory of greenhouse gas pollutants has been compiled for the project. The assessment includes carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are converted to a CO_2 equivalent for evaluation and comparison purposes.

BMA's Carbon Management Plan sets out an approach for managing greenhouse gas emissions that cost-effectively reduces the impacts of carbon penalties, ensures compliance with regulatory and corporate requirements and maintains BMA's corporate commitments in relation to greenhouse gas emissions.

Construction will generate greenhouse gas emissions from diesel consumption, release of fugitive emissions of IMG, and electricity usage. Greenhouse gas emissions from land clearing or sequestration from forestry or consumption of unleaded petroleum (ULP) or liquefied petroleum gas (LPG) in site vehicles is considered to be immaterial.

To reduce methane emissions, the following options will be considered for reuse of captured IMG during detailed design stage.

- Option 1 – on site power generation, the primary benefit from a greenhouse gas perspective is the reduction in emissions associated with purchasing of electricity from the Queensland power grid.
- Option 2 – off-take to third-party for use off site will reduce the project's base case greenhouse gas emissions inventory by an amount equal to the emissions associated with flaring of the gas.
- Option 3 – transport and storage of the collected IMG on the mining lease so that it can be used beneficially on the mining lease. This may involve compression, liquefaction or conversion to liquids. This option is considered technically and commercially challenging at this stage but is considered here for completeness.

Scope 1, Scope 2 and Scope 3 greenhouse gas emissions associated with the project have been quantified. These will not be significant in the context of Australian national emissions.

7.10 Noise and Vibration

In 2009 and 2011, background noise levels and ambient vibration were monitored at locations within and adjacent to the EIS study area. Receptors include isolated homesteads and cottages, some of which are owned or managed by BMA or BMC, and a BMA owned on-lease accommodation village.

A 3-D SoundPLAN noise model was developed to model all steady state (L_{A90}) average (L_{Aeq}) and maximum (L_{Amax}) noise emissions from construction activities and operational noise emissions. Both neutral and worst case weather conditions were modelled. Predictions were then undertaken for a range of scenarios at different stages of the proposed mining activity.

Noise criteria were established using Queensland Government processes, augmented with national standards where Queensland standards had not been established. Noise criteria focussed on protecting amenity of residential locations as well as managing sleep disturbance. Occupational noise was not assessed.

The Broadmeadow extension will not generate any significant noise and were not assessed as part of the noise impact assessment.

Noise sources associated with the construction of the GRM incremental expansion and RHM underground expansion option are not likely to cause any disturbance at receptor locations.

Operational noise levels were predicted to achieve the nominated noise criteria at all receptors other than:

- marginal (1 dBA) exceedences of the nominated *Planning for Noise Control* guideline L_{A90} background creep criterion at Broadmeadow Homestead during worst case weather conditions; and
- 2 to 4 dBA exceedences of the nominated L_{Aeq} criterion at Eureka Village during worst case weather conditions.

As a project wide initiative, the use of 'self-adjusting volume' or 'broad-band buzzer' type reversing alarms may be adopted where required to avoid additional annoyance to neighbours.

It is considered that acceptable operational noise levels could be achieved at Eureka Village using one of a range of noise control options. This would be subject to a detailed assessment at the detailed design stage of the CHPP and conveyors associated with the GRM incremental expansion and RHM underground expansion option.

The nominated sleep disturbance criteria of L_{Amax} 65 dBA and 50 dBA for accommodation villages/sites and other residences respectively were predicted to be achieved at all locations during neutral and worst case weather conditions for general steady-state and variable operational noise.

In summary of the above, operational noise levels associated with the project are considered to be acceptable subject to a further assessment of operational noise affecting Eureka Village at the detailed design stage.

7.11 Cultural Heritage

7.11.1 Aboriginal Cultural Heritage

The Aboriginal Cultural Heritage (ACH) considerations relevant to the proposed project were initially identified through a desktop review of previous cultural heritage surveys. Field surveys were conducted by the two Aboriginal groups currently claiming cultural heritage interest over portions of the ACH study area, which envelopes the project, namely:

- Barada Barna people (registered); and
- Wiri Core Country people (Wiri Core).

Surveys of the Barada Barna claim area indicates that a range of artefacts and sites exist, with particular concentration of material associated with the Isaac River and tributaries.

No evidence of ACH was found within the Wiri Core survey areas. As these areas are outside the direct footprint of the project, there is a low probability that future development associated with the proposed project will impact significantly on Wiri Core ACH in the area.

