

ENVIRONMENTAL IMPACT STATEMENT

RED HILL
MINING LEASE

Section 21
Cumulative Impacts

Section 21 Cumulative Impacts

21.1 Introduction

21.1.1 Objective

The objective of the cumulative impact assessment was to assess the potential for impacts from the Red Hill Mining Lease (the project) to have compounding or synergistic interactions with similar impacts from other projects, including projects proposed, under development or already in operation within an envisaged sphere of influence of the project. The sphere of influence is considered to be variable, based on each biophysical and social aspect considered during the compilation of this environmental impact statement (EIS).

21.1.2 Overview

The impacts of projects are usually assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected by development, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This section describes the potential impacts of the project that are cumulative.

There are three levels at which cumulative impacts may be relevant:

- EIS Study Area Localised Cumulative Impacts – These are the cumulative impacts that may result from multiple existing or proposed mining operations in the immediate vicinity of the project. Localised cumulative impacts include the cumulative effects from concurrent operations that are close enough to potentially cause additive effects on the environment or sensitive receivers. These typically include dust deposition, noise and vibration, groundwater drawdown, groundwater and surface water quality, and transport.
- Regional Cumulative impacts – Regional cumulative impacts include the project's contribution to impacts that are caused by mining operations throughout the Bowen Basin region or at a catchment level. Each coal mining operation in itself may not represent a substantial impact at a regional level; however the cumulative effect on habitat availability and connectivity, downstream water quality, and the socio-economic characteristics of a region may warrant consideration.
- Global Cumulative Impacts – Global cumulative impacts are those that the project might contribute to at a global scale. The only impact from the project that has potentially global scale impacts is greenhouse gas (GHG) emissions as this relates to impacts on global concentrations of greenhouse gases in the atmosphere. The level of GHG emissions from the project, however, represents a very minor contribution at this scale (refer to **Section 12**).

21.2 Relevant Projects

21.2.1 The project

The project comprises three elements as follows:

- an extension of three longwall panels (14, 15 and 16) of the existing Broadmeadow underground mine (BRM);
- a future incremental expansion option of the existing Goonyella Riverside Mine (GRM); and
- a future Red Hill Mine (RHM) underground expansion option located to the east of the GRB mine complex.

The Broadmeadow panel extensions will sustain existing operations and do not require the construction of additional mining infrastructure and works will be carried out by the existing Broadmeadow workforce. The impacts associated the Broadmeadow extensions are limited to the surface impacts associated with the installation of gas drainage infrastructure and subsidence.

21.2.2 Other Relevant New or Developing Projects

The TOR requires the cumulative impact assessment to consider other nearby development projects. The assessment is to include a summary of the project’s potential impacts with respect to both geographic location and environmental values.

Relevant projects that have been considered include:

- projects within the envisaged sphere of influence of the project, as listed on the Department of State Development, Infrastructure and Planning (DSDIP) website that are undergoing assessment under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) for which an Initial Advice Statement (IAS) or an EIS are available; and
- projects within the envisaged sphere of influence of the project, which are listed on the website of the Department of Environment and Heritage Protection (EHP) that are undergoing assessment under the *Environmental Protection Act 1994* (EP Act) for which an IAS or an EIS are available.

Projects currently undergoing assessment or having recently completed assessment under these processes and included in the cumulative impact assessment for the project are listed in **Table 21-1**.

Table 21-1 Projects Considered in the Cumulative Impact Assessment

Project - Proponent	Description	EIS Status	Relationship to Red Hill Mining Lease	
			Timing	Location
Eaglefield Coal Mine Expansion-Peabody	Expansion of existing open-cut mine from 5 to 10.2 mtpa. Construction workforce will be 650 and the operational workforce will be 700. Construction commenced in 2012 with a 22 year mine life. Accommodation will be at on-site facilities. Coal will continue to be exported to Dalrymple Bay via existing rail infrastructure	EIS assessment report.	May have overlapping operational phases with the construction and operations of the GRM incremental expansion and the RHM underground expansion option.	Abuts the northern boundary of the Goonyella Riverside Mining lease. Drains to Goonyella Creek sub-catchment.

Project - Proponent	Description	EIS Status	Relationship to Red Hill Mining Lease	
			Timing	Location
Ellensfield Coal Mine Project - Vale	New underground coal mine to produce 5.5 mtpa. Development also includes an on-site gas fired power station (8 to 20 megawatts). Construction workforce will be 160 and the operational workforce will be 280. Accommodation will be at Coppabella or Moranbah. Timing for commencement unknown	EIS assessment report.	May have overlapping operational phases with the construction and operations of the GRM incremental expansion and the RHM underground expansion option.	121 km to the west of the EIS study area May utilise the same transport networks Within the Isaac River sub-catchment.
Grosvenor Coal Mine Project – Anglo Coal	Greenfield underground mine to produce up to 5 mtpa. Construction and operation workforces will both be approximately 500 persons. Construction commenced in 2012 with full production by 2015. Workforce accommodation 25% in Moranbah and 75% remote workforce.	EIS process completed.	Likely to have overlapping operational phases with the proposed project.	9 km to the south of the EIS study area. Land surface drains to the Isaac River. May utilise the same transport networks and will locate workers and accommodation facilities at Moranbah.
New Lenton Coal Mine Project – New Hope	Greenfield open-cut and underground mine to produce 5 mtpa. Construction workforce will be 300 with an operational workforce of 200. Construction commencement not known.	IAS available. EIS lodgement proposed 2014.	May have overlapping operational phases with the proposed project.	15 km to the north-east of the EIS study area. Within Isaac River sub catchment.
Eagle Downs Coal Mine Expansion - Aquila	Greenfield underground mine to produce 7 mtpa. Construction workforce will be 360 and operational workforce will be 570. Workforce to be accommodated at accommodation facilities in and around Moranbah. Construction commenced in 2013 and first coal is expected in 2015	EIS process completed.	Likely to have overlapping operational phases with the project.	39 km to the south-east of the EIS study area. May utilise the same transport networks and may locate workers at Moranbah. Within the Isaac River sub-catchment.
Caval Ridge Coal Mine Project - BMA	Greenfield open-cut mine to produce 5 mtpa. Construction workforce will be 1760 with an operational workforce of 500. Remote workforce to be accommodated in single worker facilities. Construction commenced in 2012 with full production by 2014.	EIS process completed.	May have overlapping operational phases with the construction and operations of the GRM incremental expansion and the RHM underground expansion.	29 km to the south of the EIS study area. May utilise the same transport networks. Within Isaac River sub-catchment.

Project - Proponent	Description	EIS Status	Relationship to Red Hill Mining Lease	
			Timing	Location
Daunia Coal Mine Project - BMA	Greenfield open-cut mine to produce 4.5 mtpa. Construction workforce of 1000 with an operational workforce of 450. Remote workforce to be accommodated in the Coppabella Accommodation Village. Construction commenced in 2009 with full production achieved in 2013.	EIS process completed.	Likely to have overlapping operational phases with the construction and operations of the GRM incremental expansion and the RHM underground expansion option.	36 km to the south-east of the EIS study area. May utilise the same transport networks. Within Isaac River sub-catchment.
Millennium Coal Mine - Peabody	Expansion of an existing open-cut coal mine from 2 to 5.5 mtpa. Construction workforce of 627 with an additional operational workforce of 160. Accommodation for both construction and operational workforces to be at the Coppabella Village. Construction commenced in 2012 with full production by 2015.	EIS completed.	May have overlapping operational phases with the construction and operations of the GRM incremental expansion and the RHM underground expansion option.	30 km to the south-east of the EIS study area. May utilise the same transport networks. Within Isaac River sub-catchment.
Moranbah South Project – Anglo Coal and Exxaro Australia Pty Ltd.	Greenfield underground mine to produce 18 mtpa. Construction commencement not known Mine infrastructure proposed adjacent to the Moranbah airport.	EIS lodged, public notice period completed.	May have overlapping construction and operational phases with the GRM incremental expansion and the RHM underground expansion option.	28 km to the south of the EIS study area May utilise the same transport networks. Within Isaac River sub-catchment.
Connors River Dam and Pipeline – Sunwater	Water supply dam on the Connors River and a water supply pipeline from the dam to Moranbah to service coal mines and communities in the Bowen Basin. Construction workforce will be 250 for the dam and 300 for the pipeline. There will be accommodation at an on-site construction camp. Project has been deferred.	EIS completed.	May have overlapping construction and operation phases with the project. Dam construction will be remote from the proposed project with minimal impact. Pipeline construction will be short term.	Pipeline passes within 13 km to the south of the EIS study area. Dam is located in the Connors River subcatchment, approximately 10 km south of the EIS study area.
Goonyella to Abbot Point Rail Expansion Project – Aurizon	70 km long stretch of new rail, linking the Goonyella system to the Newlands system. Construction commenced in 2011, and was completed in 2012.	Complete.	Operational overlap with the construction and operations of the GRM incremental expansion and the RHM underground expansion option.	Southern end is adjacent to GRM and 0.7 km from the EIS study area.

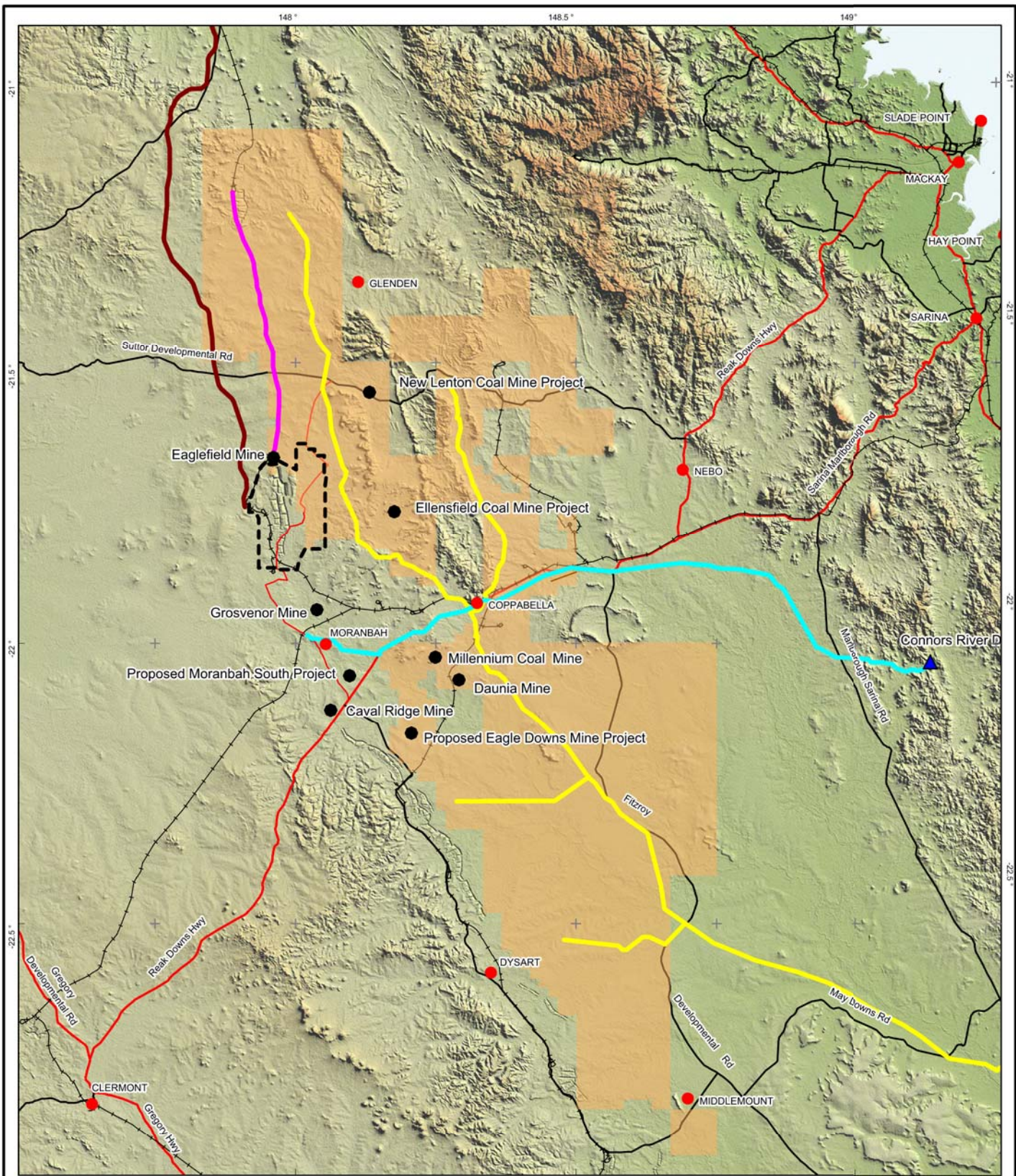
Project - Proponent	Description	EIS Status	Relationship to Red Hill Mining Lease	
			Timing	Location
Bowen Gas Pipeline – Arrow Energy	Construction of an approximate 580 km of pipelines and associated infrastructure, which will convey coal seam gas (CSG). Construction commencement not known Construction workforce of approximately 700, commissioning and decommissioning workforce of 10, and operations workforce of 15.	EIS completed.	May have overlapping construction and operational phase with the GRM incremental expansion and the RHM underground expansion option. Operational impacts not significant at a local or regional level.	Runs to the east of the EIS study area at a distance of 3 km at its closest point.
Bowen Gas project – Arrow Energy	Development of approximately 7,000 CSG production wells over an approximate 35 to 40 year life Much of the gas produced by the Bowen Gas Project will be piped to the proposed Curtis Island LNG Plant. Construction commencement not known.	EIS lodged and supplementary EIS being prepared.	Operational impacts will be managed as part of a co-development agreement with Arrow Energy.	CSG infrastructure to extend north to south from Glenden to Blackwater covering the majority of MLA70421.

The locations of these mining projects considered in the cumulative assessment are shown on **Figure 21-1**.

21.2.3 Existing Developments

In most cases, impacts of existing developments such as operational mining activities have already been accounted for in terms of baseline data collection. For example, background noise measurements account for noise levels from existing activities that are audible at receptors identified for the Red Hill project. Similarly, the conservation status of flora, fauna and vegetation communities is based on known extents of habitats or populations and hence, takes into account clearing that has occurred to date. For social and socio-economic issues, assessment of impacts is based on potential changes when compared to current baseline conditions, which have already been influenced by existing developments and operations

Contribution of existing activities to impacts is, therefore, already accounted for in the impact assessment and is not considered further in this cumulative impact assessment.



