SARAJI EAST MINING LEASE PROJECT

Environmental Impact Statement

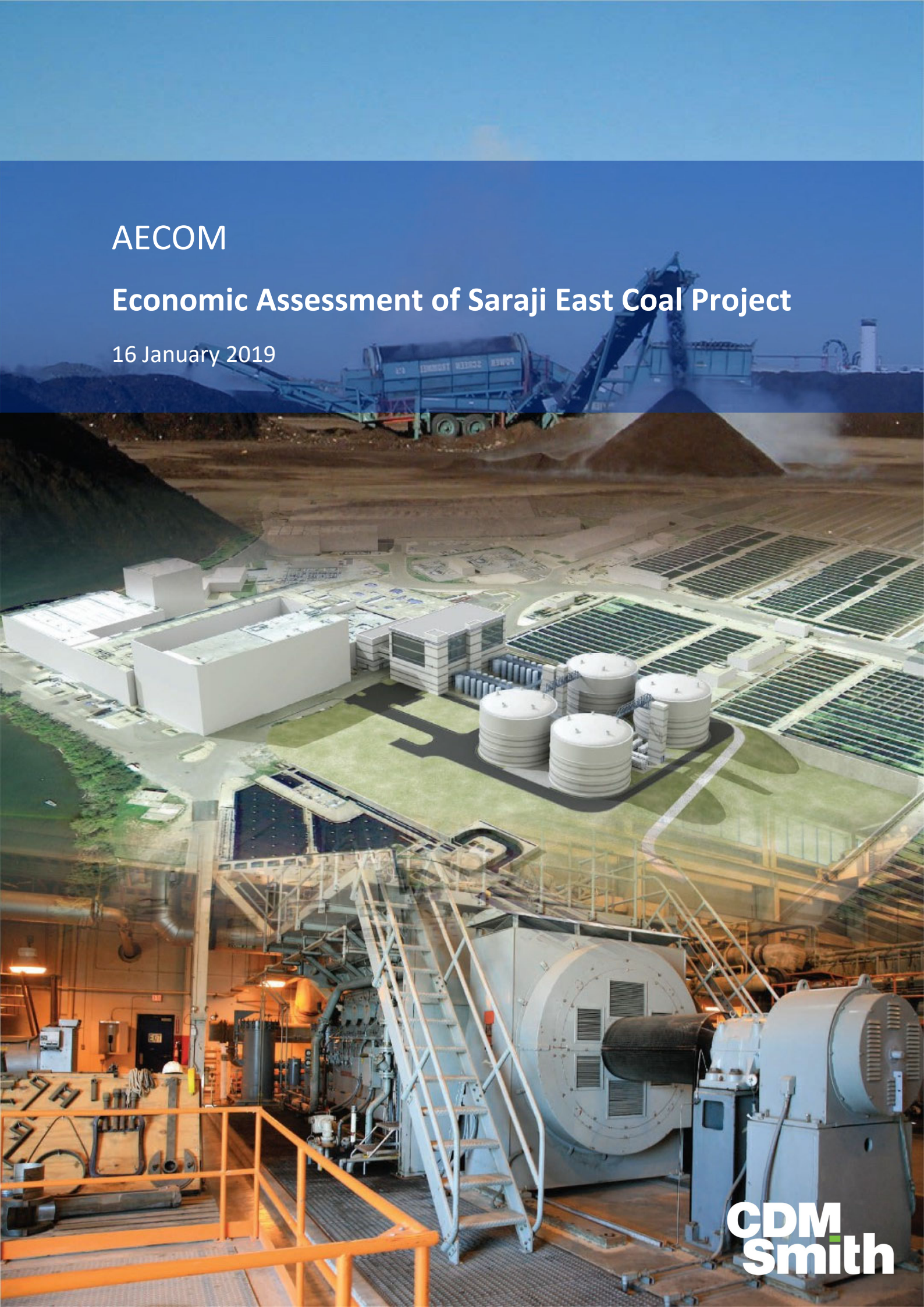
Appendix M-1
Economics Technical Report

BHP

AECOM

Economic Assessment of Saraji East Coal Project

16 January 2019



CDM Smith

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Executive Summary

Introduction

The proposed Saraji East Mining Lease Project (the Project) is located approximately 170 kilometres (km) southwest of Mackay. It comprises a greenfield, single seam underground coal mine to be developed on Mining Lease Application (MLA) 70383 commencing from within the adjacent existing Saraji Mine. The mine is anticipated to produce up to approximately eight million tonnes per annum of coal product for the export market over a 20-year production schedule. It is expected that a new accommodation facility will be required to support the construction and operational phases of the Project, which would consist of a temporary construction village and a separate permanent operations village. The Project would also require ancillary infrastructure including:

- Coal handling and processing plant (CHPP);
- Conveyor system delivering coal from underground to the CHPP and to the loading facilities,
- Rail spur and balloon loop signalling system,
- Network of gas drainage bores, gas and water collection networks and access tracks across the underground mine footprint;
- Relocation of the existing water pipeline, powerline and transport corridor into a new infrastructure and transport corridor on MLA 70459 and MLA 70383; and
- ROM stockpile and product stockpile pads.

BM Alliance Coal Operations Pty Ltd (BMA) acts on behalf of the Central Queensland Coal Associates (CQCA) Joint Venture, namely BHP Coal Pty Ltd, BHP Queensland Coal Investments Pty Ltd, Umal Consolidated Pty Ltd, QCT Resources Pty Limited, QCT Mining Pty Ltd, QCT Investment Pty Ltd, and Mitsubishi Development Pty Ltd under a management agreement. The CQCA is an unincorporated joint venture between BHP Billiton (50%) and Mitsubishi Corporation (50%).

This economic assessment included the following components:

- Baseline economic assessment of existing regional economic environment (Baseline economic assessment);
- Regional economic impact assessment (and mitigation strategies);
- Cost benefit analysis.

Economic Baseline Assessment

The economic baseline assessment describes the existing local, regional, state and national economies that may be affected by the Project.

The study areas analysed has been based on the Project location along with the consideration of likely primary sources of labour, goods and services that will be utilised by the Project. The study area represents the regional economies most likely to be either directly or indirectly affected by the Project. The study areas are defined as follows:

- Local economy: Isaac Local Government Area (LGA); and
- Regional economy: Mackay – Isaac – Whitsunday Statistical Area Level 4 (MIW SA4).

A summary of the economic baseline identified that:

- The resident population of Isaac LGA is anticipated to increase at an average annual rate of 1.2% per annum between 2016 and 2036. The resident population of MIW SA4 is anticipated to increase at an annual average rate of 1.5% during the same time period.
- The average age of residents in Isaac LGA and MIW SA4 was lower than the state average in 2016. In 2016, Isaac LGA had a significantly lower proportion of persons aged 15-19 years, females aged 45-64 years and persons

aged 65 years and over relative to the state average. In 2016, Isaac LGA had a significantly higher proportion of persons aged 0-14 years, persons aged 25-34 years and males aged 35-54 years.

- Average household incomes were significantly higher in Isaac LGA relative to MIW SA4 and Queensland between 2006 and 2016, although decreased between 2011 and 2016 by 0.9% per annum and 0.4% per annum respectively.
- The unemployment rate in Isaac LGA has been consistently lower and its labour force participation rate consistently higher than MIW SA4 and Queensland between 2010 and 2017. The unemployment rate increased marginally in Isaac LGA, MIW SA4 and Queensland between 2010 and 2017. The size of the labour force in both Isaac LGA and MIW SA4 decreased between 2013-14 and 2015-16 but showed signs of recovery in 2016-17 with a 2.4% and 3.9% increase in that year respectively.
- In 2016 the most significant industry of employment for residents of Isaac LGA was the mining industry, accounting for 37.7% of all employment. In 2016 the mining industry was the most significant industry of employment for residents of MIW SA4, accounting for 14.4% of all employment.
- In Isaac LGA, the most common occupation grouping was lower blue collar workers[1] (35.3% of workers), whereas employed persons within MIW SA4 and Queensland were most commonly lower white-collar[2] workers (29.2% and 35.3% of workers, respectively).
- In 2016, 41.8% of the resident population of Isaac LGA aged 15 years and above held a post-school qualification, as compared with 43.1% and 48.3% in MIW SA4 and Queensland respectively. In 2015-16 Isaac LGA produced agricultural commodities which had a value of $549.71 million, accounting for 49.1% of the total value of agricultural commodities produced in MIW SA4 and, 4.2% of the total value of agricultural commodities produced in Queensland.
- As of 2010-11 MIW SA4 had a nominal GRP of $22.8 billion, as compared to $6.3 billion in 2000-01, which represented an average annual growth rate of 13.7%. The most significant contribution to MIW SA4 GRP was the mining industry, amounting to $12.4 billion which represented 54.2% of total nominal GRP.
- There are 31 major development projects within MIW SA4 which were approved recently but have not begun operations and those which the EIS is in preparation and are likely to commence operations in the next several years. Of the 31 projects identified, 23 were coal, mineral and gas projects.
- Total coal production in Queensland increased from 205.7 million tonnes in 2012-13 to 237.6 million tonnes in 2016-17, and MIW SA4 increased its share of Queensland production from 63% (129.9 million tonnes) in 2012-13 to 66% (157.1 million tonnes) in 2016-17. If all the coal projects identified in the project development pipeline become operational, this would equate to an additional 278 million tonnes of coal production per annum within MIW SA4.
- Total workforce accommodation village bed capacity and hotel/motel room capacity within Isaac Regional Council increased in 2011 to a room capacity of 18,510 in 2017, representing an average capacity increase of 2.9% per annum.
- The residential property market experienced a significant downturn after 2011-12. In 2017-18 prices and annual sales have stabilised recently at a median sale price in the order of $150,000 and ~230 sales per annum.