Some disturbance of ACH values may occur during construction and also associated with IMG management infrastructure and subsidence. A cultural heritage management plan has been prepared jointly with the Barada Barna people to address:

- survey and monitoring requirements; and
- mitigation of impacts and management of cultural heritage material during the mining activity.

7.11.2 Non-Indigenous Cultural Heritage

The Non-Indigenous Cultural Heritage (NICH) study provided information regarding the nature of NICH significance relevant to the EIS study area, along with the potential impacts and required mitigation as a result of the proposed project. This assessment included:

- a historical background of the EIS study area;
- contextual research;

- the NICH field survey results;
- the nature of cultural heritage significance and potential impacts; and
- specific management recommendations.

Nine historical archaeological sites (HAS) and six sites of 'historical interest' (HI) were identified in the EIS study area including former homesteads, farm waste dump areas, examples of old agricultural equipment, surveyors marks and fences. Anecdotal information suggests that there is potential for a former Native Police camp site located adjacent to the Isaac River; however, the site was not located during the non-indigenous or the multiple indigenous surveys that were carried out in the area.

No sites or places were identified as containing levels of cultural heritage significance important to Queensland under Section 34 of the *Queensland Heritage Act 1992*. No sites or places are, therefore, recommended for nomination to the Queensland Heritage Register as a result of this cultural heritage survey.

Review of the proposed project indicates that three HAS sites may potentially be impacted by the project (**Table 4**). All of these sites are located within the proposed RHM underground expansion option footprint.

Predicted subsidence contours indicate that RHHAS-04, RHHAS-08, and RHHAS-09 may be impacted by topography changes. If subsidence occurs in the area, impacts on historic features can occur. These sites are considered to be of low to moderate levels of local heritage significance.

Table 4 Historic Archaeology Sites Potentially Impacted by the Project

Impact Type	Impacted Site/s	Individual Significance Rating
Potential impact (underground mining)	RHHAS-04 (Dump in drainage channel)	Low-Moderate
Potential impact (underground mining)	RHHAS-08 (Old Riverside Homestead)	Low-Moderate
Potential impact (underground mining)	RHHAS-09 (Current Riverside Homestead)	Moderate

Two HI sites may be impacted by the proposed project, namely:

- RHHI-02 (historic property boundary fence 2); and
- RHHI-04 (possible former native police camp).

Where possible, disturbance to HAS and HI sites will be avoided or minimised. If disturbance to the 'old station yard', or RHHI-04 appears likely, a further survey will be undertaken to determine the type and extent of any surviving archaeological material prior to any development or impact in these areas.

Otherwise, if sites are to be significantly disturbed, a photographic record will be made of the sites prior to disturbance.

7.12 Scenic Values

The visual assessment of the project included a baseline assessment of the existing landscape character. A series of landscape character zones were identified. An assessment of the existing scenic quality indicated that the landscape has low scenic quality and is modified by vegetation clearing and mining landforms. As minimal surface infrastructure is proposed as part of the

Broadmeadow extension, the opportunity for visual impacts is not significant. The potential viewshed of infrastructure associated with the GRM incremental expansion and RHM underground expansion option was identified as well as key viewing situations. The potential visual impact of the proposed project was evaluated in relation to the viewing situations.

The above-ground infrastructure includes a gas management system, coal handling facilities, rail infrastructure, vehicle maintenance, administration buildings, power lines, the Red Hill accommodation village, overhead power lines and sub-stations, a bridge over the Isaac River, and a possible water pipeline diversion.

The proposed underground mining operations will result in surface subsidence. This will result in local changes to the drainage system that will influence the distribution of vegetation communities and visual landscape character over time.

This visual assessment concluded that the proposed project will produce a low to negligible visual impact on surrounding area. The nature of underground mining operations will not generate new overburden landforms. The proposed infrastructure is in close proximity to similar infrastructure associated with GRB mine complex. The visual prominence of existing overburden landforms and infrastructure associated with the current GRM operations will form a backdrop to the Red Hill MIA and other infrastructure.

There are a low number of potential viewers due to the absence of townships, villages, public recreation areas and lookouts within the viewshed of RHM. The most significant views of the RHM MIA will be from vehicles travelling on Red Hill Road. This road has low traffic volume and views across the Isaac River floodplain are interrupted by remnant woodland vegetation.