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RED HILL MINING LEASE ENVIRONMENTAL IMPACT STATEMENT

PROJECTS CONSIDERED IN THE CUMULATIVE IMPACT ASSESSMENT



CUMULATIVE IMPACTS

Figure: 21-1



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21.3 Cumulative Impacts

21.3.1 Land Resources

21.3.1.1 Method of Assessing Land Resource Impacts

This section of the cumulative impact assessment considers potential impacts on land resources from the project compounded by nearby development proposals, as listed in **Section 21.2**. Land resource cumulative impacts have been measured using the following indicators:

- the dominant current land use within each project area; and
- the presence of good quality agricultural land (GQAL) and potential strategic cropping land (SCL) associated with each project.

It should be noted that data used to assess each criteria were derived from available sources and may be subject to change. The assessment of GQAL and SCL relies on data provided in respective EIS documents and desktop interpretations of local and state government data and was not validated by further field work by the EIS study team.

21.3.1.2 Cumulative Land Resource Measurement

The operation of the project will impact on existing cattle grazing operations, and disturb minor tributaries of the Isaac River within the project footprint. The future RHM is anticipated to operate for a period of 20 to 25 years and with infrastructure associated with the GRM incremental expansion option will disturb an approximate 3,967 hectares. Further details of the impacts of the GRM incremental expansion and RHM expansion option on land resources are contained within **Section 5**.

An assessment has been undertaken to obtain estimates of the area to be altered through mining activities within the listed nearby projects. The results of this assessment are tabulated **Table 21-2**.

Table 21-2 Land Resource Impacts

Project	Estimated Area	Life of Project	GQAL	SCL	Existing Land Use	Proposed post mining land use
Red Hill Mining Lease Project (underground footprints and surface infrastructure)	3,967 ha	20-25 years	Present: <ul style="list-style-type: none"> • Class B • Class C1 • Class C2 • Class C3 • Class D 	No (none within impacted areas)	Grazing, mining	Grazing
Eaglefield Coal Mine Expansion (open-cut & underground)	3,515 ha	22 years	Present <ul style="list-style-type: none"> • Class A • Class B • Class C1 	No	Grazing	Grazing
Ellensfield Coal Mine Project (underground)	3,388 ha	20 years	Present <ul style="list-style-type: none"> • 2,396 ha (grazing only – assumed C1) 	No	Grazing	Grazing

Project	Estimated Area	Life of Project	GQAL	SCL	Existing Land Use	Proposed post mining land use
Grosvenor Coal Mine Project (underground)	9,000 ha	24 years	Present <ul style="list-style-type: none"> Class C 	No	Grazing	Grazing
New Lenton Coal Mine Project (open cut & underground)	1,205 ha	Unknown	Present <ul style="list-style-type: none"> Class n/a 	Potential SCL	Grazing	Grazing
Eagle Downs Coal Mine Expansion (underground)	4,550 ha	54 years	Present Pre-mining: <ul style="list-style-type: none"> Class B – 334.5 ha Class C – 3,869.2 ha Class D – 352.7 ha Post-mining: <ul style="list-style-type: none"> Class B – 154 ha Class C – 3,328.2 ha Class D – 774.2 ha 	No	Grazing	Grazing
Caval Ridge Coal Mine Project (open-cut)	6,440 ha	30 years	Present <ul style="list-style-type: none"> Class A – 245 ha Class C1 – 3,454 ha GQAL will not be disturbed by mining activities.	Potential SCL	Grazing/ Mining and Commercial (airport)	Grazing
Daunia Coal Mine Project (open-cut)	2,000 ha	21 years	Present Impact Area: <ul style="list-style-type: none"> Class A – 160 ha Class B – 80 ha Class C – 1,530 ha 	Potential SCL	Grazing	Grazing
Millennium Coal Mine Project (open-cut)	966 ha	16 years	Present <ul style="list-style-type: none"> Class n/a (likely Class A, Class B and Class C1) 	No	Mining / Grazing (expansion of existing mine)	Grazing
Moranbah South Project (underground)	17,550 ha	30 years	Present <ul style="list-style-type: none"> Class n/a 	Potential SCL	Grazing	Grazing
Connors River Dam and Pipeline (project deferred)	5,850 ha dam + 133 km pipeline	100+ years	Present <ul style="list-style-type: none"> Class n/a (likely Class A, Class B and Class C1) 	Potential SCL	Grazing	Grazing
Goonyella to Abbot Point Rail Expansion Project (Aurizon)	69 km rail Corridor	100+ years	Present <ul style="list-style-type: none"> Class n/a (likely Class A, Class B and Class C1) 	Potential SCL	Grazing	Grazing
Bowen Gas Pipeline	580 km pipeline	Unknown	Present <ul style="list-style-type: none"> Class A Class B Class C1 	Potential SCL	Grazing	Grazing

Project	Estimated Area	Life of Project	GQAL	SCL	Existing Land Use	Proposed post mining land use
Bowen Gas Project	Study area: 10,000 km ²	35 years	Present <ul style="list-style-type: none"> • Class A • Class B • Class C1 	Potential SCL	Grazing/ Cropping	Grazing

Class: arable (A), limited arable (B), pastoral (C) and non-agricultural (D).

21.3.1.3 Assessment

The proposed mining and infrastructure projects listed in **Table 21-2** will all directly impact on land of agricultural value. GQAL appears to be present across the majority of project areas. The areas of Class A and Class B are limited. The majority of land is Class C, which is suitable for grazing activities. Small areas of SCL have been identified on some of the sites through Queensland Government mapping of SCL management areas; however, it is not known if validation has been undertaken for any of these areas.

The mining projects have an expected life of mine in the order of 20 to 50 years with the planned post mining land use being return to agriculture in the case of each mine. This requirement to rehabilitate is placed on mining through the environmental authority (mining activities) issued under the Queensland Environment Protection (EP) Act, and mining proponents are required to lodge financial assurance against achievement of rehabilitation requirements. However, some degradation of agricultural productivity can be expected particularly for open cut projects.

The infrastructure projects are likely to be present for longer periods, with the potential Connors River Dam (currently deferred) effectively permanent. The proposed rail and gas projects have limited impact on agricultural productivity provided that access and stock movements are not overly restricted.

In the context of the area of agricultural land that may be affected, the projects range in size from about 1,205 hectares to approximately 17,500 hectares.

The cumulative area of these proposed projects represents a relatively small loss of land resources at a regional or state level, given the widespread availability of similar agricultural land resources across the region, agricultural productivity is not expected to be significantly reduced or disrupted.

Further, the more significant agricultural lands within the Bowen Basin are large tracts of arable rainfed broad acre cropping situated on the flood plains of the Isaac, Mackenzie, and Comet rivers. These areas are located to the south of the considered mining operations within the northern Bowen Basin.

Strategic cropping land is limited in the considered area. Cropping is present but is confined to areas of more fertile soils and where the use of agricultural machinery is not constrained by difficult topography.

The need to balance agricultural production with mining activities, and the economic benefits of mining are identified in State government policies and regional statutory plans. Alternative locations for mining activities are not generally available as location is driven by the presence of a viable resource. Principle 4.3.1 of the Mackay, Isaac and Whitsunday Regional Plan provides for '*Mineral, petroleum and extractive resources to be managed for current and future use, and their extraction, processing, transport and downstream value-adding continue to contribute to the economy*'.

Overall, while some cumulative loss of agricultural land can be expected, this loss is balanced by economic benefits from mining activities, and is not likely to significantly reduce overall agricultural productivity when considered at a regional or state level.

21.3.2 Scenic Amenity

21.3.2.1 Regional Cumulative Impacts

At the regional scale the overburden landforms typically associated with current and previous open cut mining are the most significant non-natural visual elements in the landscape. However, the proposed underground RHM will not result in the creation of any new overburden landforms and therefore will not contribute to the cumulative regional impacts associated with the overburden landforms.

The project will be utilising existing services; power, water, and roads, thus potential cumulative impacts at a regional scale will be negligible.

21.3.2.2 EIS Study Area Localised Cumulative Impacts

The scenic amenity assessment has determined that the potential visual impacts of the proposed mining and infrastructure components of the project will be low to negligible. The above ground infrastructure elements associated with the GRM incremental expansion will be similar in visual character and scale to the existing infrastructure associated with current mining at GRM, BRM, and North Goonyella Mine. The infrastructure elements will generally not be visible from Red Hill Road, which is the only public road in the vicinity of the project. Consequently the contribution of the above ground infrastructure to the cumulative impacts of existing mining operations in the vicinity of the site will be very low. The construction of a proposed flood levee around the proposed Red Hill MIA will have only localised visual impact and will not contribute to altering the broader landscape. Further discussion of the proposed levee design and visual impact is provided in **Section 5.2**.

Vegetation clearing and installation of the proposed incidental gas management infrastructure will contribute to the cumulative impact of other vegetation clearing in the vicinity of the project. However, the relative limited extent of (additional) clearing and the proposed revegetation program will result in re-establishing the grassland and riparian vegetation characteristic of the existing (modified for agriculture) landscape in the area. The longer term cumulative visual impacts are therefore expected to be minimal.

21.3.3 Surface Water Resources

21.3.3.1 Water Quality

The project is located just inside the catchment boundary for the Isaac River, which is a major tributary within the Fitzroy basin. The Fitzroy basin is the largest catchment in Queensland draining into the Pacific Ocean and also the largest catchment that drains to the Great Barrier Reef, although it does not contribute significant freshwater flows to the coastal environment when compared to river systems further north.

In 2008, the Queensland Government undertook an investigation into the cumulative effects of coal mining in the Fitzroy River basin on water quality (EPA 2009). The investigation found that:

- There were inconsistencies in discharge quality limits and operating requirements for coal mine water discharges as imposed through environmental authorities.
- In some cases, discharge limits and operating conditions of coal mines were not adequately protecting downstream environmental values.

These conclusions led to a number of inter-related actions by Queensland Government and other stakeholders:

- Water quality objectives were developed for the Fitzroy Basin and added to Schedule 1 of the *Environmental Protection (Water) Policy 2009* (EPP (Water)) in October 2011.
- Model water conditions were developed for coal mines in the Fitzroy basin (DERM February 2012). These model water conditions are designed to manage water discharges to meet the water quality objectives set out in the EPP (Water) and to provide consistency between mining operations in the Fitzroy basin.
- Environmental authorities for a number of mining operations were amended to introduce conditions consistent with the model water conditions.
- A number of mining operations entered into Transitional Environmental Programs (TEP) under the EP Act. These TEPs were focussed on actions that would allow mines to achieve compliance with new environmental authority conditions and upgrade operating conditions.

With these measures in place, a strong strategic and policy framework is now in place for management of cumulative water quality impacts from mining activities. This framework allows for management of individual mining activities in such a way that overarching water quality objectives can be achieved.

Mine water from the proposed Red Hill Mine and Broadmeadow extension will be managed through the existing Goonyella Riverside and Broadmeadow mining complex water management system as this allows water to be reused in coal handling and preparation. The environmental authority EPML00853413 (formerly MIN 100921609) for the GRB mine was amended in October 2011 to bring it into line with the model water conditions, with discharge conditions and in-stream trigger levels aligned with water quality objectives in the EPP (Water). Using a mine water balance model, an analysis has been undertaken of the effect of water from the proposed RHM on the ability of GRB mine to maintain compliance with environmental authority conditions (**Section 7.3.4**). This analysis indicates that the addition of mine water from the RHM makes no difference to the compliance profile for GRB and is negligible in terms of salt load to the Isaac River.

While the EPA cumulative impact assessment of mining in the Fitzroy Basin focussed on salinity as the key water quality issue related to mining activities, surface disturbance associated with mining activities can result in erosion and increased sediment levels in surface waters. The Great Barrier Reef outlook report also identified that the Fitzroy Basin contributed one of the highest sediment loads to the reef, largely attributing sediment loads to use of land for agricultural activities (GBRMPA 2009). Water quality data presented in **Section 7.2.6** indicates that suspended solids and turbidity in the upper Isaac River and local tributaries are in excess of water quality objectives and hence, cumulative assessments must consider additional sediment inputs.

The Queensland Government commissioned an assessment of mine affected water releases in the Fitzroy River basin during the 2012–2013 wet season. The report, prepared by consultants Gilbert and Sutherland, concluded that the Fitzroy as a whole is not currently ‘at capacity’ in terms of salt load at a catchment or sub-catchment scale.

The water quality assessment undertaken for the project has identified that sediment inputs can be controlled through drainage, erosion and sediment control measures. Depressions created by subsidence will also tend to trap sediment until the depressions are in-filled (a matter of decades) and while this will mitigate effects of any erosion across the mine footprint, it is unlikely to create a significant reduction in sediment load in the lower Isaac River and Fitzroy system. On this basis, the proposed project is not expected to make any significant contribution to cumulative sediment loads in the Fitzroy River Basin.

Given that the GRB mine water releases are being managed within an overarching strategic framework for management of cumulative impacts of mining activities, the proposed management approach for mine water from the project is expected to have negligible cumulative impact on surface water quality and associated environmental values.

21.3.3.2 Subsidence

In 2009, the then DERM, BMA and Anglo Coal undertook a cumulative impact assessment of the combined effects of subsidence of the Broadmeadow underground mine (BMA) and Moranbah North mine (AAMC) (Alluvium 2009).

The Isaac River Cumulative Impact Assessment (IRCIA) developed and quantified impacts from subsidence and associated geomorphic response of the Isaac River across all the existing and proposed underground mine plans that were planned to extend beneath the Isaac River as they were known in 2007. While the current mine plan for the future RHM includes a different configuration of longwall panels, and potentially a greater depth of subsidence, the overall findings of the IRCIA remain relevant. The length of time within which subsidence troughs along the Isaac River can be expected to fill in will potentially increase from the IRCIA predictions because of the increased subsidence depth, however there is still a moderate probability that these troughs will infill during the life of the mine. Geomorphic effects are not significantly different.

The IRCIA identified that while there is potential for impacts on the Isaac River as a result of mine related subsidence, none were determined to be significant in terms of instigating long term large scale geomorphological change. Subsidence voids in the river channel based on the then current mine plans when considered on a reach scale were predicted to have close to 50 per cent or greater probability of infilling during the period of mining. Overall, subsidence voids were predicted to be infilled within 20 years after the cessation of mining on the Isaac River unless there is a substantial reduction of sediment inputs from the Isaac River catchment. Within the mining period however, risks were identified to bed and bank stability along the 28 kilometre reach considered, such as potential for river bed deepening of up to 1.8 m and subsequent widening through bank erosion. Such impacts are presently being managed for existing mining operations at the local scale with soft engineering solutions such as timber pile fields and vegetation being implemented at BRM and Moranbah North mine.