Regional Impact Assessment

The regional impact assessment estimated the direct and indirect economic impacts of the Project during the construction and operation phases on the regional, state and national economies.

[1] CDM Smith defines lower blue collar workers as those employed within the single digit ANZSCO occupations of Machinery Operators and Drivers and Labourers.
[2] CDM Smith defines lower white collar workers as those employed within the single digit ANZSCO occupations of Clerical and Administrative Workers, Community and Personal Service Workers and Sales Workers.

Construction Costs

The construction costs associated with the Project are estimated at $1,313.0 million, comprising:

- $420.2 million incurred within MIW SA4;
- $538.3 million incurred within the Rest of Queensland;
- $91.9 million incurred within the Rest of Australia; and
- $262.6 million incurred overseas.

Operational Costs

Total operational costs are estimated at $5,982.4 million over the life of the Project, comprising:

- $2,852.4 million incurred within MIW SA4;
- $1,480.6 million incurred within the Rest of Queensland;
- $1,641.4 million incurred within the Rest of Australia; and
- $8.0 million incurred overseas.

Economic Impact Assessment

Construction Phase

The total output impacts for the MIW SA4, Rest of Queensland and Rest of Australia economies resulting from the construction phase of the Project are estimated at:

- MIW SA4 -Total contribution to output of $674.7 million, comprising $420.2 million in direct contribution and $million indirectly;
- Rest of Queensland – Total contribution to output of $1,013.7 million, comprising $538.3 million in direct contribution and $475.3 million indirectly; and
- Rest of Australia – Total contribution to output of $185.3 million, comprising $91.9 million in direct contribution and $93.4 million indirectly.

Output impacts are anticipated to be most significant within the construction, mining and manufacturing sectors at the regional, state and national level.

Operational Phase

MIW SA4

Total contribution to output, household income, employment and value added in the MIW SA4 economy attributable to the operational phase of the Project is as follows:

- Total output contribution of $5,341.2 million, comprising $2,852.4 million in direct output contribution and $2,488.8 million in indirect output contribution
- Total household income contribution of $1,207.4 million, comprising $682.4 million in direct household income contribution and $525.0 million in indirect household income contribution;
- Average employment contribution of 683 FTEs, comprising 385 direct FTEs and 299 indirect FTEs; and
- Total contribution to value added of $2,313.9 million, comprising $1,227.4 million directly and $1,086.5 million indirectly.

Rest of Queensland

Total contribution to output, household income, employment and value added in the Rest of Queensland economy attributable to the operational phase of the Project is as follows:

- Total output contribution of $2,466.1 million, comprising $1,480.6 million in direct output contribution and $985.5 million in indirect output contribution;
- Total household income contribution of $658.3 million, comprising $418.4 million in direct household income contribution and $239.9 million in indirect household income contribution;
- Average employment contribution of 407 FTEs, comprising 253 direct FTEs and 153 indirect FTEs; and
- Total contribution to value added of $1,122.0 million, comprising $683.0 million directly and $439.0 million indirectly.

Rest of Australia

Total contribution to output, household income, employment and value added in the Rest of Australia economy attributable to the operational phase of the Project as follows:

- Total output contribution of $2,912.2 million, comprising $1,641.3 million in direct output contribution and $1,270.8 million in indirect output contribution;
- Total household income contribution of $809.2 million, comprising $491.6 million in direct household income contribution and $317.6 million in indirect household income contribution;
- Average employment contribution of 508 FTEs, comprising 307 direct FTEs and 201 indirect FTEs; and
- Total contribution to value of added of $1,352.4 million, comprising $774.8 million in direct contribution and $577.6 million indirectly.

Value of Coal Exported

The Project is anticipated to produce approximately 109.7 million tonnes of metallurgical coal over a twenty year production schedule, comprising a mix of hard coking coal, semi soft coking coal and PCI coal.

The total export value of the coal produced is estimated to be $14.3 billion to $15.3 billion over the life of the Project. Assuming Queensland coal mining royalty rates remain unchanged, this will yield royalties of approximately $1.2 billion - $1.3 billion over the life of the Project.

Opportunity Cost of the Project

The opportunity cost of any given Project is generally defined as the next best alternative use of the resources that will be foregone because of the Project. Thus, in the MIW SA4, the most common economic use of the land is for cattle grazing.

The Project footprint is estimated to be 3,541 hectares and the analysis has conservatively assumed that cattle can be grazed over the entire mine lease area. As the Project represents an underground coal mine, it has been assumed that cattle grazing on the site can continue, but over a smaller area due to subsidence. The assessment has assumed a loss of 20% of the Project footprint resulting from subsidence.

Therefore, the opportunity cost of the Project is terms of annual output foregone and annual gross margin foregone is estimated to be approximately $0.71 million and $0.11 million, respectively.

Ecosystem Services Foregone

The Project is likely to disrupt and adversely impact regional ecosystems which provides habitats for a number of species. The total regional ecosystems impacted by the Project is estimated to be 1,261 hectares.

There will also be 2,280 hectares of non-remnant vegetation disturbed by the Project.

The study anticipated that the Project is anticipated to have an adverse ecosystem services impact of $4.2 million per annum.

Assessment of Project Impacts

The assessment of impacts utilises a risk-based assessment framework based on the anticipated interaction of probability and consequence of impacts occurring. This assessment has been applied to both positive and adverse impacts resulting from the Project (provided in Table 3-34 and Table 3-35 in the main body of this report) and include the likelihood, consequence and impact of the following:

- Economic stimulus to the regional, state and national economy during construction and operation;
- Increased regional supply chain and employment opportunities throughout construction and operation;
- Opportunity costs of the Project;
- Loss of ecosystem services;
- Inflationary pressures in the local labour market;
- Inflationary pressures in the local residential, commercial and industrial property market, and
- Increased burden on local and regional infrastructure.

Impacts Requiring Mitigation

Increased labour costs and skills shortages

The Project has the potential to increase labour costs within the region, particularly during the construction phase. To mitigate this potential impact, the following actions have been recommended:

- Promote the additional purchasing opportunities that the project will generate to the 200 plus Local Buy Program registered businesses which make up a key component of BMA's existing local supplier base. The advanced promotion of the additional opportunities will enable local businesses to plan and then secure purchase orders and thereby support the further expansion and development of the local labour force and its skills base;
- Work with BMA's local partners in the Local Buying Program to deliver training programs to raise skill levels of existing and new small business and other workers attracted to the region as a result of the supply opportunities generated by the project; and
- Maintain and expand the focus of BHP's Community Development Management Plans (CDMP) and related social investment spending on local education and training programs. This will include the employment of additional apprenticeships to be part of the project's operational workforce. This represents a strong contribution to mitigating the potential risks of future skills shortages.

The BMA approach to working with its communities is guided by its Community Development Management Plans (CDMP). This includes investing not less than 1 per cent of pre-tax profits (three year average) in social investment in the communities in which BHP operates. The current CDMP (BHP 2017) includes a clear focus on local employment, local procurement and social investment and education and training. The Social Impact Management Plan (SIMP) for the Project[3] includes five management plans including a Workforce Management Plan which will articulate desired outcomes, an action plan and monitoring.

Localised inflation in the housing market

The Project has some potential to result in increased housing costs within its host region, particularly during the construction phase.

The Project will include, if required, an accommodation facility which may consist of a temporary construction village and a separate permanent operation village to support the construction and operational stages. As such the potential

[3] Further details relating to the SIMP can be found in the Social chapter of the EIS.

for inflationary pressure in the local or regional housing market will be mitigated. BMA advises that the reference to "if required" means that it is committed to ensuring its workforce is suitably accommodated while also not causing substantial accommodation prices inflation to the detriment of people seeking affordable accommodation. As at 2018, there are unoccupied existing dwellings in the Isaac Regional Council area. If this situation was to continue, the proposed accommodation facility may not be required. However, in the past, there have been periods when there has not been any surplus accommodation available in the region to readily absorb the substantial increase in demand that is associated with a new project. This is particularly the case when other projects are advanced by other proponents at the same time. As BMA cannot control these externally determined factors, it is considered prudent to plan for a new facility in case it is required given accommodation market conditions at the unknown tie in the future when the project is executed.

Note: BMA included an operational accommodation village within the scope of the Project at the commencement of the EIS, but following consideration of Social Impact Assessment (SIA) related consultation with the Office of the Coordinator General (OCG) and the IRC after completion of this section of the EIS, it became evident to BMA that these key stakeholders did not agree that the proposed operational village was warranted. As a result, BMA is not further pursuing approval of the operational village as part of the EIS process.