While visual impacts are not expected to be significant, mitigation measures will be implemented, primarily focusing on retaining roadside and riparian vegetation where possible to screen views of the mine. If a flood levee is required to protect the Red Hill MIA and mine access, planting of grass on this structure will be undertaken to assist with minimising visual impact. Design will seek to minimise visibility of lighted areas where they are visible from Red Hill Road.

7.13 Waste Management

The Broadmeadow extension will also generate mine waste, however the annual quantities of mine waste currently generated by BRM will not materially change as a result of the proposed panel extensions and waste will be managed as part of the existing GRB mine complex waste management system.

The GRM incremental expansion and RHM underground expansion option will generate solid and liquid waste, in addition to mine waste, including:

- reusable or recyclable waste;
- general waste;
- sewage effluent and sludge; and
- regulated wastes.

The findings of the waste management assessment are that the nature and quantities of wastes that may be generated by the GRM incremental expansion and RHM underground expansion option can

be managed using existing services and facilities within the GRB mine complex to avoid adverse impacts on these values.

The main waste management strategies include waste minimisation, segregation for reuse or recycling, cleaner production, and appropriate waste disposal consistent with the requirements of the waste management hierarchy. Dedicated waste management areas will be established at the Red Hill MIA and Red Hill accommodation village to maximise segregation of waste, as well as to provide for secure storage until wastes can be removed from the site.

Waste types and volumes will be tracked and the waste register regularly inspected to identify opportunities to avoid, minimise, reuse or recycle wastes.

7.14 Traffic

The Broadmeadow extension will not impact on the current traffic associated with the existing BRM operations as the panel extensions will sustain existing operations and work will be undertaken by the existing BRM workforce.

The assessment of the traffic impacts associated with the GRM incremental expansion and RHM underground expansion option has been undertaken in accordance with the methodology outlined in the Department of Transport Main Road's (TMR) *Guideline for the Assessment of Road Impacts of Development* (2006). The study area of the assessment and the adopted performance thresholds were established using the criteria stipulated in TMR's guideline.

The road network adjacent to the EIS study area has been recognised to experience potentially high traffic growth due to the growth of the region from various industrial and mining projects. The background traffic growth rate adopted includes allowance for the cumulative traffic generation of multiple projects.

The performance analysis undertaken for the five scoped intersections identified that the following two intersections will continue to operate within generally accepted performance thresholds irrespective of the RHM underground expansion option and associated GRM incremental expansion proceeding:

- Goonyella Road/Riverside Access Road intersection; and
- Goonyella Road/Red Hill Road intersection.

The analysis indicated that the existing forms of the Goonyella Road/Curtin Street, Goonyella Road/Moranbah Access Road/Mills Avenue and Peak Downs Highway/Moranbah Access Road intersections are likely to operate outside generally accepted performance thresholds irrespective of the RHM underground expansion option and associated GRM incremental expansion proceeding. It is considered that these intersections will warrant upgrading (based on traffic growth projections) regardless of whether the RHM underground expansion option and associated GRM incremental expansion go ahead or not. It is therefore proposed to engage with the relevant road authorities regarding plans to upgrade these intersections and make a contribution towards the cost of the works.

The timing for consultation with Isaac Regional Council (IRC) regarding their proposed upgrade solution and any contribution would need to occur prior to the commencement of construction once the project owners have made a commitment to proceed with the project, determined the proposed staging and finalised its proposed workforce numbers and associated traffic volumes. The Road Impact Assessment has identified that the project will not generate any traffic impacts on the state-controlled, council-controlled or private road networks that are so significant that they should preclude

approval of the project. The proponent's commitment to engage with the asset owners (prior to the commencement of construction) and establish proportionate contributions towards road capacity works are anticipated to fully offset all significant traffic impacts associated with the project.

7.15 Social Aspects

The SIA does not include an assessment of the Broadmeadow extension as this will be completed by the existing BRM workforce and no additional mining infrastructure is required.

BMA is committed to minimising impacts and maximising opportunities associated with the development and operation of its projects. A comprehensive study of the potential social impacts and benefits associated with the GRM incremental expansion and the RHM underground expansion option has been completed. **Section 18** of the EIS provides a summary of the SIA findings (see **Appendix P**). The SIA details the proposed strategies to minimise impacts of the RHM underground expansion option to social values of the local and regional communities while maximising the opportunities from the proposed mine. This includes strategies that are specific to the GRM incremental expansion and the RHM underground expansion option, and BMA-wide approaches. It also details the timing and management of proposed strategy implementation.