BMA and Anglo Coal are currently engaging with Queensland Government agencies in relation to updating the IRCIA to take into account current mine plans for underground mines. This will include the current mine footprint for BRM and the future RHM.

21.3.3.3 Flooding

A flooding assessment of the project was undertaken (**Section 7.3.3**). The study took into account any existing structures that may affect flood behaviour as well as structures proposed for the project. There are no known projects in the planning or development phase that might result in additional structures on the floodplain in the vicinity of the project. Cumulative impacts on flooding are not expected to lead to any adverse impacts on human populations, property or other environmental or social values.

21.3.3.4 Surface Water Flows

The major influence on water flows in the Isaac River is the Burton Dam, located upstream of the Red Hill Mining Lease. The Connors River Dam on the Connors River will also influence flows in the McKenzie River below the confluence of the Isaac River once it is operational. Both projects have been addressed in water resource planning as documented through the *Water Resource (Fitzroy Basin) Plan 2011*. There are no other major storages on the Isaac River. In Queensland, the water resource planning process focussed on balancing water extraction and use with protection of ecosystems and takes into account cumulative impacts from major water storages and extraction.

The project does not require any additional raw water allocations and therefore does not contribute to cumulative impacts in relation to extraction of surface water resources.

Depressions created by subsidence will trap overland flow and in-channel stream flows until such time as sediment carried by these flows in-fills the depressions, which is estimated to occur over a matter of decades for the Isaac River. For the 12 Mile Gully tributary, sediment load is lower and permanent ponds are expected to arise. These will retard flows in 12 Mile Gully and discharges from 12 Mile Gully to the Isaac River. Assessment has indicated that there will be no measurable change in water resources when considered against flow objectives established in the *Water Resource (Fitzroy Basin) Plan 2011*; however, some localised effects may occur. Mitigation measures have been proposed to lower the water levels in subsidence troughs by creating overflow channels, if necessary, with the requirement for this to be determined post-subsidence. In any case, the proportion of water that may be retained is negligible when considered against environmental flow objectives in the Isaac River and is unlikely to make any measurable difference at downstream nodes. Given that mitigation measures are available to address the reduction in flow associated with containment of water in subsidence troughs, cumulative impacts on flows in the Isaac River and downstream rivers are not expected.

21.3.4 Groundwater

Cumulative impacts to groundwater resources have been assessed considering other coal mining operations in the immediate vicinity of the project. Predictive groundwater modelling was conducted for the project but did not include consideration of future mine operations. The project will increase impacts on the available groundwater resources within the Bowen Basin groundwater study area by increasing groundwater extraction via mine dewatering and incidental mine gas drainage.

Groundwater in the area is limited in both quality and quantity and aquifers are compartmentalised by regional faults. This limits potential for regional-scale drawdown effects and also limits the extent to which existing users may be impacted by cumulative impacts.

Dewatering activities from the coal mining projects proximal to the project will have varying impacts on regional groundwater levels depending on mine plans, schedule, and IMG management requirements.

Due to the low permeability of the Moranbah Coal Measure coal seam aquifers, marked alterations to groundwater levels (drawdown) are restricted proximal to the proposed RHM footprint with drawdown impacts expected to be limited to a zone of around four kilometres from the proposed mine. Based on the uniformity of the geology and that all coal mining proximal to the project target the same coal measures, the extent of drawdown around existing mines is considered to be on a similar scale.

The impact of mine dewatering around the projects is dependent on groundwater heads (gradient) and permeability.

The impact of additional mines, adjacent and along strike, where predicted drawdown cones overlap will result in an increase in the drawdown in groundwater level. The extent of the drawdown cones is governed by the hydraulic conductivity.

Dewatering impacts (drawdown cones) are predicted to elongate north and south, within the more permeable units (the coal seam aquifers). The cumulative impact of adding the additional mine dewatering will result in deeper drawdown where drawdown cones overlap and further elongation along strike.

The cumulative impacts to groundwater resulting from the project and the existing mining operations in the vicinity (GRM, BRM, Moranbah North, and North Goonyella Mine) were assessed based on the conceptualisation of multiple mines, as discussed above. The future RHM is located down-dip of GRM and down-dip and along strike of BRM. Moranbah North and North Goonyella Mine are located south and north respectively along strike in the Moranbah Coal Measures relative to the project. The cumulative impact of the existing mines will be to superimpose the drawdown of each mine along strike such that the Moranbah Coal Measures will be dewatered between the mines. The additional impact of the future RHM will be to increase drawdown in the Moranbah Coal Measures east of GRM and to the north east of BRM. This additional drawdown (five metre drawdown extent in the target seam) will extend to approximately four kilometres from the RHM underground footprint, encompassing part of the GRM and BRM mines to the west and southwest. The predicted drawdown will not impact on any private bores and no groundwater dependent species are located within the EIS study area.

After mining is completed, the groundwater system will re-adjust to the new aquifer conditions created through mining (i.e. alteration due to goaf). Groundwater levels and piezometric pressures within the regional aquifers will, over time, attain a new equilibrium level. The rate of groundwater level recovery will be slowed due to the ongoing mining operations at GRM.

As drawdown of five metres below steady state conditions (drawdown identified to have marked impacts on bore yields) is only predicted to extend some four kilometres from the RHM footprint, coal mines further along strike within the Moranbah Coal Measures (Grosvenor, Caval Ridge, and Eagle Downs) are outside of the RHM impact area. Other coal mines further afield from the EIS study area (Ellensfield, New Lenton, Daunia and Millenium), are well outside the RHM impact area and are separated by large fault systems. The faults, which displace units and compartmentalise aquifers, limit the extent of mine dewatering and depressurisation groundwater impacts.

Possible CSG projects could occur within the project impact zone created by dewatering and depressurisation at RHM. The additional depressurisation created by CSG operations would, similar to mine dewatering, create deeper drawdown where drawdown cones overlap and further elongation along strike. Drawdown in the hanging wall down dip of the operations will be limited towards the east due to the fault systems, which compartmentalise the coal resources. Groundwater use is limited to a

small number of private bores located to the east of the EIS study area. It is not anticipated that the drawdown will impact upon these bores, however make good arrangements would need to be made with these landowners if there is predicted to be an impact due to CSG operations.

21.3.5 Terrestrial Ecology

The project is located within the northern Bowen Basin subregion of the Brigalow Belt bioregion. The Brigalow Belt bioregion has been historically altered for agricultural activities. In addition, forestry, road development, mining and pipeline easements have further reduced and fragmented the area of remnant vegetation present. The current remnant vegetation in the bioregion is estimated at 42 per cent of the pre-clearing amount. This is lower than the estimated remnant vegetation extent within the subregion (57 per cent).

Some of the identified projects (**Table 21–1**) may have overlapping construction phases with the GRM incremental expansion and the RHM underground expansion option. The published impacts on remnant vegetation of the Eaglefield Coal Mine Expansion, Ellensfield Coal Mine Project, Grosvenor Coal Mine Project, Eagle Downs Coal Mine Expansion, Caval Ridge Coal Mine Project, Daunia Coal Mine Project, and Millennium Coal Mine combine to a total of approximately 3,500 hectares of remnant vegetation to be cleared. This represents 0.4 per cent of remnant vegetation within the subregion. This estimate includes approximately 940 hectares of *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) threatened ecological communities (TECs), endangered regional ecosystems (REs) or of concern REs. Given the similarity in environment of the other mining projects considered in the cumulative assessment, and the proximity of most of these projects to each other, it is expected that the threatened ecosystems impacted by their development will be similar to those impacted by the proposed project.

Cumulatively, direct and indirect impacts on native vegetation from mining projects will result in an increased overall loss or modification of remnant vegetation, including TECs and endangered and of concern REs, as well as habitat for species of conservation significance. In addition to further reduction in extent of these vegetation communities and habitat types, mining and linear infrastructure projects can block connectivity between major areas of habitat. A reduction in habitat connectivity may restrict opportunities for fauna to successfully seek food and water, breed and colonise new territories. Fragmentation of native vegetation also affects genetic diversity as breeding populations of animals cannot interact, and distribution of seeds and other plant propagules can also be restricted.

The RHM underground mine footprint extends under the Isaac River, as does the existing BMA Broadmeadow Mine and Anglo Coal Moranbah North Mine which are located downstream of the project, also along the Isaac River. The Isaac River is identified as an area of State significance as a wildlife corridor, although continuity of the corridor is reduced through the Broadmeadow Mine area as the Isaac River in this location was diverted in the early 1980s to allow for open cut mining to the west. Mitigation measures and rehabilitation plans have been proposed for the proposed Red Hill Mine to maintain and enhance this corridor during the mining activity which will limit further cumulative impacts on this corridor.

While the emphasis for projects is on minimising clearing or modification of native vegetation and habitat, for resource projects and linear infrastructure projects, avoidance of ecological values is not generally possible. Given this, the key mechanism in place for addressing cumulative impacts on native vegetation and habitat is the requirement for provision of offsets. Requirements for biodiversity offsets tend to increase the incentive for individual projects to minimise impacts on key biodiversity

values, as well as providing for maintenance of the areal extent of native vegetation communities and habitats in the medium to long term.

Under Queensland legislation, mining projects must offset impacts on State significant biodiversity values in accordance with the Queensland Biodiversity Offsets Policy. State significant biodiversity values required to be offset include:

- various categories of regional ecosystems including endangered and of concern REs, high value regrowth and threshold ecosystems;
- essential habitat for listed species of conservation significance;
- wetlands and watercourses, including riparian zones; and
- connectivity.

While provision of offsets by various projects will preserve the areal extent of remnant vegetation communities and habitats in the medium to long term, offset areas can take some time to reach levels of equivalent ecological function of the vegetation communities and habitats to be affected by development. Hence there may be a time lag in terms of replacement of habitat for animals of conservation significance. However, for mining projects, which represent the bulk of vegetation clearing in the region, clearing takes place progressively over the life of the mine and offset proposals are either provided up-front or progressively. This minimises the effect of this time lag. Apart from direct and indirect effects of vegetation and habitat clearing, there may be cumulative impacts arising from impacts such as increased levels of weeds and pests and additive effects due to injury or mortality of animals from vehicle movements. Mitigation measures are available to address these sorts of impacts at a project level and further mitigation to address these impacts on a cumulative basis is not required.

21.3.6 Aquatic Ecology

The impacts of the proposed development to aquatic ecology are discussed in detail in **Section 10** of the EIS. Aquatic ecosystem studies undertaken for the project and for BMA's GRB mine complex operations (BMA 2011) indicate that aquatic ecosystems in the vicinity of the EIS study area are slightly to moderately degraded and in some areas, heavily degraded. All natural drainage lines within the EIS study area and surrounds are ephemeral. The streams are characterised by unstable sediments, have limited aquatic vegetation, and few snags. No aquatic fauna species of special conservation significance were recorded during current or previous surveys. The ground survey of aquatic fauna assemblages in 2011 indicates taxa present are resilient and opportunistic species. Many of the macroinvertebrates are highly mobile and readily inhabit newly inundated waters. Fish exhibit breeding strategies associated with intermittent streams where populations flourish only during favourable conditions.

Given the similarity in land use and stream characteristics across the subcatchment, it is expected that this is also the case in proximity to other projects identified. The Isaac River catchment, within the Bowen Basin, is overlain by either mining leases, mining claims, or exploration permits (coal, petroleum and mineral).

Key impacts identified are:

- Impacts on aquatic ecosystems from multiple crossings of streams during installation of incidental mine gas management infrastructure.

- Impacts on water quality and consequent effects on aquatic ecosystems from release of sediments to surface waters. Release of sediments may occur as a result of mobilisation of soils from disturbed areas by overland flows as well as scouring at locations on watercourses disturbed by installation of infrastructure.
- Impacts on aquatic ecosystems if a large spill of hydrocarbons occurred in an area that drained to surface waters.
- Modifications to aquatic ecosystems within the underground footprint due to subsidence.

Other underground mining projects would have similar impacts on aquatic ecosystems, whilst open cut mining operations would not cause subsidence but may require watercourse diversion. Linear infrastructure projects would potentially cause sediment mobilisation and scouring of watercourses during the construction stage, with impacts diminishing during operations. Linear infrastructure projects and linear infrastructure within mining leases might also cause changes in fish passage depending on how infrastructure crossings of streams are designed and constructed.

Cumulatively, the most significant potential for degradation of aquatic ecosystems would likely arise from multiple crossings of streams by linear infrastructure as well as diversions of streams that are required for some mining projects (the proposed project does not require diversion). While subsidence modifies instream habitats, the nature of streams in the region is such that these modifications will tend to maintain current habitat conditions or potentially enhance habitat through the creation of pools.

Management measures have been identified for the project to avoid and minimise impacts on aquatic ecosystem values. These measures include adherence to State government policies and guidelines intended to protect fish habitat, fish passage and bed and banks of stream channels. State government policy and guidelines are also in place in relation to stream diversions. Design, construction and operation in accordance with these policies and guidelines by all mining and infrastructure projects will ensure that further degradation of aquatic ecosystems will be minimal.

21.3.7 Air Quality

While the proposed Red Hill Mine is predicted to make only a very minor contribution to dust emissions, cumulative impacts are considered in relation to adjacent mining activities operated by BMA and others.

The Peabody Energy North Goonyella underground mine and the Eaglefield open-cut mine are located to the north of GRB mine complex. Adjacent to the southern boundary of the GRB mine complex is Anglo Coal's Moranbah North underground mine. Anglo Coal has received Queensland government approval to develop the Grosvenor underground mine to the south of its Moranbah North operations with both mines utilising a common CHPP located at Moranbah North.

In order to assess the potential for cumulative impacts from BMA and non-BMA mining operations, dispersion modelling was undertaken. Information pertaining to operations not controlled by BMA was sourced from publically available information. Details of the emissions for each of the facilities are provided in **Appendix L**. For non-BMA operations, data was obtained from published EIS for each of the projects and hence, may not reflect actual dust emissions.

The cumulative impact assessment has explicitly included predicted emissions of dust from the following:

- GRB mine complex (BMA);
- the project (BMA);
- Eaglefield Mine (Peabody Energy); and
- Moranbah North Mine and Grosvenor underground mine (Anglo Coal).

21.3.7.1 Background Creep

A summary of the background creep due to the cumulative impact of emissions from both BMA and non-BMA mining operations, as well as the project is presented in **Table 21-3**. A contour plot is presented in **Figure 21-2**.