Increased burden on local and regional infrastructure

The Project will involve the relocation of the existing water pipeline and existing 132 kilovolt (kV) powerline into a new infrastructure and transport corridor. The Project will likely contribute to an increase in traffic volumes on the road network, thereby accelerating deterioration of the network. The Project will also increase the utilisation of the Goonyella railway network for the haulage of coal to Hay Point and Dalrymple Bay coal terminals. The traffic assessment for the Project noted that the Goonyella railway network is likely to be able to accommodate the increase on the network[4].

The mitigation measures for minimising impacts on terrestrial ecology are found within Chapter 6 of the EIS.

Cost Benefit Analysis

The cost benefit analysis identifies the present value of costs and benefits over the life of the Project, presented in real dollar values. This economic assessment outlines the assumptions utilised in the cost benefit analysis and assesses the Project over a range of discount rates, with key decision criteria reported include net present value and benefit cost ratio. In addition, the economic robustness of the Project is assessed through scenario testing.

Project Costs

BMA estimates that total Project costs are anticipated to be $7.4 billion over the life of the Project. This estimate is inclusive of construction costs, operational costs and the cost of make good agreements.

Project Benefits / Disbenefits

The following benefit / disbenefit streams have been identified for the Project:

- Value of coal production (less haulage costs);
- Greenhouse gas emissions;
- Opportunity cost of alternative land use; and
- Value of ecosystems foregone.

Overall, the net benefits of the Project were estimated to be $12.7 billion over the life of the Project.

Summary of Results

[4] Refer to the Traffic Chapter of the EIS report for further details regarding transport matters.

A range of discount rates are used by government assessment agencies for the purposes of project evaluation. This analysis utilises the real discount rates of 4%, 7% and 10%, which are consistent with the range of discount rates used by Infrastructure Australia.

Under all real discount rates analysed, the Project provides a positive net benefit, with the benefit cost ratio ranging between 1.3 and 1.7.

Sensitivity Testing

Sensitivity testing was also undertaken in addition to the main case analysis outlined above to test the economic robustness of the Project. The three sensitivity tests identified included:

- An increase in project costs of 10%;
- A decrease in project benefits of 10%; and
- A combined increase in project costs of 10% and a decrease in project benefits of 10%.

The scenario tests indicate that the net present value under all scenarios remains positive under all real discount rates analysed for both coal production scenarios.

Conclusion

This assessment has considered the potential economic impacts of the project on the local, regional and state geographies and estimated the costs and benefits and economic impacts of the project using both regional impact analysis and cost benefit analysis. The assessment has been undertaken in general accordance with the Coordinator-General's *Economic Impact Assessment Guideline* (April 2017). The Project would employ mitigation measures to minimise potential adverse economic impacts. Overall the project would provide a positive net benefit and may be determined accordingly.

Section 1 Introduction

1.1 Project Overview

BM Alliance Coal Operations Pty Ltd (BMA) proposes to develop the Project, located approximately 170km southwest of Mackay. The Project comprises a greenfield, single seam underground coal mine to be developed on Mining Lease Application (MLA) 70383 commencing from within the existing adjacent Saraji Mine. The mine is anticipated to produce up to eight million tonnes per year of coal product for the export market over a 20-year production schedule. It is expected that a new accommodation facility will be required to support the construction and operational phases of the Project, which would consist of a temporary construction village and a separate permanent operations village. The Project would also require ancillary infrastructure including:

- Coal handling and processing plant (CHPP);
- Conveyor system delivering coal from underground to the CHPP and to the loading facilities,
- Rail spur and balloon loop signalling system,
- Network of gas drainage bores, gas and water collection networks and access tracks across the underground mine footprint;
- Relocation of the existing water pipeline, powerline and transport corridor; and
- ROM stockpile and product stockpile pads.

The proponent for the Project is BM Alliance Coal Operations Pty Ltd (BMA) acts on behalf of the Central Queensland Coal Associates (CQCA) Joint Venture, namely BHP Coal Pty Ltd, BHP Queensland Coal Investments Pty Ltd, Umal Consolidated Pty Ltd, QCT Resources Pty Limited, QCT Mining Pty Ltd, QCT Investment Pty Ltd, and Mitsubishi Development Pty Ltd under a management agreement. The CQCA is an unincorporated joint venture between BHP Billiton (50%) and Mitsubishi Corporation (50%).

1.2 Purpose of Study

The purpose of this report is to address the economic components of the finalised Terms of Reference for the Project, comprising a regional impact assessment and a cost benefit analysis.

1.3 Report Structure

This report is structured as follows:

- **Section 1 – Introduction**: This section reports on the purpose of the study, an overview of the Project and the report structure;
- **Section 2 – Economic Baseline Analysis**: This section identifies the local and regional economies that are likely to be impacted by the Project and reports on the current historic demographic and economic conditions of the identified economies;
- **Section 3 – Economic Impact Analysis**: This section utilises an input-output approach to estimate the direct and indirect economic impacts of the Project during the construction and operation phases on the regional, state and national economies in terms of output, household incomes, employment and value added. It also discusses other potential impacts resulting from the Project including expected royalties payable and ecosystem services foregone; and

- **Section 4 – Cost Benefit Analysis**: This section provides a comprehensive cost benefit analysis of the Project, including sensitivity and scenario testing.

Section 2 Economic Baseline Assessment

The economic baseline assessment describes the existing local, regional, state and national economies that may be affected by the Project. The economic baseline assessment considers the following factors:

- Size and structure of the existing economy;
- Demographic analysis;
- Industry analysis;
- Project Development pipeline;
- Coal production outlook;
- Agricultural production;
- Local property market overview; and
- Commercial accommodation assessment.

The study areas analysed has been based on the Project location along with the consideration of likely primary sources of labour, goods and services that will be utilised by the Project. The study area represents the regional economies most likely to be either directly or indirectly affected by the Project. The study areas are defined as follows:

- Local economy: Isaac Local Government Area (LGA); and
- Regional economy: Mackay – Isaac – Whitsunday Statistical Area 4 (MIW SA4).

2.1 Size and Structure of the Existing Economy

2.1.1 Population Size and Projected Growth

The population projections presented for Isaac LGA, MIW SA4 and Queensland are based on the latest Queensland Government Statistician's Office (QGSO) population projections (2015 edition), rebased to the 2016 estimated resident population estimates prepared by the ABS.

The population of Isaac LGA, as derived by the rebased QGSO population projections, is anticipated to increase from 21,563 persons in 2016 to 27,637 persons in 2036, or by 1.2% per annum. The resident population of both MIW SA4 and Queensland is anticipated to grow at a faster rate than Isaac LGA between 2016 and 2036. The working age population (15 years and over) in each region is anticipated to increase at a faster rate than the total population between 2016 and 2036.

Table 2-1 reports the projected total population and working age population of Isaac LGA, MIW SA4 and Queensland between 2016 and 2036.

Table 2-1 Population Projections – Total population and working age population, Isaac LGA, MIW SA4 and Queensland, 2016-2036

	2016	2021	2026	2031	2036	Ave. annual change (2016-36)
Total population						
Isaac LGA	21,563	22,822	24,381	26,033	27,637	1.2%
MIW SA4	173,892	186,111	200,754	216,537	233,005	1.5%
Queensland	4,848,877	5,245,780	5,725,137	6,235,183	6,757,340	1.6%
Working age population (15+ years)						
Isaac LGA	16,059	17,006	18,265	19,575	20,845	1.3%
MIW SA4	137,234	146,818	159,276	172,639	186,397	1.6%
Queensland	3,894,279	4,224,797	4,635,026	5,071,587	5,515,653	1.7%

Source: QGSO (2015) Projected Population (medium series) by local government area, ABS (2017)

2.1.2 Gross Regional Product

The most recent GRP estimates prepared by Queensland Treasury and Trade (QTT) in 2013 are reported in Table 2-2. The estimates reported pertain to the GRP of MIW SA4 and Queensland as of 2000-01 and 2010-11 and include a breakdown of GRP by industry.

In 2010-11, the mining sector was the most significant contributor to GRP in the MIW SA4 at $12.4 billion, or 54.2% of total GRP. Other significant industry sectors in the MIW SA4 in terms of contribution to GRP included construction, transport, postal and warehousing and manufacturing.

The most significant contributor to Queensland GRP in 2010-11 was the mining industry, although the contribution to total GSP was significantly lower than in the MIW SA4. Other significant industries in terms of contribution to Queensland GSP in 2010-11 included construction, manufacturing and the health care and social assistance sector.

Between 2000-01 and 2010-11 the MIW SA4 economy grew at an average annual rate of 13.7% per annum, significantly above the state average (8.8% per annum). The average annual growth rate in GRP in MIW SA4 significantly exceeded the state average for the following sectors:

- Construction: Average annual growth rate of 23.3% per annum, 11.1% points above the Queensland average;
- Rental, hiring and real estate services: Average annual growth rate of 15.5% per annum, 5.8% points above the Queensland average;
- Administrative and support services: Average annual growth rate of 14.8% per annum, 5.5% points above the Queensland average;
- Other services: Average annual growth rate of 10.8% per annum, 4.9% points above the Queensland average; and
- Manufacturing: Average annual growth rate of 10.4% per annum, 4.9% points above the Queensland average.