The SIA process involved three stages:

1. baseline assessment;
2. impact assessment process; and
3. development of strategies to minimise impacts and maximise benefits.

With the future RHM located approximately 20 kilometres north of Moranbah, the Moranbah community will be the community subject to the greatest level of potential project influence. Impacts and benefits will also be experienced at wider regional levels such as the IRC Local Government Area and the Mackay, Isaac and Whitsunday (MIW) Region.

7.15.1 Baseline Assessment

A baseline has been developed to detail existing social characteristics, conditions and indicators which may be affected by the GRM incremental expansion and RHM underground expansion option. This includes a description of factors including:

- planning context, including local, State government and industry initiatives;
- consultation results;
- settlement pattern and social land uses;
- demographic characteristics and projections;
- community values and history;
- community health and wellbeing;
- social infrastructure; and
- housing and accommodation.

The baseline section concludes with an assessment of the status of existing social indicators and social conditions, and changes expected during the next 10 to 20 years. This forms the basis of the

subsequent significance evaluation and links to desired social outcomes identified in the Management and Accountability section.

7.15.2 Social Impact Assessment

The SIA includes an assessment on the likely effects the GRM incremental expansion and the RHM underground expansion option. It includes quantitative modelling of potential effects on the population and housing profile, and description of the positive and negative effects on social values and sustainability. This includes potential initiatives to maximise positive social outcomes. Key domains assessed include:

- population change (resident and full-time equivalent (FTE));
- social characteristics;
- contribution to sustainability of local and regional businesses;
- social, health and emergency infrastructure;
- impacts on and opportunities to enhance social values, amenity and land use; and
- support for local and state initiatives.

The assessment section of the SIA summarises likely impacts and their significance for social indicators. It also addresses the likely cumulative impact scenarios and how the project contributes to or alleviates cumulative impacts.

Mitigation strategies are also provided for each impact in the assessment section, along with enabling strategies for project benefits and opportunities. The SIA describes how BMA works with communities, councils, the Queensland Government and industry stakeholders to maximise social outcomes. The stakeholder groups are outlined in **Section 18** of the EIS.

The potential impacts and benefits of the GRM incremental expansion and the RHM underground expansion option have been rated and ranked according to the assessment categories of 'probability' and 'consequence', in accordance with the Queensland Government's *Social impact assessment: Guideline to preparing a social impact management plan* (DIP 2010).

A suite of proposed outcomes to mitigate impacts and enhance benefits have been developed. Strategies are specific to the GRM incremental expansion and RHM underground expansion option, and also align with BMA-wide approaches.

More specifically, mitigation strategies have been developed to minimise the overall significance of identified potential negative impacts assessed to be in the medium to high range. Strategies to enhance all potential positive impacts were also identified as part of this process. All strategies are detailed further in the SIA that is presented with this EIS.

The mitigation strategies presented in the SIA address the construction, operation and decommissioning phases of the GRM incremental expansion and RHM underground expansion option.

This SIA also outlines mitigation and management of cumulative social impacts, including presenting BMA-wide strategies and proposed collaborative responses involving other stakeholders to address such impacts. Requirements for management and monitoring of SIA implementation and effectiveness are also described.

7.15.3 Impact and Benefit Management Strategies

To address social conditions that are likely to be impacted or enhanced by construction and/or operation of the GRM incremental expansion and the RHM underground expansion option, a variety of strategies have been developed.

The plans provide a clear blue print to government, stakeholders, community members and partner organisations of the specific and/or company-wide strategies which BMA proposes to develop and implement for the management and mitigation of its predicted social impacts.

Moranbah, the IRC Local Government Area and the wider MIW Region experience social impact associated with local and regional growth. At present regional councils, state government agencies and resource companies, such as BMA, are working to address these impacts either individually or in partnership.

An integrated approach has been adopted to mitigate potential impacts and enhance benefits and opportunities. In addition to potential strategies drafted within the SIA, BMA-wide strategies will be used as appropriate. BMA-wide strategies apply across all of BMA's current operations and projects currently in construction.

Where possible, opportunities to link to existing local, regional and state government plans, strategies and programs have been proposed and are detailed where relevant.

A detailed summary of potential impacts and mitigations is provided in **Section 18** of the EIS.