A comparison with results presented in **Table 21-3** and **Figure 21-2** for the GRB mine complex only, highlights the impact of open-cut mining activities associated with the proposed Eaglefield Expansion Project on receptors located in the north region of the local airshed.

21.3.7.2 Cumulative Future Air Quality Environment

A summary of the receptor locations at which exceedences of the relevant EPP (Air) objectives are predicted when cumulative impacts are considered is presented in **Table 21-4**. Additional results are presented in **Appendix L**.

A plot showing predicted impacts of cumulative emissions and comparing the EPP (Air) objective of 50 $\mu\text{g}/\text{m}^3$ for the 24-hour average concentration of PM_{10} for both the future mining scenarios and the cumulative future mining scenarios is presented in **Figure 21-3**. The influence of dust emission sources associated with the Eaglefield Expansion Project is evident by the extension of the 50 $\mu\text{g}/\text{m}^3$ contour northward of its future mining scenario location.

Modelled dust emissions from the project make a very minor contribution to overall dust levels.

Existing and proposed underground mining activities to the south of the GRB mine complex associated with the MNM and Grosvenor mine are predicted to have a minor impact.

Table 21-3 Background Creep of PM10 for the Cumulative Future Mining Scenario Based on the 70th Percentile 24-Hour Average Concentration of PM10

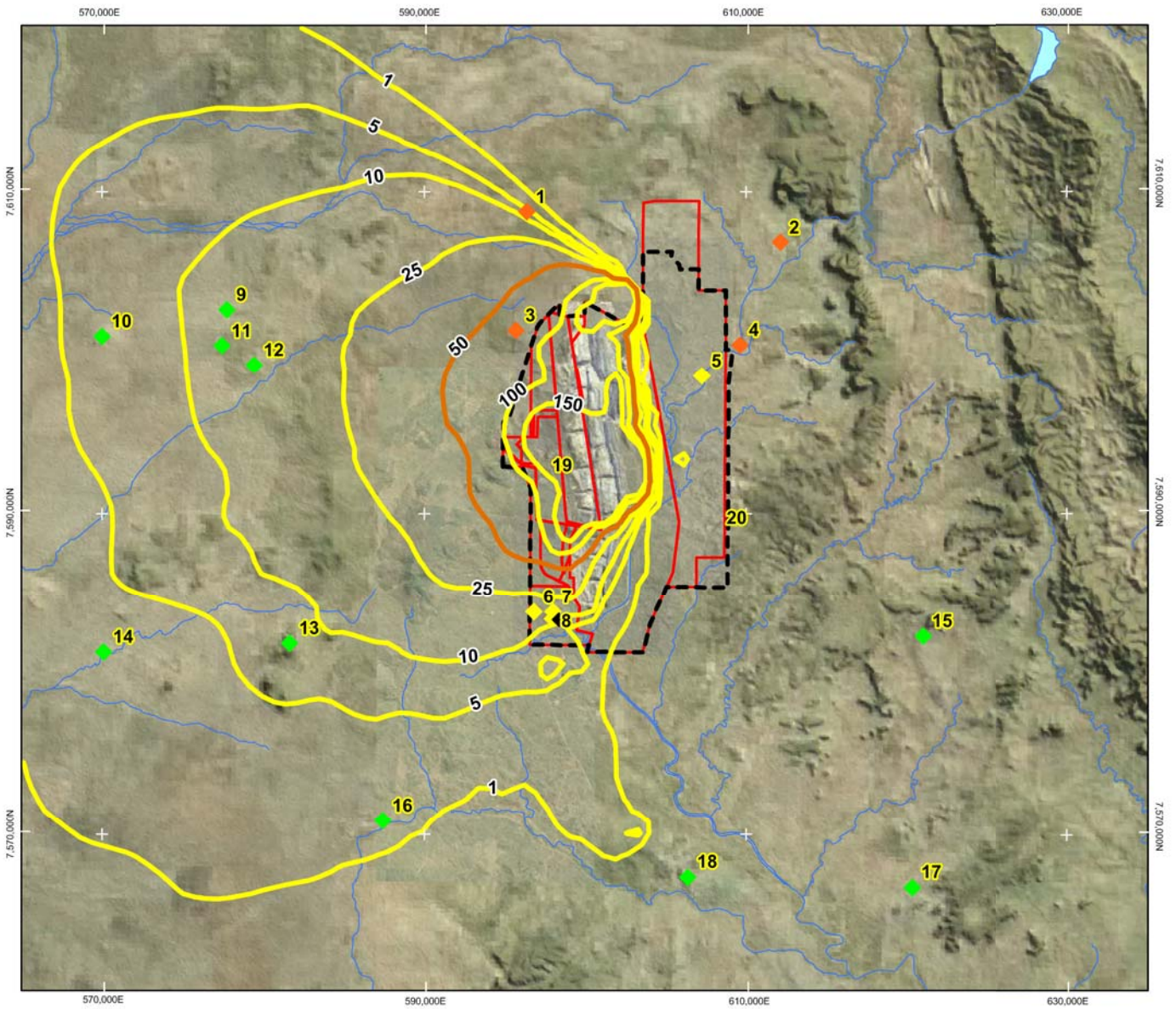
Receptor	Scenario FY2015	Scenario FY2030	Scenario FY2040	Scenario FY2050
R1 - Denham Park	0	0	0	0
R2 - Burton Downs	0	0	0	0
R3 - Lapunyah	65.8	55.5	41.8	39
R4 - Red Hill	0	0	0	0
R5 - Riverside Homestead	0	0	0	0
R6 - Broadmeadow Cottage 2	6.2	7.5	16.9	11.3
R7 - Broadmeadow Homestead	4.1	5.0	15.6	15.7
R8 - Broadmeadow Cottage 1	3.3	4.2	11.3	14.4
R9 - Kimberley	9.4	10.2	10.1	4.8
R10 - Wavering Downs	4.7	5.0	5.1	2.6
R11 - Sondells	9.1	9.8	9.7	4.8
R12 - Nibbereena	11.9	12.4	11.8	6.1
R13 - Pretoria	5	5.7	6.7	3.1
R14 - Wyena	1.6	1.7	2.0	1.0
R15 - Broadlea	0	0	0	0
R16 - Rugby	0.5	0.6	0.9	0.5
R17 - Watunga	0	0	0	0
R18 - Moranbah water treatment plant	0	0	0	0

Estimated background level of 29.6 µg/m³.

EPP (Air) objective is 50 µg/m³ not to be exceeded more than 5 days per year.

Table 21-4 Receptor Numbers Predicted to Exceed Pollutant Criteria at least once for the Future Mining and the Cumulative Future Mining Scenarios

Scenario	Receptor	Existing Mining Scenario			
		2015	2030	2040	2050
TSP Annual average	R3 - Lapunyah	√	√	√	√
	R1 - Denham Park	√	√	√	√
PM₁₀ 24-hour average	R2 - Burton Downs	√	√	√	√
	R3 - Lapunyah	√	√	√	√
	R4 - Red Hill	√	√	√	√
	R5 - Riverside Homestead	√	√	√	√
	R6 - Broadmeadow Cottage 2	√	√	√	√
	R7 - Broadmeadow Homestead	√	√	√	√
	R8 - Broadmeadow Cottage 1	√	√	√	√
	R9 - Kimberley	√	√	√	-
	R11 - Sondells	√	√	√	-
	R12 - Nibbereena	√	√	√	√
	R13 - Pretoria	√	√	√	-
	R16 - Rugby	-	-	√	-
	R18 – Moranbah Water treatment plant	√	√	√	-
	PM_{2.5} 24-hour average	R3 - Lapunyah	√	√	√
R5 - Riverside Homestead		√	√	√	-
R7 - Broadmeadow Homestead		-	√	√	-
R8 - Broadmeadow Cottage 1		-	-	√	-
PM_{2.5} Annual average	R3 - Lapunyah	√	√	√	√
	R6 - Broadmeadow Cottage 2	√	√	√	√
	R7 - Broadmeadow Homestead	√	√	√	√
	R8 - Broadmeadow Cottage 1	-	√	√	√
Dust Deposition Monthly average	R3 - Lapunyah	√	√	√	√



Mines included: GRM, BRM, RHM, EFM, Grosvenor and MNM.

- BMA Tenure/Tenement
- EIS Study Boundary
- ◆ Receptor Location - BMA/BMC controlled
- ◆ Receptor Location - Privately Owned Homestead
- ◆ Receptor Location - Privately Owned Homestead (subject to negotiation with landowner)
- Background Creep 24 hr Average PM₁₀ Concentration (µg/m³)
- The EPP (Air) Objective (50 µg/m³)



0 5 10 15Km

Scale 1:400 000

Datum: GDA 94, MGA Zone 55

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RED HILL MINING LEASE
ENVIRONMENTAL IMPACT STATEMENT

**BACKGROUND CREEP OF THE 24-HR
AVERAGE CONCENTRATION OF PM₁₀
DUE TO CUMULATIVE IMPACTS,
FY2040**



CUMULATIVE IMPACTS

Figure: 21-2

File No: 42627136-g-1132b.wor

Drawn: VH

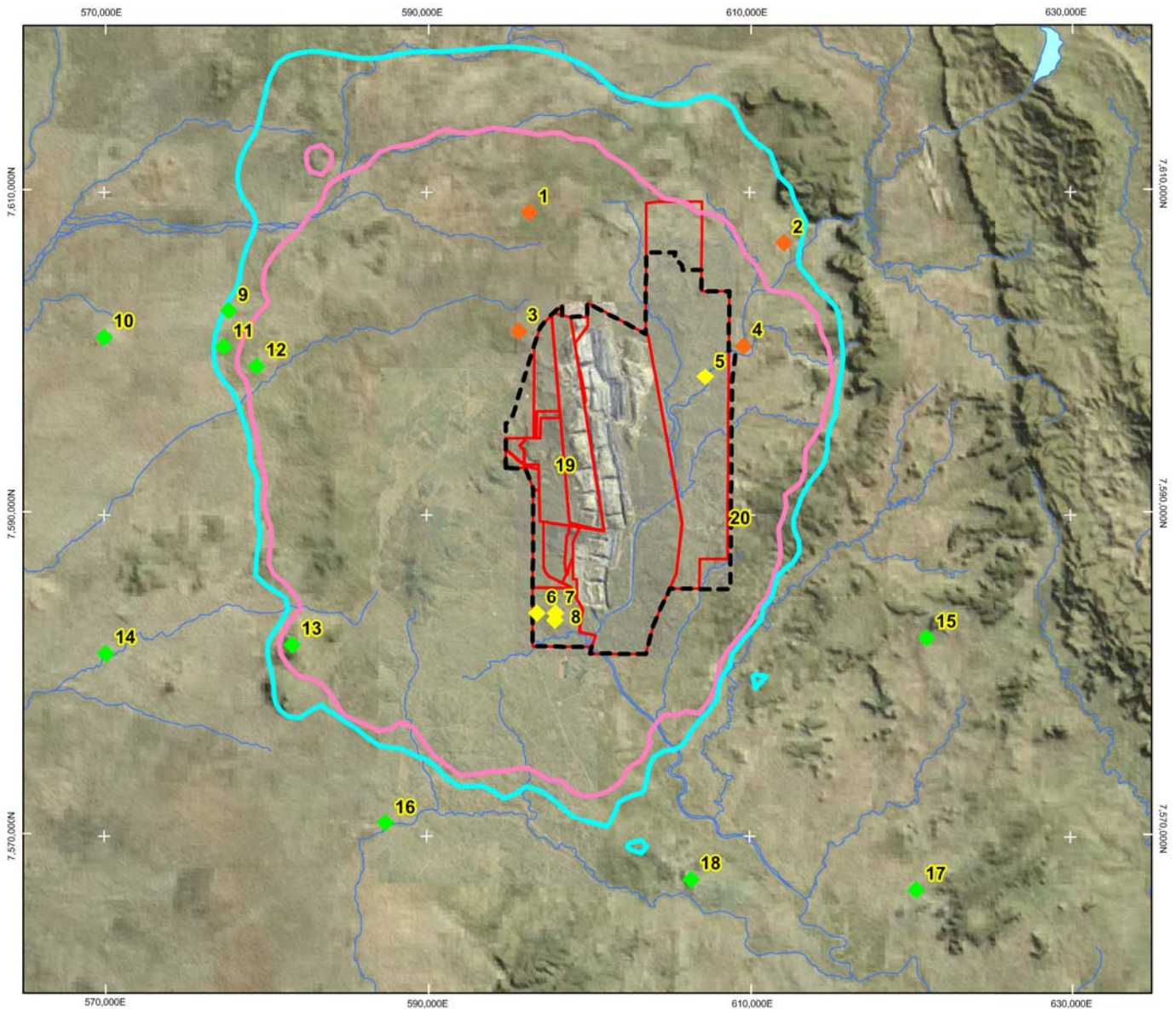
Approved: CT

Date: 29-10-2013

Rev. B

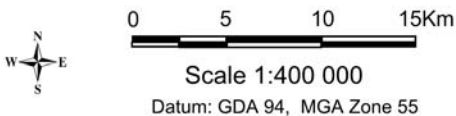
A4





Mines included: GRM, BRM, RHM, EFM, Grosvenor and MNM.

- BMA Tenure/Tenement
- EIS Study Boundary
- ◆ Receptor Location - BMA/BMC controlled
- ◆ Receptor Location - Privately Owned Homestead
- ◆ Receptor Location - Privately Owned Homestead (subject to negotiation with landowner)
- Future Environment, FY040
- Cumulative Future Environment



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RED HILL MINING LEASE ENVIRONMENTAL IMPACT STATEMENT

THE 5TH HIGHEST 24-HR AVERAGE CONCENTRATION OF PM₁₀ FOR FUTURE MINING AND CUMULATIVE FUTURE MINING SCENARIOS, FY2040



CUMULATIVE

Figure: 21-3

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Approved: CT

Date: 29-10-2013

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21.3.8 Noise and Vibration

Cumulative noise impacts relating to existing noise generating activities are inherently assessed through the background creep (LA90) and specific/intrusive criteria (LAeq) contained in the Department of EHP's *Planning for Noise Control* guideline. Both criteria take into account the existing measured ambient noise level in an area from all existing mining activities and other noise sources such as road and railway traffic.

The *Planning for Noise Control* assessment methodology is based on the existing ambient noise monitoring which was undertaken at eight locations surrounding the EIS study area and comparison to recommended ambient noise levels. Hence, it takes account of cumulative impacts from existing operations and activities.