Table 2-2 Nominal Gross Regional Product by industry, MIW SA4 and Queensland, 2011 and 2016, current prices ($m)

Industry	MIW SA4			Queensland		
	2000-01	2010-11	Ave. annual change 2000-01 to 2010-11	2000-01	2010-11	Ave. annual change 2000-01 to 2010-11
Agriculture, forestry and fishing	$485.4	$615.8	2.4%	$5,478.4	$7,286.4	2.9%
Mining	$2,446.0	$12,361.4	17.6%	$8,509.0	$28,875.7	13.0%
Manufacturing	$371.9	$1,003.5	10.4%	$12,705.1	$21,859.1	5.6%
Electricity, gas, water and waste services	$82.0	$228.1	10.8%	$2,331.2	$7,016.5	11.6%
Construction	$283.7	$2,303.5	23.3%	$7,926.1	$25,097.5	12.2%
Wholesale trade	$353.0	$752.6	7.9%	$6,760.5	$14,302.9	7.8%
Retail trade	$245.9	$524.6	7.9%	$7,226.8	$14,572.8	7.3%
Accommodation and food services	$195.4	$387.7	7.1%	$4,079.6	$7,016.5	5.6%
Transport, postal and warehousing	$416.1	$1,049.1	9.7%	$7,926.1	$16,731.7	7.8%
Information media and telecommunications	$100.9	$136.8	3.1%	$4,079.6	$5,667.2	3.3%
Financial and insurance services	$138.7	$296.5	7.9%	$6,760.5	$17,811.2	10.2%
Rental, hiring and real estate services	$75.6	$319.3	15.5%	$2,680.9	$6,746.7	9.7%
Professional, scientific and technical services	$119.8	$410.5	13.1%	$5,361.8	$16,461.8	11.9%
Administrative and support services	$63.0	$250.9	14.8%	$2,331.2	$5,667.2	9.3%
Public administration and safety	$126.1	$319.3	9.7%	$6,410.9	$15,112.5	9.0%
Education and training	$176.5	$296.5	5.3%	$5,594.9	$11,064.5	7.1%
Health care and social assistance	$195.4	$433.3	8.3%	$6,993.7	$17,271.4	9.5%
Arts and recreation services	$18.9	$22.8	1.9%	$1,165.6	$1,619.2	3.3%
Other services	$122.9	$342.1	10.8%	$2,739.2	$4,857.6	5.9%
Ownership of dwellings	$286.8	$752.6	10.1%	$9,499.7	$24,827.7	10.1%
Gross regional product	**$6,304.0**	**$22,807.0**	**13.7%**	**$116,561.0**	**$269,866.0**	**8.8%**

Source: Queensland Treasury and Trade (2013) Experimental Estimates of Gross Regional Product

2.2 Demographic Analysis

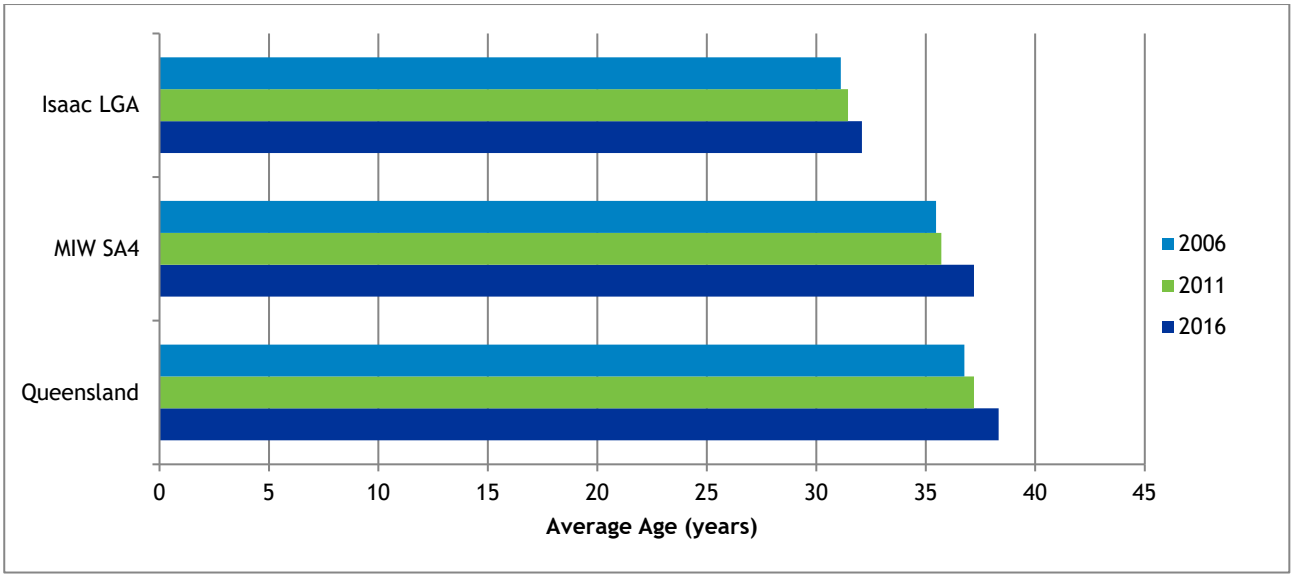
The demographic analysis considers the demographic characteristics of the local and regional economies impacted by the Project, benchmarked to Queensland. Demographic analysis presented in this section of the report includes population by age, family composition and average household incomes as of the 2006, 2011 and 2016 Censuses.

2.2.1 Average Age of Residents

The average age of residents in all three regions analysed has increased between 2006 and 2016. Specifically, the average age of residents in Isaac LGA has increased from 31.1 years in 2006 to 32.1 years as of the 2016 Census, which is significantly younger than in both MIW SA4 and Queensland. The average age of residents in MIW SA4 and Queensland increased from 35.5 years and 36.8 years in 2006 to 37.2 years and 38.3 years in 2016 respectively.

Figure 2-1 reports the average age of the resident population of Isaac LGA, MIW SA4 and Queensland as at the 2006, 2011 and 2016 Censuses.

Figure 2-1 Average age of residents, Isaac LGA, MIW SA4 and Queensland, 2006-2016



Source: ABS (2017b) Census of Population and Housing: Time Series Profile 2016

2.2.2 Age Profile

As previously outlined, the average age of residents in Isaac LGA was significantly lower than Queensland as of the 2016 Census. In 2016 Isaac LGA recorded a significantly lower, relative to Queensland, proportion of:

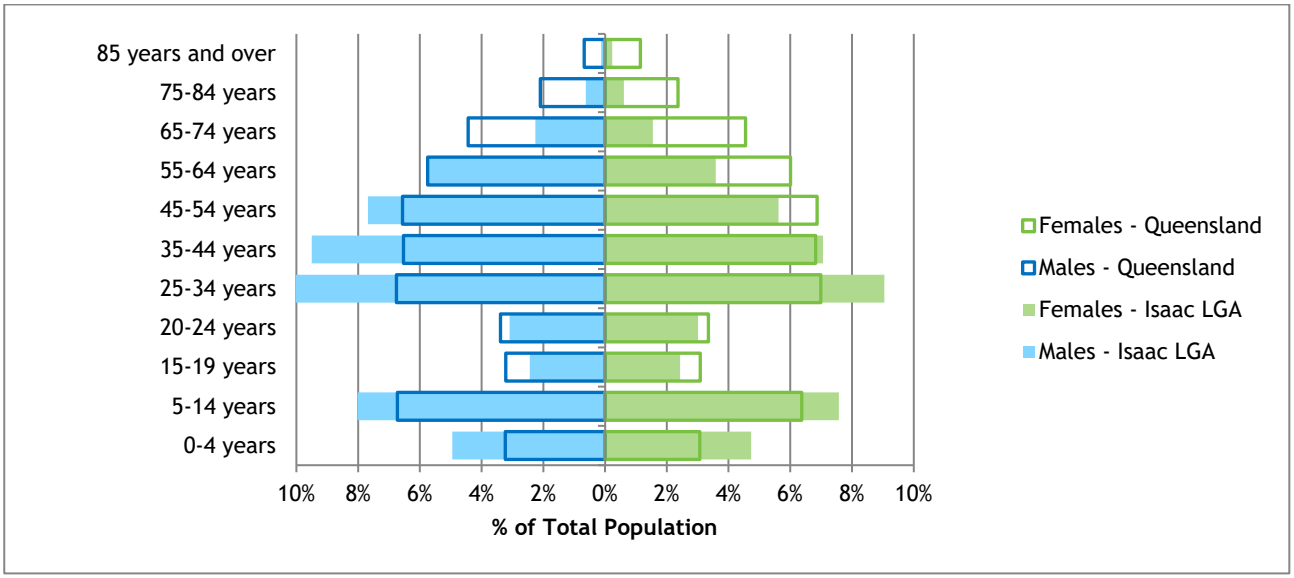
- Persons aged 15-19 years;
- Females aged 45-64 years; and
- Persons aged 65 years and over.