7.16 Economics

An economics impact assessment (EIA) for the GRM incremental expansion and the RHM underground expansion option as well as a description of the existing local and regional economic environment that may be affected is provided in **Section 19** of the EIS.

The Broadmeadow extension is not assessed as part of the EIA as the panel extensions will sustain existing operations and work will be undertaken by the existing BRM workforce.

A scenario for the construction and operation of the GRM incremental expansion and the RHM underground expansion is provided for the purposes of undertaking the EIA. The scenario is provided in order to fulfill the TOR requirements and does not reflect a commitment by the project owners to proceed with the project. The workforce numbers, plans for mine development and final investment decision by the project owners will be subject to further assessment by the project owners once the EIS approvals and grant of ML have been finalised.

The economic modelling and impact assessment considers the economic benefits and values resulting from the construction and operational phases. The GRM incremental expansion and the RHM underground expansion option has the potential to result in substantial economic impacts throughout the region, Queensland and Australia. The GRM incremental expansion and the RHM underground expansion option are not expected to cause any direct costs to government associated with the development of the project. This relates to rail, port and shipping, road, water, energy and accommodation infrastructure.

7.17 Health and Safety

BMA is committed to the health and safety of its employees, the surrounding environment and local communities. The company is required to comply with all aspects of the *Coal Mining Safety and Health Act 1999,* which requires BMA to undertake hazard identification and prepare health and safety risk management procedures.

A preliminary hazard assessment was conducted as part of the EIS for the project. The assessment determined the potential risks of the project to the health and safety of project employees, the public and the environment. It also proposed controls and mitigation strategies, where appropriate.

The assessment identified that the most critical hazards included:

- traffic accidents on or off the proposed mine site, which are rated high risk because of the potentially fatal consequence; and
- work place accidents.

BMA already has a range of management measures in place including fatal risk controls aimed at seven risk areas hazards with potentially fatal consequences; vehicles and mobile equipment, explosives and blasting, ground control, hazardous materials, isolation and permit to work, work at height and lifting operations.

In line with relevant legislation, workforce health and safety regulations and BMA's health and safety policies and procedures, the RHM underground expansion option will develop and implement an appropriate health and safety management system during construction and operations. In doing so, the mine will implement the BHP Billiton Group Level Documents (GLD) and company policies that are currently in use at all BMA operations and provide the basis for effective management of employee and public health and safety as well as environmental protection. The GLD on risk management focuses on management of material risk issues across the business. Risks are also managed at a site or project level through preparation of site based health and safety management plans and management plans contained within EAs.

As part of the health and safety management system, an emergency management plan will be developed for the construction and operation phases as required for underground coal mines in the *Coal Mining Safety and Health Act 1999*.

The plan will take a risk-based approach, focusing on likely emergency, disaster and emergency health scenarios for worksites and the Red Hill accommodation village.

The plan will be prepared in consultation with relevant emergency service providers including the Queensland Fire and Rescue Service, Queensland Police Service, Rural Fire Service, Queensland Ambulance Service, Queensland Mines and Rescue, the Moranbah Hospital and/or Isaac Regional Council. The requirements of the Isaac Regional Council Counter Disaster Plan and the Queensland Mines Rescue Service will be considered when preparing the plan. The RACQ Central Queensland Rescue Service will also be consulted through existing relationships and connections. These external stakeholders will be consulted in the development of the plan. It will be in line with relevant health, safety and emergency management legislation and regularly updated and/or tested via mock exercises.

The GRM incremental expansion and the RHM underground expansion option will also employ site paramedics and provide first aid and fire training to nominated employees who will be able to assist in emergencies and/or on site incidents.

Relevant stakeholders will also be advised of changes that could affect the Regional and Mackay District Plans.

8 Rehabilitation

Rehabilitation for the Broadmeadow extension will be undertaken in accordance with the BRM EA and associated management plans.

The GRM incremental expansion and RHM underground expansion option will develop a mine rehabilitation management plan in accordance with statutory approval and BMA internal requirements. Rehabilitation success criteria have been established through the EIS, having regard to the existing economic and ecological values of the site and proposed future land use.

Planning methodology for mine closure for the future RHM and associated infrastructure is based on achieving a stable, self-sustaining post-disturbance landform that is suitable for cattle grazing and maintains wildlife movement corridors along the Isaac River. Rehabilitation strategies are closely integrated with the subsidence management plan outlined in **Section 5.5** of the EIS.