Cumulative noise from the existing industry and other noise sources, together with the project, were assessed against the recommended ambient noise levels given in the *Planning for Noise Control* guideline. Where the existing ambient noise levels were already near to or above the recommended noise levels, the associated criteria for the allowable noise emissions were set lower to prevent overall noise emissions from increasing above (or further above) the recommended levels.

The following projects have been considered during the cumulative noise impact assessment:

- Eaglefield Coal Mine Expansion – Peabody;
- Grosvenor Coal Mine – Anglo American;
- Bowen Gas Project – Arrow Energy; and
- Bowen Gas pipeline – Arrow Energy.

All other proposed projects from **Table 21-1** are at a distance from the project which is considered to be acoustically negligible and as such have no noise impact to the sensitive receptors surrounding the project, or conversely the predicted contributions from the project will be inaudible when compared to the contributions from much closer surrounding proposed projects.

21.3.8.1 Eaglefield Coal Mine Expansion

The proposed expansion of the existing open-cut mining operations at Eaglefield Coal Mine is proposed to increase production capacity from 5 to 10 mtpa. The proposed expansion will utilise existing open-cut coal operations (truck and shovel and in pit crusher/conveyor system).

A review of the predicted noise emissions from the proposed Eaglefield Coal Mine Expansion (as detailed in **Section 13**) notes that in all cases, the predicted maximum noise level at Lapunyah, Denham Park, Dabin, Burton Downs and Red Hill homesteads from the Eaglefield Coal Mine Expansion project is greater than the predicted maximum noise level from the proposed activities associated with the projects GRM incremental expansion and RHM underground expansion option at the same locations. When combining the predicted noise emissions from the project and the proposed Eaglefield Coal Mine Expansion, exceedences of the relevant project noise criteria are predicted at Dabin, Denham Park and Lapunyah by a marginal 1 to 3 dBA. The cumulative noise levels at these sites are dominated by the proposed Eaglefield Coal Mine Expansion, with increases of 1 dBA or less due to the proposed project. This would typically be considered an acoustically negligible change and thus no additional mitigation or management is required.

21.3.8.2 Grosvenor Coal Mine

The Grosvenor mine is an underground coal mine to be located south of the existing Moranbah North Mine. The proposed mine will utilise existing surface facilities at Moranbah North Mine including their existing coal handling and preparation plant.

As the Grosvenor Mine will utilise existing surface facilities, and the main new surface facilities are to be located to the south of Moranbah North Mine, it is considered that noise emissions from the proposed mine will be no greater than the noise emissions from the existing Moranbah North Mine. The existing ambient noise monitoring undertaken for the project has inherently captured noise contributions from Moranbah North Mine (where applicable) and hence any cumulative noise impacts from this project will be negligible.

21.3.8.3 Bowen Gas Project

An IAS and EIS have been prepared for the Bowen Gas Project by Arrow Energy. Although the review of these documents showed that Petroleum Leases overlap with the proposed project's EIS study area, the location of any acoustically significant sources (i.e. compressors and/or gas wells) associated with the Bowen Gas Project could not be ascertained from the IAS or EIS. Therefore, potential for cumulative noise impacts cannot be commented on at this stage of the proposed project.

21.3.8.4 Bowen Gas Pipeline

An IAS and EIS has been prepared for the Bowen Gas Pipeline by Arrow Energy. The location of the pipeline runs within a distance of approximately six kilometres (at its nearest point) from the EIS study area (in a north-south alignment).

Construction of this pipeline is proposed over an approximate three month period, from the clear and grade phase through to the rehabilitation phase. There is the potential for cumulative noise impacts at sensitive receptors along the eastern side of the proposed project (i.e. Burton Downs, Red Hill, and Riverside), however, this will ultimately depend on the location of the pipeline route, proposed construction fleet, hours of operations, and distance to these receptors. Such impacts would be short term.

21.3.9 Traffic, Transport and Infrastructure

21.3.9.1 Roads - Construction Phase

As it is difficult to estimate traffic volumes at the feasibility stage, conservative assumptions have been made, leading to a likely over-estimation of traffic volumes. Should the project detailed design result in significantly different traffic volume estimates, it may be necessary to review the traffic assessment. The assessed traffic generation of the construction phase is based on an up to 100 per cent remote workforce, which will reside in the proposed Red Hill accommodation village and typically working 12 hour shifts, generally operating on a three weeks on/one week off roster. A peak of 2,000 construction workers may be required. It is anticipated that at the start and end of rostered periods, the up to 100 per cent remote workforce will transit through Moranbah Airport. However, in order to present a worst case scenario in terms of road usage for the road impact assessment, it was assumed that 75 per cent will transit through Moranbah Airport and 25 per cent will transit through Mackay.

Personnel will be transported between the Red Hill accommodation village and mine site by bus at the start and end of each shift.

During the construction phase, a daily average of 19 two-way delivery trips (heavy vehicles) to site is anticipated. Although these will generally occur outside of peak hours, a conservative allowance has been made for five two-way delivery trips to occur during peak hours when completing the road performance assessment. At this stage, it is not known if any over-dimensional loads will be required.

To provide an additional level of conservatism within the traffic modelling for the EIS, a traffic generation 'factor of safety' for traffic modelling was incorporated. An additional 75 light vehicle peak hour return trips (i.e. 75 light vehicle movements to the EIS study area and 75 light vehicle movements from the EIS study area) was included each way between Moranbah and the EIS study area. This ensures that the performance of the road network is unlikely to be worse than that presented herein.

In summary, during the construction phase the following peak hour one-way trips have been modelled for the performance assessment of the road network:

- Red Hill accommodation village ↔ various Red Hill Mining Lease components: 76 buses per peak hour (personnel);
- Red Hill accommodation village ↔ Moranbah Airport: 6 buses per peak hour (personnel);
- Red Hill accommodation village ↔ Mackay: 18 light vehicles per peak hour (personnel);
- Moranbah ↔ EIS study area: 150 light vehicles per peak hour (factor of safety); and
- Mackay ↔ EIS study area: 10 heavy vehicles per peak hour (deliveries).

21.3.9.2 Roads - Operation Phase

The traffic generation profile for the operational workforce is the same as the construction phase; however, based on current assumptions, up to a peak of 1,500 operational personnel on a one week on/one week off roster will be required during the operations phase when the proposed mine is at full production.

During the operations phase, a daily average of three two-way deliveries (heavy vehicle) to site is anticipated. However, for modelling purposes allowance has been made for five trips to occur during peak hours. Over-dimensional vehicles are not generally anticipated except during major maintenance activities.

As it is difficult to estimate traffic volumes at the feasibility stage, conservative assumptions have been made, leading to a likely over-estimation of traffic volumes. An additional 75 light vehicle peak hour return trips were included between Moranbah and the EIS study area. This assumption provides an additional level of conservatism within the traffic modelling and ensures that the performance of the road network is unlikely to be worse than that presented herein. Should detailed design studies indicate that the traffic generation is significantly different than that presented in this study, then the road impact assessment may be reviewed.

Therefore, during the operation phase the following peak hour one-way trips have been modelled:

- Red Hill accommodation village ↔ EIS study area: 38 buses per hour (personnel);
- Red Hill accommodation village ↔ Moranbah Airport: 8 buses per hour (personnel);
- Red Hill accommodation village ↔ Mackay: 26 light vehicles per hour (personnel);

- Moranbah ↔ EIS study area: 150 light vehicles per hour (factor of safety); and
- Mackay ↔ EIS study area: 10 heavy vehicles (deliveries) per hour.

Given the potential for an overlap with the construction workforce and operations workforce, the traffic assessment has considered the traffic impacts of the 2,000 peak construction workforce with a peak 1,000 person operations workforce. This results in a potential peak overlap workforce of 3,000 which presents a worst-case scenario.

The performance analysis undertaken for the five scoped intersections identified that the Goonyella Road/Riverside Access Road and Goonyella Road/Red Hill Road intersections will continue to operate within generally accepted performance thresholds irrespective of the GRM incremental expansion and RHM underground expansion proceeding.

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 the timing for the RHM underground expansion option and associated GRM incremental expansion. It is therefore reasonable for the proponent to make a proportionate contribution towards upgrade costs (but not fully fund) once the project owners have determined that the project will proceed and have determined the final staging for execution.

21.3.9.3 Air

BMA has recently developed new and upgraded facilities at the Moranbah Airport to accommodate recent, and expected further, increases in demand for travel to and from Moranbah. Air traffic associated with the project is proposed to utilise Moranbah Airport. At peak operations, the project would result in approximately 30 additional round trips per week.

21.3.9.4 Rail

It is not expected that rail transport will be utilised during the construction stage.

For operations, it is intended that 100 per cent of coal mined at the future RHM will be transported to port facilities by rail. When operating at peak production (14 mtpa), four to five trains will be required each day, with a nominal train capacity of 12,000 tonnes and loading time of 2.5 hours per train.

The GRB mine complex is serviced by an Aurizon rail network, the Goonyella System, which transports coal from two existing rail loops on the west of the mine complex to the existing Hay Point, Dalrymple Bay and Abbot Point Coal Terminals for shipping. A conveyor will be constructed from the Red Hill CHPP to the Riverside rail loop and a new dedicated train load-out facility provided for Red Hill coal. BHP Billiton is currently undertaking an expansion of its existing coal export facilities at Hay Point and coal from the future RHM would be exported through this terminal and the Dalrymple Bay and Abbot Point Coal Terminals

21.3.9.5 Shipping

As discussed in **Section 3** of this EIS, product coal from project will be railed to the Hay Point coal export terminals for shipping.

The additional product coal from the project will require approximately 150 extra ships per year to transport the product to market. Current expectations are that shipping will be spread across Handymax, Panamax, Small Cape, and Large Cape vessels of approximate sizes of 50,000 dead weight tons (dwt), 80,000 dwt, 150,000 dwt, and 220,000 dwt, respectively.

A strategic cumulative impact assessment of potential shipping impacts associated with its Bowen Basin coal projects has been recently completed. BHP Billiton developed the study in association with other project proponents and the North Queensland Bulk Ports Corporation.

21.3.9.6 Regional Infrastructure Provision

Moranbah and the broader Mackay Statistical District (SD) have experienced significant public and private investment in infrastructure as a direct result of the growth in the resources sector. Looking forward, the project growth in mining activity in the Mackay SD is expected to result in population growth in the region and subsequent high demand for built and social infrastructure. Social infrastructure requirements and mitigation measures are addressed in the Social Impact Assessment (**Section 18** of this EIS).

The projected population of the Isaac LGA, based on medium estimates by the Government Statistician, is 34,270 persons in 2026 and 37,000 persons in 2031. This reflects a growth of 58.96 per cent between 2011 and 2031, or an average annual growth rate of 2.35 per cent per annum. By comparison, Mackay SD and Queensland are expected to grow on average 2.22 per cent and 1.80 per cent per annum respectively between 2011 and 2031 (Government Statistician, 2012).

These population projections have significant implications for the planning and delivery of infrastructure, occurring across all three levels of government, as well as within private organisations such as mining and resources companies who play a key role in meeting infrastructure demands. Demand for infrastructure is likely to occur across all areas of built infrastructure, including transport (roads, rail and airport), water and energy (electricity and gas) and social infrastructure, including education facilities, health care, emergency services and recreation. Broad infrastructure planning principles, policies and programs for the Mackay SD are provided in the Mackay, Isaac and Whitsunday Regional Plan (DLGP 2012).

It is important to note that even without growth in the resident population there would still be additional demand for built infrastructure, such as airports, water and energy as a result of mining projects and the associated non-resident population growth.

In 2011, the Queensland Resources Council (QRC) commissioned a study into the growth of the Queensland resources sector which, among other things, looked into infrastructure requirements.

This study considered factors such as energy demand and supply across Queensland and found that while immediate activities by the Queensland resources sector between 2011-12 and 2014-15 can be met with existing regional power generation capacity, or with the proposed new generation projects, beyond 2015-16 regional energy capacity falls short of forecast demand (QRC 2011) and at least another two medium/large power plants would be required to support the emerging base load (QRC 2011).

With respect to transmission, the QRC study found that development in the Bowen Basin is expected to increase demand from 667 megawatts in 2014-15 to 2,660 megawatts in 2020-21, indicating that the basin is the largest demand resources hub in Queensland (QRC 2011). It is expected that the current network development projects in Central Queensland will not be sufficient to support the

anticipated demand, and the intended development of the Bowen Basin may require additional 275 kilovolt lines or a transmission upgrade to 500 kilovolts from Stanwell or Broadsound to the basin, and/or onsite coal or gas power generation alternatives.

The funding arrangements for such infrastructure would depend on the infrastructure required, as well as the timing and location of the infrastructure; however, it is expected that funding would come from user contributions on new power supply agreements.

The forecast demand for water in the Bowen Basin is 44,500 megalitres of water in 2015 and 77,500 megalitres of water by 2020 (Queensland Resources Council 2011). There are a number of existing and proposed water sources for this part of Central Queensland. Accordingly, additional network infrastructure to transmit the forecast demand will be required in order to ensure that enough water can be delivered in time to meet projected demand in the Basin (Queensland Resources Council 2011). Overall, it is expected that water supply will be able to expand to meet the projected increase in demand.

While acknowledging the broader constraints regarding water supply in the region, BMA owns its own water assets in the Bowen Basin to service mining operations, and has existing water allocations to address water requirements and therefore this project is not expected to directly contribute to the cumulative forecast water supply or infrastructure demand.

21.3.10 Waste Management

The project will generate solid and liquid wastes, and while every effort will be made to minimise, reuse, or recycle waste on-site some waste materials will be removed from site by a licensed contractor for treatment and/or disposal offsite at licensed recycling or disposal facilities.

It is reasonable to assume that other mining projects developed in the region will generate comparable waste types and quantities and adopt a similar management approach.

Regional development would likely increase demand for collection, transport, and recycling services for items such as waste oil, oil filters, tyres, and drums. As waste management is generally through commercial contractors, this increase is likely to stimulate a growth in services to cater for the increased demand rather than create negative impacts.

Additionally, a number of proposed mining projects in the region intend to utilise the existing Moranbah Landfill as the preferred disposal solution, which may cause strain on existing infrastructure and more rapid depletion of available space within the landfill. However, this landfill service is offered on a commercial basis, and payments from proponents to dispose of waste into the landfill can be utilised to maintain and develop landfill capacity. Should further local landfill capacity not be available, it is expected that commercial waste management contractors will be able to transport wastes to other disposal facilities at each proponents' cost.