In 2016 Isaac LGA recorded a significantly higher, relative to Queensland, proportion of:

- Persons aged 0-14 years;
- Persons aged 25-34 years; and
- Males aged 35-54 years.

Figure 2-2 illustrates the distribution of the population by age in Isaac LGA and Queensland as of the 2016 Census.

Figure 2-2 Age profile, Isaac LGA and Queensland, 2016



Source: ABS (2017a) Census of Population and Housing: General Community Profile

As of the 2016 Census, MIW SA4 had a significantly lower, relative to Queensland, proportion of:

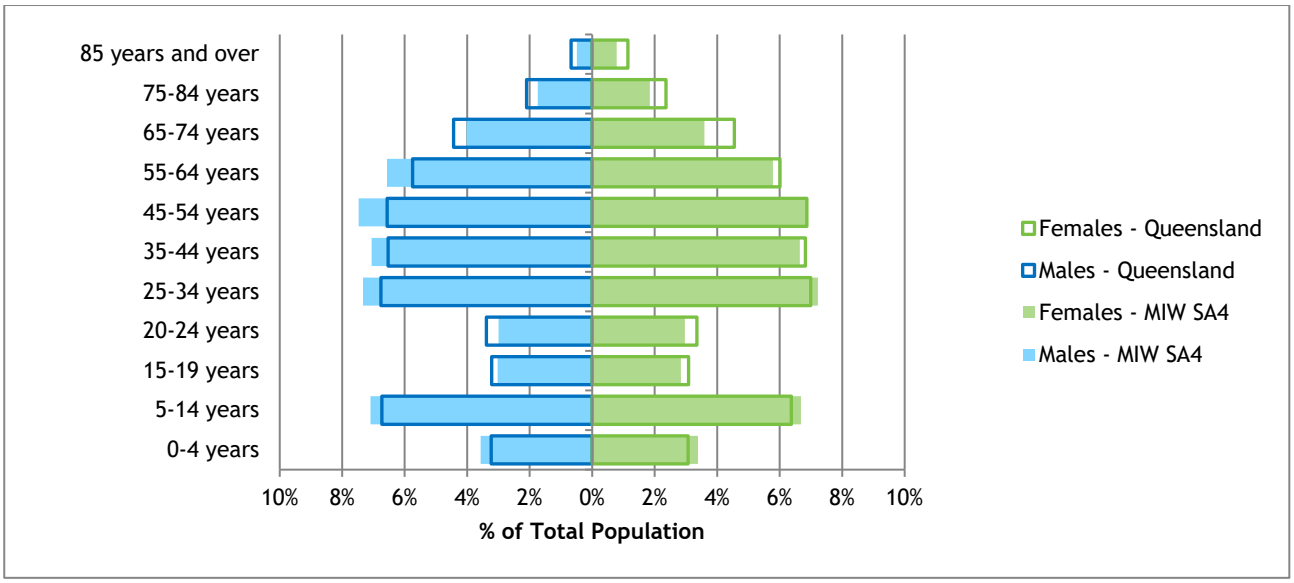
- Persons aged 15-24 years; and
- Persons aged 65 years and over.

As of the 2016 Census, MIW SA4 had a significantly higher, relative to Queensland, proportion of:

- Persons aged 0-14 years; and
- Males aged 25-64 years.

Figure 2-3 illustrates the distribution of the population by age in MIW SA4 and Queensland as of the 2016 Census.

Figure 2-3 Age profile, MIW SA4 and Queensland, 2016



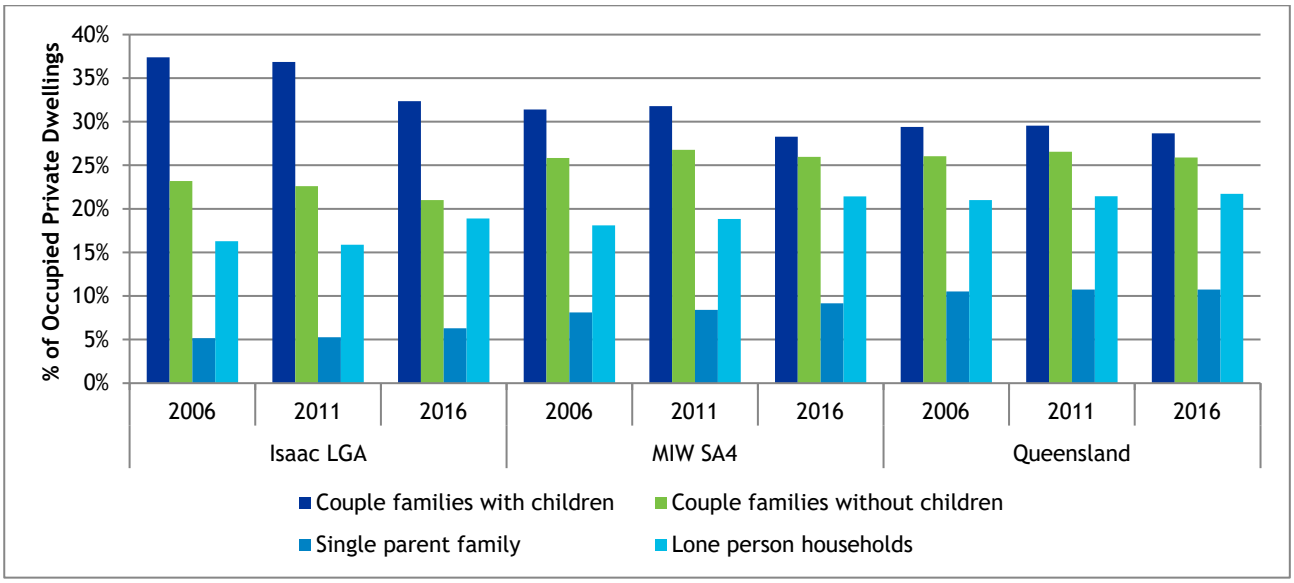
Source: ABS (2017a) Census of Population and Housing: General Community Profile

2.2.3 Family Composition

In all three areas analysed, couple families with children have remained the dominant family type in the past three Censuses, despite declines in the incidence of this family type. In the 2006 to 2016 period, there has been a corresponding increase in the proportion of single parent families and lone person households in all areas analysed.

In Isaac LGA, the proportion of couple families with children has decreased from 37.4% in 2006 to 32.3% in 2016, whilst the proportion of single parent families increased from 5.2% in 2006 to 6.3% in 2016 and the incidence of lone person households has increased from 16.3% to 18.9% over the same period. These trends are illustrated in Figure 2-4 reporting family compositions for Isaac LGA, MIW SA4 and Queensland between 2006 and 2016.

Figure 2-4 Family composition, Isaac LGA, MIW SA4 and Queensland, 2006-2016



Source: ABS (2017b) Census of Population and Housing: Time series Profile

2.2.4 Average Household Income

Average household incomes within Isaac LGA and MIW SA4 have historically been higher than the Queensland average. However, average household incomes in Isaac LGA and MIW SA4 have decreased between the 2011 and 2016 Census periods, where the Queensland average has increased. This decrease in average household incomes was likely due to a downturn in the mining sector. The average weekly household income in Isaac LGA increased from $1,902 in 2006 to $2,361 in 2011, though subsequently fell to $2,257 in 2016. This represents an average annual increase of 1.7% over the ten year period. As of the 2016 Census, average household incomes in Isaac LGA were approximately 33% higher than the state average ($1,691 per week) and 30% higher than the MIW SA4 average ($1,734 per week).

The average annual change in average household incomes in Isaac LGA between 2006 and 2016 was:

- 4.4% per annum between 2006 and 2011;
- -0.9% per annum between 2011 and 2016; and
- 1.7% annum between 2006 and 2016.