Rehabilitation will occur progressively as lands become available. Any areas disturbed during construction and IMG management infrastructure that are no longer required will be progressively stabilised and planted with pasture or selected native plants. As subsidence occurs, remedial works will be undertaken as required to address surface cracks and watercourse instability that may arise.

On closure, all above ground components of surface infrastructure and facilities will be removed, unless these components can be used for ongoing nearby mining activities, or it is negotiated with the landholder to leave components such as buildings or sediment ponds in place for future use. Concrete and bitumen and any contaminated materials will be removed and disposed of in the underground mine workings if this can be done without creating groundwater contamination, or removed to an authorised waste disposal facility.

Water and gas pipelines associated with IMG management will be emptied and made safe and left in place except where exposed by subsidence related landform changes. Bores will be decommissioned in accordance with guidelines in place at the time and cut-off to below ground level.

9 Environmental Management and Monitoring

A summary of commitments made by BMA for managing and monitoring environmental impacts has been prepared for inclusion in the EIS and sets out:

- measurable performance criteria (outcomes) for each element of the operation;
- control measures that will be implemented to achieve the performance criteria;
- the monitoring requirements to measure actual performance and effectiveness of control measures;
- auditing requirements to demonstrate implementation of agreed construction and operation environmental management strategies and compliance with agreed performance criteria;
- format, timing and responsibility for reporting and auditing of monitoring results;
- procedures for complaints and inquiries;

- corrective action procedures - the action to be implemented in case a performance requirement is not reached and the person(s) responsible for action (including staff authority and responsibility management structure);
- roles and responsibilities in relation to environmental management, monitoring and corrective actions;
- requirements for training and competence of workers; and
- proposed conditions for inclusion in the EA (mining activity) to be issued under the EP Act.

10 Cumulative Impacts

Three separate levels of cumulative impacts were considered for the EIS study area:

- localised cumulative impacts;
- regional cumulative impacts; and
- global cumulative impacts.

The only impact from the project that is potentially global is greenhouse gas emissions. However, the level of emissions from the project represents a very minor contribution at this scale.

Overall, the project is not expected to make a significant impact to cumulative impacts at a local, regional or global level. Environmental and social management and mitigation measures can be applied at a project level that will be effective in managing and minimising the project's contribution to cumulative impacts. From a social impact point of view, BMA is involved in a number of regional initiatives and consultative groups, working collaboratively with these groups and government to address key social issues in the Bowen Basin.

11 Project Benefits

The results of the EIS assessments indicate that the construction and operation of the project elements has the potential to have positive environmental, social, and economic impacts. The design of the various project elements as well as proposed management strategies will mitigate any negative impacts and optimise the positive benefits of the project. Commitments made to address the impacts are included in the BMA Commitments Summary.

A number of positive benefits have been identified both at a local and regional level, including generation of direct and indirect employment opportunities, contribution to local and regional economies, and utilisation of a valuable resource.

The key benefits of the project will include:

- subject to further assessment as part of on-going project planning and owners approvals, the potential to create up to approximately 2,000 construction jobs and up to approximately 1,500 operational jobs associated with the GRM incremental expansion and the RHM underground expansion option. Potential for flow-on indirect employment opportunities are also expected;
- export income;
- local and regional growth;

- ponding within subsidised areas within the Isaac River sub-catchment, which benefits aquatic ecosystems;
- revenue into the regional economy; and
- potentially significant state and government taxes and royalties.

There continues to be international demand for high quality hard coking coal. The conversion of the Red Hill Mining Lease will help to sustain operations at the existing GRB mine complex operations and provide a potential for development of GRM incremental expansion and the RHM underground expansion option. The coal industry is a significant employer in Queensland, employing about 20,000 people directly and a further 70,000 indirectly through the industry's activities.

The project scenario prepared for undertaking economic modelling has been assessed to require a substantial capital investment. The majority of this spend will occur within Queensland and Australia. Significant annual operational expenditure would also occur, providing opportunities for Australian companies to provide long term services to the project. During the mine's operational life, it has the potential to contribute significantly to the state through coal royalties. This contribution coupled with the direct and indirect employment opportunities and associated spending, highlights the potential value of the project to Queensland.

Overall the EIS studies found that project benefits provide a strong justification for the project elements to proceed. While potential impacts on environmental and social values have been identified for the various elements of the project, a range of mitigation measures have been proposed to avoid or minimise and manage these impacts.