Wastes generated from the linear infrastructure projects listed in **Table 21-1** will generally be highest during construction, and the main wastes typically generated by projects of this sort are vegetation waste, excess spoil and minor quantities of hydrocarbon wastes. As the proposed project will not generate spoil or vegetation requiring off-site disposal, cumulative impacts in relation to this type of waste are not expected. Hydrocarbon wastes from the linear infrastructure projects would be in small quantities and generated in the short term, and cumulatively, this is not expected to create any problems for existing waste management services.

On the basis of Queensland's established legislative framework and mature private sector waste management industry, it is expected that all wastes generated by projects in the region will be able to be managed within regulatory requirements.

21.3.11 Social

21.3.11.1 Community Characteristics and Gender Diversity

Indirect population growth within the Mackay, Isaac and Whitsunday (MIW) Region is likely to occur as the cumulative result of industry growth and the associated stimulation of those sectors which support resources production, as well as intermediate industries that provide inputs into the production of goods and services. There may also be a need for local businesses to recruit from outside the MIW Region to replace workers that are drawn to the project. This indirect population growth can be seen as part of natural population growth in the region, and in accordance with the MIW Regional Plan.

The GRM incremental expansion option and the RHM underground expansion option proposes to use an up to 100 per cent remote workforce for construction and operations, it would be unlikely that the existing cultural diversity in the MIW Region would be altered. It is possible that, depending on the scale of major project development occurring in the MIW Region and the corresponding low levels of unemployment, some projects may be required to employ labour from overseas. Depending on whether these workers are employed on a residential or remote basis, there may be a small cumulative increase of cultural diversity in the region. However, the project is not currently expected to contribute to overseas migration and, therefore, cultural diversity.

Increased regional mining development will tend to increase the number of males in the Moranbah and Isaac Regional Council Local Government Area communities and potentially exaggerate any existing disparity between genders in the community. The sheer number of workers required to meet resource industry demands across Australia will place considerable pressure on labour resources and will likely strip the typical (e.g. male, experienced) workers out of the labour pool. The cumulative impact of multiple project developments could therefore see the current higher ratio of men to women exaggerated further in Moranbah and the Isaac Regional Council Local Government Area in the short to medium term. Over time, diversity targets combined with declining availability of male workers may see increasing numbers of women employed in resource developments in the MIW Region.

Given the scale and breadth of projects in the MIW Region, local and state government have an important role to play in capturing the data from projects, so that changes to community characteristics can be monitored. BMA is committed to working with local and state government to provide information that will assist this ongoing monitoring and mitigation process.

Moranbah's 2011 resident population was 45.51 per cent female and 55.49 per cent male. With the GRM incremental expansion and the RHM expansion option contributing a small increase in FTE population during both construction and operations, it will also contribute to increased gender disparity in the Moranbah area.

Approximately 90 per cent of the construction workforce is likely to be male, which would see an increase in the total male population of around 1,800 at peak construction. However the majority of workforce activity will be on the work site or in the accommodation camp, and assuming behavioural issues are well managed (see **Table 21-5**), impacts on social values are not expected.

BMA will establish operational workforce targets for female participation prior to the commencement of operations. In this context, it is likely Moranbah residents will observe an increased number of males over females in the Moranbah region as a result of BMA's operation. However, remote workforce recruitment allows for a larger and more diverse applicant pool which creates an opportunity for significant diversity outcomes for the operational workforce.

BMA's strategies for enhancing gender diversity and managing workforce behaviour are presented in **Table 21-5**.

Table 21-5 Existing Policies and Commitments - Gender Diversity

Local/State Policy Initiatives	BMA Strategies	EIS Strategies
Not applicable	BMA Diversity Strategy Workforce Code of Conduct Communication with Council, emergency services and other stakeholders	Red Hill accommodation village Accommodation Village Management Plan

It is expected that any impacts and risks of increased gender diversity can be managed through BMA's existing standards for operations, with addition of support for community initiatives (though the Community Development Strategy) which deliver safe and active community participation programs for women. Where diversity, participation and support strategies are effectively implemented, the social outcomes will include:

- effects of increased male FTE population substantially absorbed by the Red Hill accommodation village; and
- increased percentage of female employees in operations.

21.3.11.2 Indigenous Social Characteristics and Economic Development

Traditional Owner groups in the MIW Region have developed a network of cultural heritage management services available to local proponents in response to the development of major projects. Consultation indicated that these services are much sought after and generally provide consistent work opportunities for these groups across projects particularly during the exploration and operation phases. The project development in exploration and operations will provide extra opportunities and place extra demands on the services provided by Traditional Owners, particularly in cultural heritage management, and as there are multiple projects, and therefore multiple proponents requiring their services. BMA works closely with Traditional Owner groups to plan and manage BMA projects' demands on their services.

Traditional Owner group representatives indicated during consultation that projects in the region provided opportunities to for their organisations beyond their role in cultural heritage management. This will allow them to diversify their services, pursue skilling for employment and training services, as well as supply labour and services to mining companies.

Indigenous employment in the mining industry is an increasingly common standard, as indicated by the signing of the memorandum of understanding (MoU) between the Minerals Council of Australia and the Australian Federal Government in June 2005. The MoU commits both parties to improve employment outcomes of Indigenous communities in specific mining regions, with training

opportunities for Indigenous people recognised as an important principle to increase their employment options.

The number of major projects occurring within the MIW Region will provide clear growth in the opportunities available for Indigenous people to be employed by these projects. These opportunities are likely to occur through demand for Traditional Owners cultural heritage services and Indigenous groups' businesses, or through direct employment of Indigenous people in the project's construction or operations phases. There is potential for Indigenous people to relocate to the MIW Region to meet this cumulative demand from project growth, and therefore increase the number of Indigenous people working and residing in the area.

BMA has established a target of five per cent Indigenous employment across the company's mine operations, and is developing targeted training and recruitment programs for Indigenous employees. It is anticipated that given increased Indigenous employment in the resources industry, other companies have or may set Indigenous employment targets for operations in the MIW Region, accompanied by structured training and employment programs. The cumulative effect of these multiple programs is expected to significantly improve Indigenous employment and training opportunities within the MIW Region.

Indigenous values are described in detail in the **Section 18.13.1**, as are potential impacts to cultural heritage values. BMA and representatives of the Barada Barna and Wiri Core traditional owners groups are in regular discussion regarding the use and values of land in the Moranbah region.

Opportunities for Indigenous engagement and employment are discussed in **Section 18.16** and include:

- opportunity to increase Indigenous workforce capacity and BMA workforce diversity; and
- opportunity for Indigenous businesses in the region to benefit from supplying goods and services for the project.

The social outcomes will include:

- increased project employment uptake by Indigenous personnel (locally or regionally-based); and
- increased participation of Indigenous business in BMA's Local Buying Program and supply opportunities.

Strategies for Indigenous business participation currently being implemented or in planning include:

- working with Indigenous people in the region to identify their needs and aspirations in relation to employment;
- setting a target for Indigenous employment in operations for the GRM incremental expansion and the RHM underground expansion option;
- identifying appropriate training programs in consultation with Indigenous people; and
- rolling out the Indigenous pre-employment training and trainee employment initiative across the business.

As part of its Indigenous Relations Plan, BMA will also develop initiatives aimed at increasing Indigenous businesses' participation in BMA's operations. These include:

- developing an awareness program with Indigenous stakeholders to outline the process for tender based contracts;

- working with Indigenous people of Central Queensland, and elsewhere, to identify opportunities to supply BMA operations directly, or in collaboration with other business and industry; and
- supporting a three year Indigenous community development program with Central Highlands Regional Council, which is intended to enhance capacity, community strengths and positive relationships within the Indigenous and wider communities.

Positive impacts of the project will include:

- increased opportunities for Indigenous employment in underground mining;
- increased Indigenous workforce skills levels; and
- opportunities for Indigenous businesses.

21.3.11.3 Education, Training and Childcare

Increased growth in the resource industry as a whole may see an increase in families in communities of the MIW Region as a result of either direct or indirect population growth. The OESR (2011b) estimates that Isaac Regional Council Local Government Area's average annual growth rate will be 2.35 per cent from 2011 to 2031, with an annual average growth rate of 3.5 per cent from 2011 to 2016. The MIW Region's average annual growth rate is also expected to be 2.22 per cent between 2011 and 2031, with an annual average growth rate of 2.6 per cent between 2011 and 2016.

The project will have little direct demand on the provision of childcare services or local education within the Isaac Regional Council Local Government Area or wider MIW Region at either an early childhood, primary, or secondary level. The proposed use of an up to 100 per cent remote workforce will see the majority of the workforce remain at their usual place of residence and reside in the accommodation village on the mining lease during their shift.

Any growth in demand for these services will not be directly associated with the project. Potential growth may lead to an increase in the number of children enrolled in local education services, or those who require childcare services in the MIW Region, placing potential cumulative demand on service providers which may already be at their limits. This is not able to be quantified, but will need to be addressed by collaborative industry and government action.

In the context of continuing resource industry expansion and the requirement for new workers, it is expected that other major project proponents will look to develop and implement local training and skills development programs, similar to that proposed by BMA (refer to **Section 18**). Inevitably, a cumulative investment in training and skills development by all proponents across the MIW Region will have a positive effect, and encourage the promotion of regional labour force capacity for the long-term.

Increased growth in the resource industry as a whole may also increase the focus in some schools, particularly in senior classes, on job readiness and skills training associated with the mining industry. It is likely that these types of programs will be supported by local training providers and resource companies (as is currently provided by BMA). Inevitably, the continuing expansion of this industry and the requirement for new workers will encourage further education development in key skills and services.

Monitoring the capacity of childcare and local education services within the MIW Region at an early childhood, primary, or secondary level is the responsibility of the Queensland Government. BMA is committed to working with the Queensland Government to provide information that will assist this ongoing monitoring and mitigation process.

There is also value to be gained from continued dialogue and engagement between state government agencies, local and regional training providers, the QRC, and construction and mining companies to determine skills gaps and opportunities for cooperation. State government is the appropriate facilitator of this forum.

Demand for childcare and school services is unlikely to increase in the Moranbah given the proposed up to 100 per cent remote workforce. Increased demand on public and private training providers is likely to be spread across Queensland regions. Many are private organisations and will appreciate the opportunity for extra supply. Strategies for increased training supply would need to focus on the capacities existing within the Isaac and MIW regions, if their turnover and opportunities for local people to access training opportunities are to be increased. It is recommended that BMA assess the capacity of local and regional training providers 12 months prior to construction to inform training supply.

21.3.11.4 Housing and Accommodation

The project will not directly add to the demand for housing in Moranbah or the IRC LGA during construction or operations, and therefore will have no direct impact on the availability or affordability of housing or rental accommodation. The proposed use of an existing workforce at BRM for the panel extensions and up to 100 per cent remote workforce for the GRM incremental expansion and RHM underground expansion option, combined with the provision of village accommodation to be constructed on the mining lease to accommodate both construction and operations workforces, will avoid adding further pressure on local housing availability or affordability. Rooms will be made available for all BMA and contracted workers.

However, it is likely that there will be continued demand on local housing and short-term accommodation in Moranbah from other resource companies and supporting industries. It is expected that the cumulative rate of in-migration to Moranbah and the Isaac Regional Council Local Government Area in general will be strongly controlled by housing availability. This could lead to the dispersion of employees associated with new major project development across the MIW Region.

House prices (both rental and purchase) in Moranbah have generally been higher than comparators over the last ten years. At the time of assessment, Moranbah housing prices were above state and regional averages, but significantly more affordable than in the previous three years. Cost reductions attributable to BMA's rent control policy instituted in 2011, a decrease in speculative housing purchase for rental, BMA's investment in housing, development of the BMA accommodation villages and the 2012 downturn in the coal industry.

In July 2013, BMA completed the construction of the 400th new employee home built during 2011-2013, reflecting BMA's commitment to ensuring its host communities are attractive places for employees to live and work. BMA has also recently contributed to the delivery of affordable housing in Dysart and Moranbah, through its contribution to the Isaac Affordable Housing Trust.

Stakeholders' key concerns as expressed in consultation were that the cumulative impacts of demands on local housing stocks by mining projects leads to decreased affordability, and overcrowded, communal workers' homes, which impact neighbourhood amenity and community safety.

Given provision of accommodation for all non-local workers including contractors, the GRM incremental expansion and the RHM underground expansion option are unlikely to exacerbate demand for housing or short-term accommodation.

Table 21-6 outlines the existing strategies of government and BMA to manage the availability and affordability of housing and rental accommodation.

Table 21-6 Existing Policies and Commitments - Housing

Local/State Policy Initiatives	BMA Strategies	EIS Strategies
IRC planning scheme in preparation to increase land availability Regional and Resource Town Action Plan priorities - development of the Belyando Estate.	BMA Rent Control Policy BMA provision of housing for all residential workers	On-site Red Hill accommodation village

Given the expansion in BMA's housing stocks of 400 dwellings in the Bowen Basin during 2011-13, plans by IRC to increase residential land availability, and the UDA's development of affordable housing in Moranbah, it is more likely that housing stocks in 2020 (assumed project commencement date for GRM incremental expansion and the RHM underground expansion option) could absorb and adapt to any additional demand on housing compared to conditions which have existed in recent years.

An evaluation of social impacts in this context finds:

- impacts on availability and affordability of housing supplies in Moranbah will be largely mitigated through accommodation provision for the workforce, including adequate accommodation village capacity and management planning; and
- increases in service staff (e.g. police) or business staff as a result of cumulative demands may require Council or Government consideration of housing development, dependent on the availability of housing stocks from 2020.

The social impacts and opportunities evaluated as of or above medium likelihood or significant consequence include:

- increases in local service staff (e.g. police) or business staff may require local or State Government consideration of cumulative housing demands, dependent on the availability of housing stocks from 2020.

Housing impacts and outcomes will be realised in a cumulative context rather than as a direct impact of the project. As such, the desired social outcome is for maintenance of at least current affordability levels (i.e. housing costs as a proportion of gross income) in Moranbah during the 2020-2022 period, which will require co-ordinated and co-operative responses from local and State Governments with resource companies.

21.3.11.5 Business, Industry and Employment

Given low levels of unemployment in the Isaac Regional Council Local Government Area it is anticipated that the construction and operations workforce for the GRM incremental expansion and the RHM underground expansion option could be drawn from across regions of Queensland and possibly interstate. The expansive growth in major resource projects across the MIW Region means there is considerable demand for skilled and experienced workers and general labour. In addition to

existing labour pressure from coal operations, the MIW Region is experiencing increasing growth of the CSG industry and energy sectors, which will be in direct competition with BMA and other coal companies for human resources.