The average annual change in household incomes in MIW SA4 between 2006 and 2016 was:

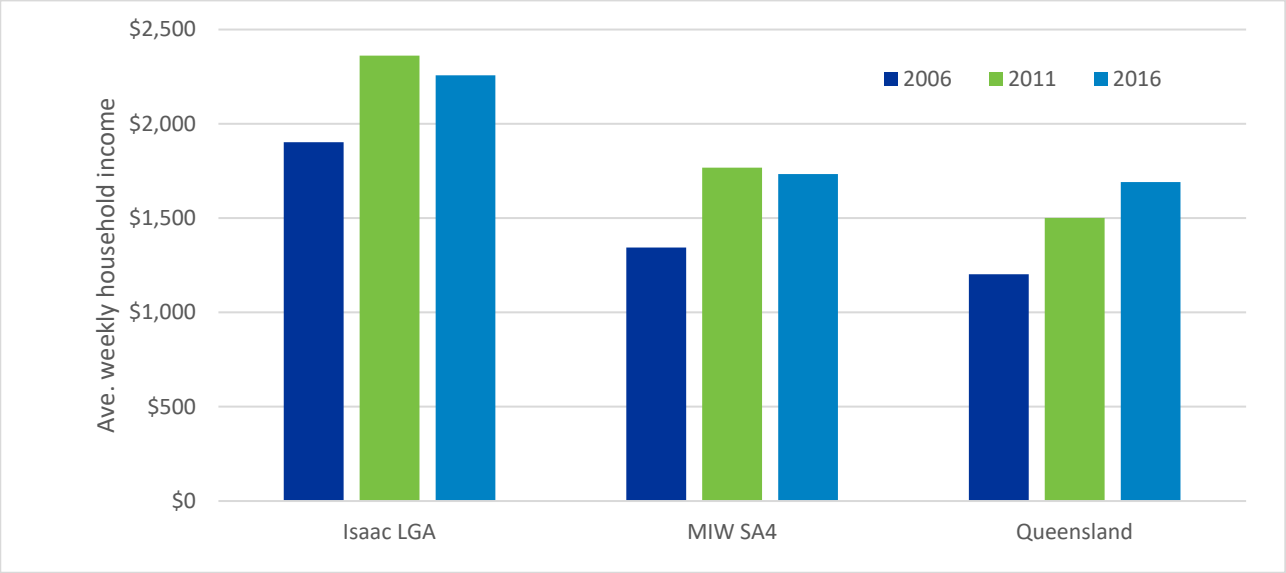
- 5.6% per annum between 2006 and 2011;
- -0.4% per annum between 2011 and 2016; and
- 2.6% per annum between 2006 and 2016.

The average annual change in household incomes in Queensland between 2006 and 2016 was:

- 4.5% per annum between 2006 and 2011;
- 2.4% per annum between 2011 and 2016; and
- 3.5% per annum between 2006 and 2016.

Trends in average weekly household incomes of Isaac LGA, MIW SA4 and Queensland between 2006 and 2016 are illustrated in Figure 2-5.

Figure 2-5 Average weekly household income, Isaac LGA, MIW SA4 and Queensland, 2006-2016



Source: ABS (2017b) Census of Population and Housing: Time Series Profile

2.3 Industry Analysis

The industry analysis provides an overview of the labour market characteristics within Isaac LGA, MIW SA4 and Queensland, based on several data sources, including the Australian Government's Department of Employment (Small Area Labour Market statistics), the 2016 Census (employment by industry and occupation and post-school qualifications) and ABS business count data.

2.3.1 Labour Force Size

Corresponding to a lull in projects entering the development pipeline in the Mackay – Isaac – Whitsunday region in the recent past, the size of the labour force in both Isaac LGA and MIW SA4 has decreased from the highs recorded between 2012 and 2014 but showed early signs of recovery in 2016-17, recording growth of 2.4% and 3.9% respectively.

The size of the labour force in Isaac LGA decreased from 14,760 persons in 2012-13 to 12,638 persons in 2015-16 and increased to 12,938 persons by 2016-17. Similarly, the size of the MIW SA4 labour force decreased from 104,333 persons in 2013-14 to 95,049 persons in 2015-16 and increased to 98,769 persons by 2016-17. This contrasts with the total Queensland labour force which has shown positive growth in all years analysed, increasing from 2,418,190 persons in 2011-12 to 2,523,291 persons in 2016-17. Between 2015-16 and 2016-17 the size of the Isaac LGA, MIW SA4 and Queensland labour force has increased by 2.4%, 3.9% and 0.1% respectively.

Table 2-3 reports the size of the labour force in Isaac LGA, MIW SA4 and Queensland between 2011-12 and 2016-17.

Table 2-3 Labour force size, Isaac LGA, MIW SA4 and Queensland, 2011-12 to 2016-17

Labour force size	Isaac LGA	MIW SA4	Queensland
2011-12	13,987	97,445	2,418,190
2012-13	14,760	104,165	2,432,922
2013-14	14,548	104,333	2,469,281
2014-15	13,617	99,983	2,488,878
2015-16	12,638	95,049	2,521,675
2016-17	12,938	98,769	2,523,291
Ave. annual change 2011-12 to 2016-17	-1.5%	0.3%	0.9%
Ave. annual change 2015-16 to 2016-17	2.4%	3.9%	0.1%

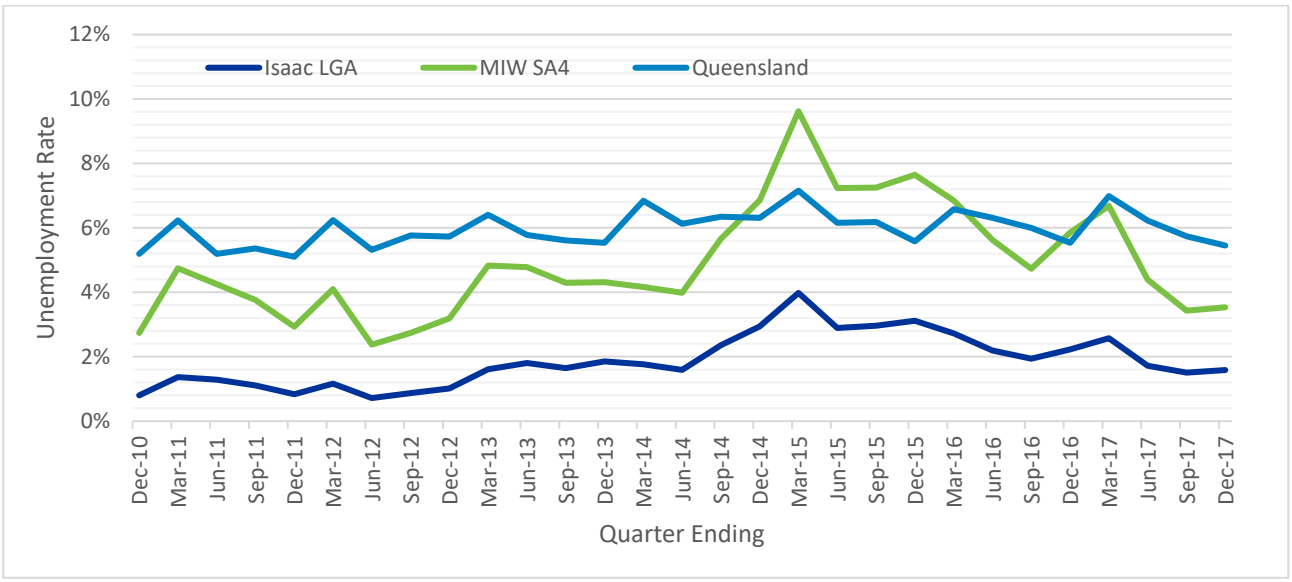
Source: Department of Employment (various years) SALM Statistics

2.3.2 Unemployment Rate

The unemployment rate in Isaac LGA has historically been significantly lower than MIW SA4 and Queensland. Similarly, the unemployment rate in MIW SA4 has also generally been lower than Queensland between 2010 and 2017, though with a temporary increase above the state level between December 2014 and March 2016.

The unemployment rate in Isaac LGA has increased from 0.8% in the December quarter 2010 to 1.6% in the December quarter 2017, with a notable increase in unemployment in the 2014-15 financial year (to a maximum of 4.0%). The unemployment rate in MIW SA4 has increased from 2.7% in the December quarter 2010 to 3.5% in the December quarter 2017, with a notable increase in unemployment in the 2014-15 financial year to a maximum of 9.6% which was above the state average at that time.

Figure 2-6 Unemployment rate, Isaac LGA, MIW SA4 and Queensland, 2010-2017



Source: Department of Employment (various years) SALM Statistics

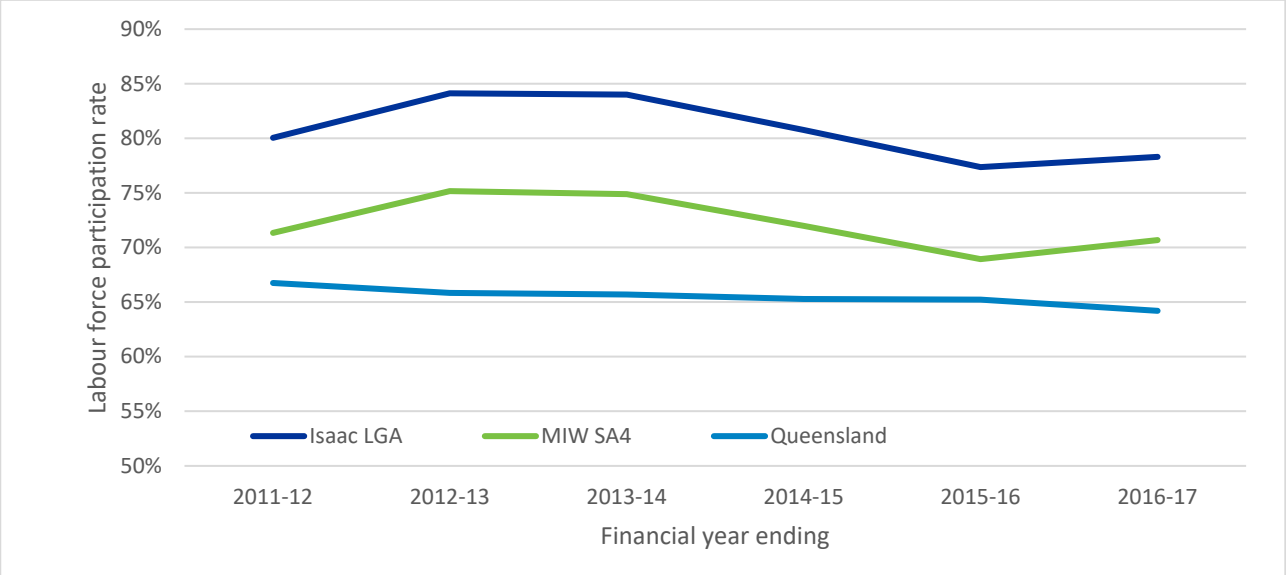
2.3.3 Labour Force Participation Rate

The labour force participation rate has historically been higher in Isaac LGA and MIW SA4 relative to the state average. The labour force participation rate in Isaac LGA increased from 80.0% in 2011-12 to 84.0% in 2013-14 and subsequently decreased to 78.5% in 2016-17. The labour force participation rate in Queensland has experienced a decrease from 66.8% in 2011-12 to 64.5% in 2016-17.

The labour force participation rate in Isaac LGA and the MIW SA4 has followed a similar trend over the six years analysed, with the labour force participation rate averaging 8.6% points higher in Isaac LGA than MIW SA4.

Figure 2-7 reports the labour force participation rate for Isaac LGA, MIW SA4 and Queensland between 2011-12 and 2016-17.

Figure 2-7 Labour force participation rate, Isaac LGA, MIW SA4 and Queensland, 2011-12 to 2016-17



Source: ABS (2017c) Census of Population and Housing: Working Population Profile, Department of Employment (various years) SALM Statistics

2.3.4 Employment by Industry

As of the 2016 Census the mining and agriculture, forestry and fishing industries were the primary employers of workers residing in Isaac LGA, accounting for 37.7% and 10.4% of employment respectively. Other significant industries of employment within Isaac LGA included:

- Education and training – accounting for 6.6% of employment;
- Accommodation and food services – accounting for 6.5% of employment; and
- Other services – accounting for 5.7% of employment.

Although accounting for a lower proportion of total employment than in Isaac LGA, the mining industry was also the key employer in MIW SA4, accounting for 14.4% of total employment as of the 2016 Census. Other significant industries of employment within MIW SA4 as of the 2016 Census included:

- Retail trade – accounting for 9.3% of employment;
- Health care and social assistance – accounting for 9.1% of employment;
- Other services – accounting for 8.5% of employment; and
- Accommodation and food services – accounting for 8.2% of employment.

For comparison, the most significant industries of employment within Queensland as of the 2016 Census included the health care and social assistance (13.0% of employment), retail trade (9.9% of employment), construction (9.0% of employment) and education and training (9.0% of employment) sectors.

Table 2-4 reports the resident employment by industry for Isaac LGA, MIW SA4 and Queensland as of the 2016 Census.

Table 2-4 Employment by industry, Isaac LGA, MIW SA4 and Queensland, 2016

	Isaac LGA	MIW SA4	Queensland
Agriculture, forestry and fishing	10.4%	5.5%	2.8%
Mining	37.7%	14.4%	2.3%
Manufacturing	3.0%	5.5%	6.0%
Electricity, gas, water and waste services	1.1%	0.9%	1.1%
Construction	3.5%	7.0%	9.0%
Wholesale trade	1.3%	3.0%	2.6%
Retail trade	5.1%	9.3%	9.9%
Accommodation and food services	6.5%	8.2%	7.3%
Transport, postal and warehousing	4.0%	6.3%	5.1%
Information media and telecommunications	0.2%	0.5%	1.2%
Financial and insurance services	0.3%	1.1%	2.5%
Rental, hiring and real estate services	1.0%	1.6%	2.0%
Professional, scientific and technical services	1.4%	3.6%	6.3%
Administrative and support services	3.6%	3.4%	3.5%
Public administration and safety	4.1%	4.2%	6.6%
Education and training	6.6%	7.1%	9.0%
Health care and social assistance	3.9%	9.1%	13.0%
Arts and recreation services	0.6%	0.8%	1.6%
Other services	5.7%	8.5%	8.2%
Total	100.0%	100.0%	100.0%

Source: ABS (2017c) Census of Population and Housing: Working Population Profile

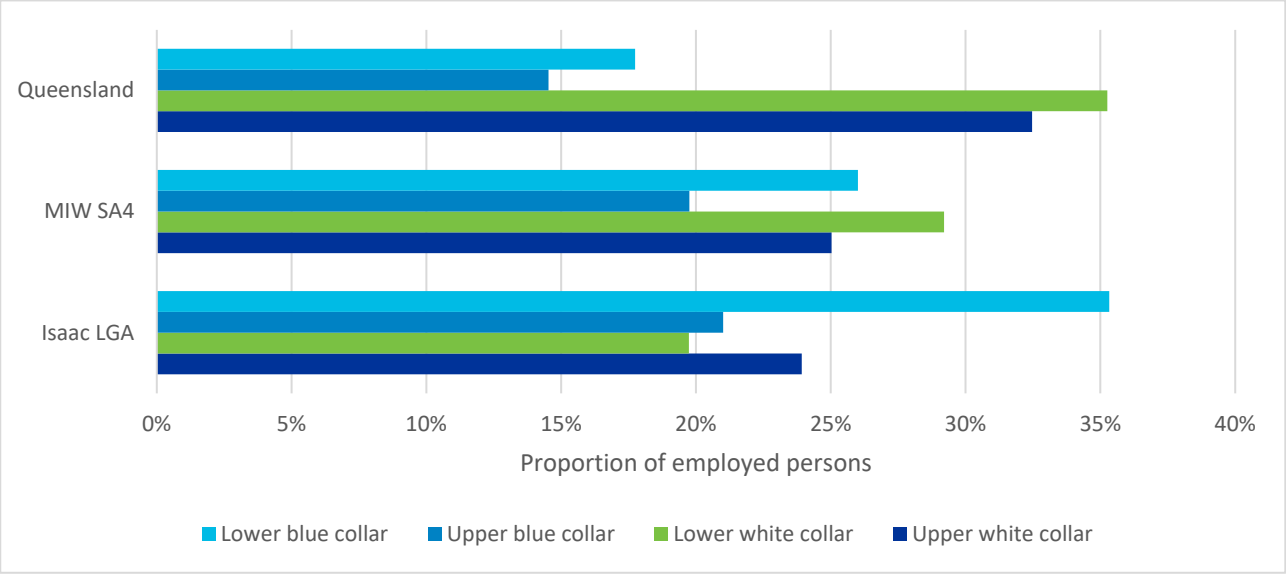
2.3.5 Occupation

As of the 2016 Census, lower blue collar[5] occupations represented the dominant occupation type within Isaac LGA, accounting for 35.3% of employment. This contrasts with MIW SA4 and Queensland where the dominant occupation type was lower white-collar[6] occupations, accounting for 29.2% and 35.3% of employment respectively. Lower white-collar workers were under represented relative to Queensland accounting for 19.7% of employment as of the 2016 Census. Figure 2-8 illustrates the distribution of employment within Isaac LGA, MIW SA4 and Queensland by occupation type as of the 2016 Census.

[5] CDM Smith defines lower blue collar workers as those employed within the single digit ANZSCO occupations of Machinery Operators and Drivers and Labourers.

[6] CDM Smith defines lower white collar workers as those employed within the single digit ANZSCO occupations of Clerical and Administrative Workers, Community and Personal Service Workers and Sales Workers.