Based on figures obtained from state government sources that are highly dependent on information provided by resource companies, there is potential demand for approximately 10,000 construction workers between 2012 and 2017, and approximately 12,500 operations workers from 2012 (DEEDI 2011c, 2012). The demand for construction workers will ebb and flow depending on the construction cycle of projects in the region (i.e. as one construction project ramps down, another may ramp up allowing construction workers to move from one project to another). It is clear from these figures that the project and BMA's wider existing and proposed operations may at times face substantial resourcing competition.

Potential cumulative impacts arising from the combined resourcing requirements of the GRM incremental expansion and the RHM underground expansion option and other projects potentially include:

- increased demand on the Queensland labour pool, resulting in restricted availability for all resource industry projects in the MIW Region and other parts of Queensland;
- increased labour pool diversity (e.g. more women, Indigenous and previously unskilled workers);
- flow-on impacts and added pressure to the recruitment needs of local businesses (large or small);
- a rise in labour prices in the MIW Region to attract workers from other regions; and
- increased use of remote workforce arrangements in the MIW Region as new projects require access to new labour sources.

Growth in the delivery of major projects proposed in the MIW Region is likely to result in employment generation across regions of Queensland. Positive increases in employment generation are also likely in those sectors which support resource production and manufacturing, as well as intermediate industries which provide inputs to the production of goods and services.

While increased growth in the resource industry will provide significant benefits for local business growth in the Isaac Regional Council and MIW Region, much of this business is connected directly to the resource industry. The resource industry is characterised as being driven by boom and bust cycles. It is important for local industry to have alternative sources of work where possible to maintain their business in the event of an industry down turn. Any decrease in industry momentum will be felt by local businesses across the MIW Region.

BMA has committed to the Queensland Resource and Energy Sector Code of Practice for Local Content 2013, administered by the Queensland Resources Council.

BMA's Local Buying Program (BLBP) is a targeted program providing opportunities for small businesses to competitively supply goods and services to BMA and its operations throughout the Bowen Basin. BLBP targets businesses with less than 25 full-time employees (it is noted that the large majority (93.9 per cent) of businesses in the Isaac region employ less than 20 staff), registered or operating as their primary place of business in the townships of Moranbah, Dysart, Blackwater, Emerald and Nebo. Further detailed information is available at <http://c-res.com.au>. In partnership with the Mackay Whitsunday Regional Economic Development Corporation (REDC), BMA has also developed the C-Res (Community Resourcing) foundation, to support delivery of BMA's Local Buying Program.

The Local Buying Program results from the first 12 months (to mid 2013) include:

- More than 300 approved C-Res Suppliers (of whom 190 are new suppliers to BMA/BMC);
- More than 830 work opportunities made available to local businesses;
- Total approved expenditure of \$12.38M; and
- More than \$170,000 allocated to the Local Buying Community Foundation.

Community concerns exist regarding the need for population growth to support business growth and diversification. These concerns were reinforced in recent media releases by IRC regarding the project and the opportunity it represents for local employment and for transport, goods and service industries.

The BMA Local Buying Program (BLBP) provides opportunities for small businesses to competitively supply goods and services to BMA. BMA's Local Buying Program supports the Queensland Resources and Energy Sector Code of Practice for Local Content (2013) which offers guidance for further refinements and access to details of key supplier and buyer government programs.

Table 21-7 outlines the existing policies and commitments by state government and BMA to local content. The BLBP is discussed in detail in **Appendix P**. The general trade of non-resident workers (e.g. accessing local shops or the hotel) are likely to provide a small stimulus to the local, economy, which may result in increased local business trade, and potentially increased employment.

Table 21-7 Existing Policies and Commitments – Local Business

Local/State Policy Initiatives	BMA Strategies	EIS Strategies
Endorsement of Queensland Resources and Energy Sector Code of Practice for Local Content 2013	BMA Local Buying Program Indigenous Relations Plan	Support for Queensland Resources and Energy Sector Code of Practice for Local Content 2013 through BLBP

The desired social outcome of BMA's well-established and successful Local Buying Program will involve:

- locally-awarded contracts, demonstrated through existing BMA public reporting of quarterly local buying activities for its northern Bowen Basin projects; and
- decreased feedback received regarding adverse impacts to local or regional business operations as a result of remote workforce effects.

Given timing for the delivery of the GRM incremental expansion and the RHM underground expansion option is uncertain, BMA will engage with the Queensland Resources Council regarding the BLBP to ensure these established mechanisms remain aligned with Code of Practice for Local Content.

21.3.11.6 Income and Cost of Living

It has been recognised that in order to attract and retain staff in non-mining industries, local and regional business employers need to offer greater financial incentives, including elevated wages and accommodation assistance. The provision of higher wages however, may have potential flow-on consequences in that service providers are required to increase the prices of goods, therefore raising costs to local consumers.

In 2010, the cost of living in Moranbah was 13.9 per cent above Brisbane. Average individual and household incomes in Moranbah were more double than the Queensland average in 2011 (see **Appendix P** Section 4.4.2) which offsets costs for those on higher incomes.

Housing prices in Moranbah have decreased since 2010, however food, energy and transport costs have increased across Queensland. Regional towns often experience higher costs than coastal centres due to transport costs, lack of competition and, in mining towns, capacity within the community to pay higher prices. Moranbah is likely to continue to have a higher cost of living than Brisbane based on these factors. In recognition of higher costs of living, BMA subsidises housing for its existing local workforce, so that housing costs are reduced to approximately \$70/week.

The GRM incremental expansion and RHM underground expansion option are not expected to increase the cost of living in Moranbah.

As the GRM incremental expansion and RHM underground expansion option are proposed to use an up to 100 per cent remote workforce for both the construction and operations of the mine, it is expected that they will not directly exacerbate the current high living costs in Moranbah. Housing demand and workforce expenditure will not be concentrated in the Moranbah community, but rather dispersed throughout the MIW Region and other regions in Queensland.

However, there is potential for the cost of goods and services in the Moranbah community to change, depending on the accommodation and workforce recruitment (i.e. local or remote) policies of other resource projects operating in the local area.

21.3.11.7 Social Infrastructure and Community Safety

There will be increased demands on local police and emergency services as a result of the GRM incremental expansion and RHM underground expansion option during both construction and operations phases.

Local QPS personnel have identified the cumulative impacts of increased numbers of oversized vehicles from multiple projects is a challenge for police, particularly given current staffing levels. Increased traffic on the Peak Downs Highway, including significant increases in wide loads, is and will continue to also be of particular concern. However, the traffic impact assessment in this EIS (refer to **Section 14**) indicates that the GRM incremental expansion and RHM underground expansion option are not likely to contribute significantly to existing traffic conditions. Increased heavy vehicle movements as a direct result of the GRM incremental expansion and RHM underground expansion option, in combination with existing traffic conditions, are not expected to significantly impact on existing travel times or road safety.

The cumulative impacts of multiple project developments and the need for incident response services will place increased pressure on local and regional emergency service providers such as the Queensland Police Service (QPS), Queensland Ambulance Service (QAS) and Queensland Fire and Rescue Service (QFRS).

Stakeholder consultation in 2012 revealed concerns that the increasing number of non-resident workers in Moranbah negatively impacts the family feel of the township, including community perceptions of safety and security.

Five year trend data indicates Moranbah's rate of offences against people and other offences peaked in 2007/08, while offences against property peaked in 2010/11. Offence rates in Moranbah were generally trending down in 2011/12 to rates lower than in 2007/08. This has been during a period

which saw non-resident workforce numbers in Isaac LGA increase from approximately 9,380 in 2008 to approximately 17,125 in 2012. As such there does not appear to be clear evidence that the increase in non-resident workers has negatively affected the rate of offending in the Moranbah/Isaac Regional area.

Other community safety concerns raised in consultation related to road safety, in town and on local connector roads. Existing constraints on police resourcing and emergency service capacity also have a strong influence on local community safety, and are addressed in **Section 18**.

Table 21-8 outlines BMA's existing policy and commitments to community safety. In this context, the following impacts have been identified:

- the number of people in an area may increase the likelihood of offences or anti-social behaviour occurring, particularly if positive behaviour and respect for local values are not strictly enforced;
- the risk that the cumulative impacts of non-resident workers from a variety of projects and operations will decrease levels of safety in Moranbah, dependent on consistent standards of workforce management, and sufficiency of police resources; and
- an increase in the number of buses and trucks in the area, in the context of emergency services' current strained capacity, may require a corollary increase in the capacity of emergency services. The risk of decreased traffic safety in the Moranbah area has been assessed in **Section 14** of the EIS.

Table 21-8 Existing Policies and Commitments - Community Safety

Local/State Government Initiatives	BMA Strategies	EIS Strategies
Monitoring of need for increased or more flexible resources to assist emergency services and police to respond to large numbers of non-resident workers	Emergency Management Protocols Fatigue Management Plans Workforce Code of Conduct Alcohol and drug policies Stakeholder and community engagement, including. Regular engagement with IRC and Moranbah-BCN	Stakeholder and Community Engagement Plan Provision of bus transport between the airport, job site and accommodation village to decrease congestion and the potential for small vehicle accidents.

Mitigation strategies to address community safety issues include:

- workforce behaviour management through plans as described in **Section 18**;
- inclusion of local values in workforce induction material, and ongoing enforcement of expected standards of behaviour;
- ongoing working relationship with QPS and other emergency services to implement the co-developed Emergency Response and Management Protocol;
- explore co-training and engagement opportunities which strengthen local emergency response capacity; and
- develop targeted strategies as required for training, positive behaviour-modelling and road safety needs.

Where BMA protocols are effectively enforced and targeted mitigation strategies developed in consultation with QPS, IRC and emergency services, the desired social outcome will manifest as negligible safety incidents or community safety complaints attributed to the project.

21.3.11.8 Police and Emergency Services

The likelihood of significant increases in crime and social misconduct associated with the GRM incremental expansion and RHM underground expansion option is low; however, the perception held within the local community that it could occur is high. The likelihood of anti-social behaviour from BMA employees will be minimal given that BMA will operate a predominantly self-contained accommodation village on the mining lease that will service the workforce needs and enforce tight behavioural management expectations for its workers.

A potential issue exists in that non-resident workers of other major projects in the MIW Region may be able to access local entertainment and recreational facilities in these projects' areas of influence. However, the behaviour standards and policies enforced at other major resource projects in the MIW Region are beyond the scope of BMA's control.

Moranbah and Isaac region's emergency services currently have limited capacity to service their geographic region and the FTE population, as staffing levels are generally calculated on the resident population, and non-resident workers may increase the population load by more than 50 per cent. In consultation during 2012, regional police and ambulance officers noted constraints on resourcing in Moranbah, and the fact that permanent staff are not allocated or do not stay, leading to staff shortages. At June 2013, the Queensland Police Union was quoted saying that 11 officers were stationed in Moranbah while the bare minimum staffing requirement for a 24-hour station (indicated as required by the size of the FTE population) was 18 officers. Local emergency service capacity for responses to multi-vehicle accidents, bus accidents or air traffic accidents is also less than optimal.

Section 18 outlines the strategies employed by BMA to manage demand on local and regional emergency services. In this context, it is expected that the impacts are of medium likelihood and consequence will include:

- increased demand on QPS, QAS and QFRS in response to accommodation village call outs, traffic incidents, and wide load supervision; and
- this is part of a cumulative demand on police and emergency services due to non-residents workforces for a number of operations, and requires a Government planning and resourcing response.

The mitigations strategies required in respect to demands on police and emergency services are:

- the Accommodation Village Management Plan (AVMP) which outlines behavioural standards, policies on alcohol and drug use in the village, and emergency response procedures;
- a commitment to engagement with local and regional police and emergency services, ahead of construction and operational commencement, to advise services of the anticipated workforce build up, major activities which would place demand on local services (such as movement of large equipment by road), behavioural standards and communication protocols;
- orientation to the Accommodation Village and its emergency response procedures prior to the Village's operation; and
- consultation on the Emergency Response Protocol, to ensure effective co-operation between project staff and local services.

The key desired outcome is an adequate level of government funding for emergency services (fire and ambulance) and Police, commensurate with the size, location and of the FTE population resulting from cumulative impacts.

The desired social outcome is for appropriately managed demand on police and emergency services including demonstrably good working relationship between the workforce and QPS, QAS and QFRS in Moranbah, and minimisation of demands on services as a result of on-site behavioural and safety management procedures.

21.3.11.9 Health and Well-being

Moranbah Hospital and GP services in the Isaac region have limited capacity to service the demands of Moranbah's population, including non-resident workers' demands on services. This has recently been addressed through a partnership between BMA, Moranbah medical centres, other industry proponents and Medicare Local. The number of GPs in Moranbah increased from four to seven during 2012-2013. Local doctors report there is currently adequate local capacity, and they plan to recruit additional staff to respond to growth. Other positive developments as a result of the health services partnership are planned, including a medical centre at Dysart being supported by Queensland Government funding.

Given a peak of 2,000 construction workers and 1,500 operational workers, increased demands on local health facilities (ambulance, GPs, Hospital and allied health) are expected.

The DoHA considers the ratio of 0.71:1000 as the standard doctor-to-patient ratio, which, compared to BMA's estimated construction workforce of up to 2,000 is expected to require the equivalent of access to at least one full time doctor, as well as to a range of allied health services. This demand may be moderated given workers may see their own doctors when off-shift, however local experience indicates some demand associated with non-resident workers.

Increased demand can be reduced through provision of on-site medical staff, or through collaborative arrangements for local service provision commensurate with the size of the workforce, relative to benchmarks for GPs per population. BMA is currently working with local medical service provider ER24 to provide paramedic and medical care to its local mine operations.

Given timing for the delivery of the project is uncertain, it is recommended that 12 months prior to construction, BMA engage with local medical providers, including Moranbah Hospital, local GPs and the Queensland Ambulance Service, to assess capacity for additional demand to be absorbed by local service provision arrangements. The capacity of health services capacity will also require monitoring by the Queensland Government as part of its assessment of cumulative impacts, and as part of planning for regional population growth.

The desired social outcome for managing workforce demand on local health services is that non-resident workers' needs are addressed sufficiently to avoid any impact on residents' access to local medical and health services. This will include consultation with medical service providers to identify any gaps in local capacity, and development of strategies to reduce and manage workforce demand. The effectiveness of BMA's local service arrangements will be monitored during construction through feedback from Moranbah Hospital, Local GP and allied health providers and QQAS.

An AVMP will be finalised prior to village operation, and will include:

- workforce well-being and facility provision;
- engagement with local services including QPS, QFRS and QAS;
- management of behaviour in the accommodation villages;

- gender and cultural issues; and
- the complaints management procedure.

The accommodation village will also support BMA's commitment to maintaining the health and well-being of its workers and contractors' workers. Health facilities and service provision for all persons accommodated by BMA in relation to the project will include access to a health clinic, gyms, outdoor recreation space, and social meeting places, Employee Assistance Program for counselling and emotional health issues, and regular health promotion programs.

21.3.11.10 Community Cohesion and Social Networks

The cumulative increase in the number of non-resident workers as a result of new and expanded resource operations in the region was identified by the Moranbah community as a perceived potential threat to local community safety and cohesion.

The behavioural standards and policies enforced by other projects in the MIW Region is beyond BMA's control and depends on the relevant companies implementing workforce management and community cohesion plans during the construction and operations of their projects. BMA plans to develop a community workforce cohesion plan which will include a workforce code of conduct and respect for local values induction. BMA will also develop an AVMP. Therefore, it is not likely that the GRM incremental expansion and the RHM underground expansion option will contribute to changes in the MIW Region community's safety, identity, or cohesion.

As BMA intends to operate with an up to 100 per cent workforce, non-resident workers may experience a level of disconnection with their families due to the time away from their usual place of residence. Equally, there is the chance that the workers' partners and family members may feel a level of severance while the worker is on roster, which is somewhat compensated when the worker is off roster and at home.

21.3.11.11 Residential Amenity, Recreation and Liveability

Moranbah has a good level of recreational facilities, with numerous sporting fields, club houses, and a recently BMA funded upgraded aquatic centre. The cumulative increase in non-local residents has resulted in some increases in demands for sporting fields and some concerns about behaviour at sporting events, given the number of families who attend (e.g. football fixtures and rodeos). Strategies in place to address these concerns include:

- Red Hill accommodation village provision, including recreational facilities commensurate with the size of the village;
- local values induction material;
- stakeholder and Community Engagement Plan including complaints management, monitoring and reporting; and
- regular engagement with Queensland Police Service and Isaac Regional Council regarding any impacts on facilities and services.

In this context, the impacts and opportunities of or above a medium likelihood and significant consequence are:

- potential impact on locals' enjoyment of sporting and recreational activities if workers do not behave appropriately; and
- potential increased pool of participants for local fixtures and competitions.

Strategies to address these impacts and opportunities include:

- workforce code of conduct;
- provision of recreational facilities within the accommodation village; and
- provision and management of opportunities for scheduled sporting activities between town residents and workers during operations, to increase the size and vitality of local sporting competitions.

Assuming provision of adequate recreational facilities within the Village, and opportunities for well managed workforce/community recreational activities are provided, the desired social outcome of no impact on locals' use and enjoyment of recreational facilities is likely to be met and the project is not expected to adversely alter the values and lifestyle that the MIW Region community shares. The local community has been significantly shaped by the developments of the mining sector over the past 40 years. Thus, development of the project, coupled with wider expansion in the mining sector, is consistent with historic events.

The introduction of other new projects across the MIW Region, however, may have a cumulative impact upon local values and liveability, particularly in those communities with strong agricultural traditions. There is also a perception, expressed by some resource communities throughout the MIW Region that the increased use of remote workforce arrangements will have an impact on the family orientated nature of the region.

21.3.11.12 Land Use and Private Tenure Ownership

Multiple project developments in the MIW Region will add further impacts to local landholders and the use of their land, as resource companies acquire interests in the land required for projects. It is expected that all new projects proposed by other proponents will undertake adequate investigations into the impacts of construction and operations activities on surrounding privately owned land and dwellings, and that cumulative impacts on landholders will be identified and addressed as they emerge.

21.3.11.13 Mitigation of Cumulative Social Impacts

The cumulative social impacts of mining activities on Moranbah and the Isaac region are mostly felt through an increased demand on physical and social infrastructure and services from an increased resident and non-resident population. There may also be increased demand for housing, goods and services in the MIW Region if workers in projects located within Isaac region (and the central Highlands region) relocate their families to the Mackay and Whitsunday regions.

The key determinant of cumulative social impacts in the Isaac regional context is the number and demographic characteristics of additional people, including non-resident workers, in the region as a result of major projects. This affects:

- population characteristics (e.g. number of non-resident workers in the region);
- the labour force (e.g. employment duration, skills availability and supply issues);
- social infrastructure (e.g. health, police and emergency services, and training supply issues);
- housing (e.g. demand associated with the projects); and
- impacts on community values or social indicators.

The lead time between the project EIS and potential construction of the largest component from around 2020 (scenario only), and current volatility in mining growth projections, makes it difficult to accurately define the number or location of major projects whose construction and/or operation will coincide with that of the GRM incremental expansion and RHM underground expansion option.

This assessment of the GRM incremental expansion and RHM underground expansion option therefore bases prediction and evaluation of contribution to cumulative social impacts on the likely contribution to the total non-resident workforces and FTE population forecast in the Isaac region, based on OESR's (Office of Economic and Statistical Research) current projections of non-resident numbers to 2019 (the latest currently available estimate).

OESR projections estimate Isaac LGA's annual rate of growth at three per cent (latest OESR projections were calculated in 2011), from a population of 23,277 in 2011 to 31,418 in 2021. On this basis the resident population of Isaac LGA (based on 2008 ASGC) is likely to be approximately 31,000 in 2020.

OESR's projections of non-resident workers are largely based on companies' estimations of workforces over time. The number of non-resident workers on shift in the Isaac region was estimated (in early 2013) at 17,190 in 2013. This is currently expected to decrease to 14,920 in 2019 (Series A), based on the non-resident population on-shift in the area at June 2012. It includes non-resident workers associated with existing operations, as well as future projects that have reached final investment decision (FID) and commenced construction, or to 15,460 under series B (Series B includes Series A), plus the projected non-resident population growth from projects that have an EIS approved but have yet to reach FID. The projections included an assumption that the project would commence construction in 2018 with a small number of workers.

The construction workforce is assumed to build from a small workforce (a few hundred) in 2020 to a peak (potentially in 2021) of 2,000 workers. For the purpose of modelling cumulative impacts, an average of 1,000 construction workers has been assumed across the two year construction period. As such, the project is assumed to represent some 6.5 per cent of the projected number of non-resident workers in the Isaac region during 2020-2021 (figures and timing are presented for modelling purposes and do not represent a commitment by BMA).

The project's operation is assumed to commence in 2022. Based on the OESR's projection of an average increase in Isaac LGA's population between 2021 and 2026 of 570, the resident population in 2022 could be assumed at approximately 31,989 people. Adding the number of non-residents, this would see a total FTE population of 46,980 people, if the number of non-resident workers remains constant at around 15,000 (the average of Series A & B projections for 2019). The project's operational workforce of 1,500 is therefore expected to represent approximately 10 per cent of the Isaac region's non-resident population and approximately three per cent of the FTE population.

The contribution of the GRM incremental expansion and RHM underground expansion option to cumulative impacts is expected to consist of:

- a long term increase in the FTE population of around two per cent from around 2022, declining as a percentage of the population if the Moranbah region's population continues to grow;
- a small increase in the percentage of males in the FTE population (see Section 5.5.1);
- an incremental increase in demand for police and emergency services in the Isaac region;

- an increase in demand for health and medical services if these are not delivered through existing partnerships with local providers;
- negligible impact on cumulative impacts on housing access and affordability in Moranbah; and
- potential increased road traffic (primarily buses and trucks) on the Goonyella Access Road, Moranbah Access Road and Peak Downs Highway (discussed in EIS **Section 14**).

BMA is currently active in a number of collaborative efforts to address cumulative impacts, including: participation in the Moranbah Cumulative Impact Group, and establishing relationships and regular communication between construction and operations managers, and local QPS, QAS and QFRS teams. The timing for further detailed engagement in relation to the project, will be decided once the project owners have determined the timing and rate of development.

Cumulative impacts need to be addressed through collaboration between Regional Councils, State government agencies, resource companies and communities. Mitigation and monitoring of cumulative impacts will therefore require the involvement and coordination of multiple stakeholders.

The owners' commitment to identifying and monitoring cumulative impacts includes:

- prior to construction and operation, evaluate potential contributions to cumulative impacts in the context of social conditions and the number of other relevant projects at the time;
- consult with the Isaac Regional Council and Queensland Government about their plans to accommodate increased growth in the Moranbah and Isaac Region, to identify any potential collaborations; and
- continuing participation in cumulative social impacts forums and industry initiatives.

No one resource company can mitigate or monitor cumulative impacts. Cumulative impacts are influenced by a range of factors not solely subject to BMA mitigation or management control. Therefore, cumulative impacts cannot be understood or mitigated by focusing on one individual mining operation. A well-developed understanding of the impacted environment in addition to collaborative action is required to address the cause/s (Franks *et al.* 2010).

The BMA Communities team works regularly with mining industry counterparts to identify and address local issues. One forum for this is the Communities Local Industry Working Group, through which community advisors from BMA, Anglo, Rio Tinto, Dyno Nobel, Arrow and other industry partners share information and work collaboratively on projects and activities impacting on the local community/ies.

Through its community development strategy, BMA is making a financial contribution to and investment in infrastructure upgrades. The company has also entered into a number of partnerships and funding agreements with local and regional community organisations to address capacity constraints of community infrastructure and services.

BMA provides information on its existing operations to relevant local services, government agencies and other key stakeholders regularly. This includes an annual submission of employment data to the OESR as part of its workforce survey to assist in monitoring FTE populations in the MIW Region.

BMA, in conjunction with other resources proponents of local and regional influence, will also continue to participate in forums which seek to improve the coordination and management of cumulative impacts in the Bowen Basin. This includes continuing its role in the Moranbah Cumulative Impacts Group, which consists of local government, mining company representatives, state government department representatives, and community members.

BMA has also established the BMA Community Network (BCN) as a key consultation and monitoring mechanism. The BCN and the network provides a framework in which government, key service provider and other key stakeholders can share information and collaborate on matters of common concern in relation to RHM and other BMA projects. This information will be reported back to BMA and made publicly available on the BMA website.

The GRM incremental expansion and the RHM underground expansion option's contribution to cumulative impacts will be addressed through the mechanisms detailed above as well as the strategies to mitigate impacts and maximise opportunities, as outlined in **Section 18** of this EIS.

21.3.12 Economic

Accordingly, while significant direct negative impacts of the project are not expected to be significant, the incremental demand and activity generated by the project may add to existing cumulative impacts of other mining projects and supporting infrastructure projects, including rail infrastructure, port infrastructure, pipelines, roads and local infrastructure.

This section supports the assessment conducted in the SIA and describes the likely economic cumulative impacts of multiple development projects including impacts on businesses, the labour market, property and regional physical infrastructure.

Cumulative impacts on the area of assessment (Mackay SD) have been assessed qualitatively based on existing baseline data, additional desk-top research and technical judgement.

21.3.12.1 Businesses Creation and Industry Growth

Since early 2000, Moranbah and the MIW region, have been experiencing constant demand, driven by both existing operations and the construction activities of new mine developments. This has also been supplemented by an inflow of residential and non-residential mine employees and employees engaged in mining and construction support sectors, who spend locally on goods and services.

There are a number of positive impacts associated with this level of economic development sustained by the current level of investment and demand generated by the culmination of mine operations surrounding Moranbah and the broader Mackay SD.

Potential cumulative impacts on businesses and employment in the Mackay SD are generally positive and include:

- Increased demand for existing businesses supporting the resources sector including retail, food, transport and accommodation.
- Increased opportunities for the creation of new local and regional businesses in response to sustained demand for local services.
- Increased business confidence, resulting in local and regional business expansion and investment.
- Increased diversity in the local economy as a result of business expansion and investment.
- Increased employment generation in supporting industries and secondary industries providing inputs to the resources sector.

While noting these potential benefits, there are potential limitations to fully realising these benefits. The current labour market conditions in the Isaac Regional Council Local Government Area are tight, reflected by the low level of unemployment (1.3 per cent) compared to Queensland and Australia.

This may place upward pressure on wages, limiting the ability of local businesses to attract and retain labour, especially when competing with mine operations. The cost and supply of housing in the Mackay SD might also place a limit on the extent to which workers can locate into the region to take advantage of increased employment opportunities.

Local business may be limited in capacity to provide the volume of goods and services required by the various mine projects and operations. For BMA projects and operations, BMA has initiated a Buy Local policy which, among other things, seeks to make access to tendering processes easier for local businesses.

21.3.12.2 Labour Force and Skill Shortages

There is currently considerable demand for suitably qualified and experienced workers in the resource industry, for both construction and operating activities periods and the projected expansion in the resources sector, across the Bowen Basin and throughout Queensland will further increase demand for workers, and particularly skilled workers.

The demand for workers in the resources sector has been estimated as part of the QRC study into the growth of the Queensland resources sector (QRC 2011). The study found that projected expansion in the resources sector will create a significant requirement to expand the supply of labour in Queensland, with excess demand created during both the construction phase and operating phases of the pipeline of resources projects in Queensland up to 2020. The key skill set shortfalls are predicted to include Technicians and Trade Workers, and Machinery Operators and Drivers.

Mining and resource companies operating in Queensland are therefore aware of the tight labour market conditions and the potential risks associated with being unable to recruit workers, including risks that projects may not be able to go ahead where workforce is not available.

BMA is implementing measures for existing operations and new projects to increase training of workers without mining skills and recruitment from outside of Queensland. BMA is also supporting mining-related skills training in schools and at tertiary training facilities. It is expected that other proponents will take similar approaches to managing this risk.

Linked directly to skill shortages is the potential for wage inflation. The Mackay SD and Queensland are currently recording very low unemployment and this is likely to contribute to wage inflation for workers in the mining sector and related sectors. Where this occurs skilled and unskilled workers may be drawn away from non-mining sector roles; which may contribute to or potentially exacerbate skill shortages in non-mining sectors. Indeed, during the project consultation phase, a number of non-mining related local businesses in Moranbah indicated that they were struggling to attract and retain workers, as they were unable to compete with the wages paid by mining companies.

While acknowledging the potential labour force constraints within the Mackay SD, continued demand for skilled and unskilled workers, combined with the use of a remote workforce is likely to provide employment opportunities for residents outside the Mackay SD, such as other regions in Queensland currently experience high unemployment rates.