Figure 2-8 Occupation type, Isaac LGA, MIW SA4 and Queensland, 2016



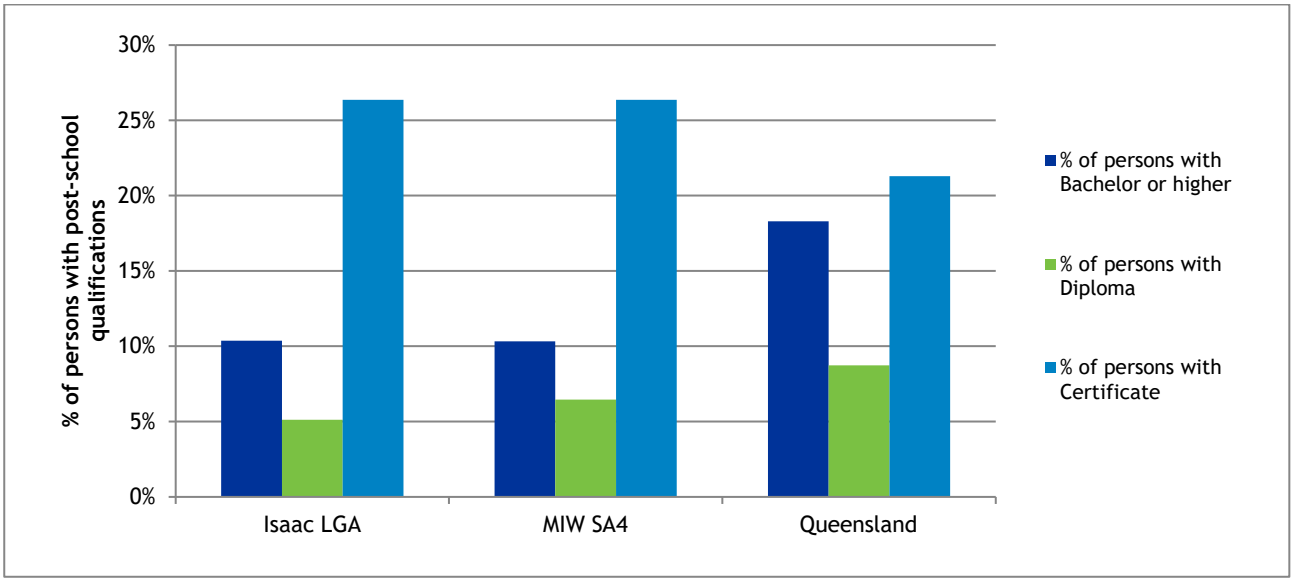
Note: CDM Smith defines each occupation category as follows: Lower blue collar – one digit ANZSCO categories of Machinery Operators and Drivers and Labourers, Upper blue collar – one digit ANZSCO categories of Technicians and trades workers, Lower white collar – one digit ANZSCO categories of Clerical and Administrative Workers, Community and Personal Service Workers and Sales Workers, Upper white collar – one digit ANZSCO categories of Managers and Professionals
Source: ABS (2017c) Census of Population and Housing: Working Population Profile

2.3.6 Qualifications

As of the 2016 Census, the proportion of the population aged 15 years and above holding a post-school qualification in Isaac LGA, MIW SA4 and Queensland was 41.8%, 43.1% and 48.3% respectively. The lower incidence of post-school qualification holders within Isaac LGA relative to Queensland is primarily due to a lower proportion of persons with a bachelor's degree or higher (10.4% in Isaac LGA, 18.3% in Queensland). However, reflective of the high representation of employment within the mining industry, Isaac LGA and MIW SA4 both had a higher incidence of the population aged 15 years and above attaining a certificate qualification relative to the state average.

Figure 2-9 illustrates the incidence of the population aged 15 years and above within Isaac LGA, MIW SA4 and Queensland who held a post-school qualification as of the 2016 Census.

Figure 2-9 Proportion of population with post-school qualifications, Isaac LGA, MIW SA4 and Queensland, 2016



Source: ABS (2017a) Census of Population and Housing: General Community Profile

2.3.7 Business Activity

As of June 2017, there were 1,637 registered businesses operating within Isaac LGA, of which 1,017 businesses were classified as sole traders, 592 businesses employed between 1 and 19 workers and 28 businesses employed between 20 and 199 workers. Of all registered businesses in Isaac LGA, 696 businesses or 42.5% of businesses operated within the agriculture, forestry and fishing industry, with the next most significant industry of business operation being construction, accounting for 10.4% of all registered businesses. As of June 2017, there were no businesses operating within Isaac LGA which employed 200 or more workers. Table 2-5 reports on the composition of registered businesses within Isaac LGA by industry and number of employees as of June 2017.

Table 2-5 Counts and classification of businesses within Isaac LGA, June 2017

Industry	1-19 Employees	20-199 Employees	200+ Employees	Total employing	Non employing	Total
Agriculture, Forestry and Fishing	206	3	0	209	487	696
Mining	5	0	0	5	6	11
Manufacturing	14	0	0	14	14	28
Electricity, Gas, Water and Waste Services	0	0	0	0	0	0
Construction	71	6	0	77	94	171
Wholesale Trade	9	0	0	9	19	28
Retail Trade	53	5	0	58	27	85
Accommodation and Food Services	33	5	0	38	15	53
Transport, Postal and Warehousing	35	3	0	38	37	75
Information Media and Telecommunications	3	0	0	3	3	6
Financial and Insurance Services	5	0	0	5	55	60
Rental, Hiring and Real Estate Services	24	0	0	24	109	133
Professional, Scientific and Technical Services	22	0	0	22	35	57
Administrative and Support Services	30	0	0	30	16	46
Public Administration and Safety	0	0	0	0	0	0
Education and Training	6	0	0	6	14	20
Health Care and Social Assistance	12	3	0	15	18	33
Arts and Recreation Services	3	0	0	3	4	7
Other Services	50	3	0	53	42	95
Currently Unknown	11	0	0	11	22	33
Total	**592**	**28**	**0**	**620**	**1,017**	**1,637**

Source: ABS (2018a) Counts of Australian Businesses, Including Entries and Exits

As of June 2017, there were 14,631 registered businesses operating within MIW SA4, of which 8,794 were classified as sole operators, 5,456 businesses employed between 1 and 19 workers, 372 businesses employed between 20 and 199 workers and nine businesses employed 200 or more workers. Of all registered businesses in MIW SA4, 3,155 businesses or 21.5% of businesses operated within the agriculture, forestry and fishing industry, 2,287 businesses or 15.6% of businesses operated within the construction industry and 1,675 businesses or 11.4% of businesses operated within the rental, hiring and real estate services industry.

Of the registered businesses employing more 200 or more workers, three were within the wholesale trade industry, three were within the transport, postal and warehousing industry and three were within the other services industry.

Table 2-6 reports on the composition of registered businesses within MIW SA4 by industry and number of employees as of June 2017.

Table 2-6 Counts and classification of businesses within MIW SA4, June 2017

Industry	1-19 Employees	20-199 Employees	200+ Employees	Total employing	Non employing	Total
Agriculture, Forestry and Fishing	763	28	0	791	2,364	3,155
Mining	49	16	0	65	82	147
Manufacturing	251	11	0	262	201	463
Electricity, Gas, Water and Waste Services	15	0	0	15	15	30
Construction	1,032	41	0	1,073	1,214	2,287
Wholesale Trade	100	13	3	116	157	273
Retail Trade	420	42	0	462	242	704
Accommodation and Food Services	365	60	0	425	162	587
Transport, Postal and Warehousing	319	28	3	350	510	860
Information Media and Telecommunications	17	0	0	17	31	48
Financial and Insurance Services	141	3	0	144	716	860
Rental, Hiring and Real Estate Services	248	14	0	262	1,413	1,675
Professional, Scientific and Technical Services	454	26	0	480	465	945
Administrative and Support Services	231	25	0	256	217	473
Public Administration and Safety	16	3	0	19	12	31
Education and Training	72	6	0	78	103	181
Health Care and Social Assistance	285	24	0	309	312	621
Arts and Recreation Services	45	0	0	45	65	110
Other Services	577	32	3	612	402	1,014
Currently Unknown	56	0	0	56	111	167
Total	**5,456**	**372**	**9**	**5,837**	**8,794**	**14,631**

Source: ABS (2018a) Counts of Australian Businesses, Including Entries and Exits

As of June 2017, there was a significantly higher representation of registered businesses within Isaac LGA and MIW SA4 operating in the agriculture, forestry and fishing industry relative to Queensland. Queensland had a higher incidence of businesses operating within the professional, scientific and technical services industry, the health care and social assistance industry and the financial and insurance services industry relative to Isaac LGA and MIW SA4. The proportion of registered business in Queensland that were classified as sole traders was not significantly different from that of Isaac LGA and MIW SA4.

Table 2-7 provides a comparison of the composition of registered businesses by industry that were registered within Isaac LGA, MIW SA4 and Queensland as of June 2017.

Table 2-7 Regional comparison of businesses by industry, June 2017

Industry	Isaac LGA	MIW SA4	Queensland
Agriculture, Forestry and Fishing	42.5%	21.6%	9.4%
Mining	0.7%	1.0%	0.4%
Manufacturing	1.7%	3.2%	3.7%
Electricity, Gas, Water and Waste Services	0.0%	0.2%	0.3%
Construction	10.4%	15.6%	17.2%
Wholesale Trade	1.7%	1.9%	3.0%
Retail Trade	5.2%	4.8%	5.7%
Accommodation and Food Services	3.2%	4.0%	4.0%
Transport, Postal and Warehousing	4.6%	5.9%	6.3%
Information Media and Telecommunications	0.4%	0.3%	0.7%
Financial and Insurance Services	3.7%	5.9%	8.3%
Rental, Hiring and Real Estate Services	8.1%	11.4%	11.6%
Professional, Scientific and Technical Services	3.5%	6.5%	11.0%
Administrative and Support Services	2.8%	3.2%	3.9%
Public Administration and Safety	0.0%	0.2%	0.3%
Education and Training	1.2%	1.2%	1.4%
Health Care and Social Assistance	2.0%	4.2%	5.7%
Arts and Recreation Services	0.4%	0.8%	1.1%
Other Services	5.8%	6.9%	4.7%
Currently Unknown	2.0%	1.1%	1.2%
Total	**1,637**	**14,631**	**437,586**

Source: ABS (2018a) Counts of Australian Businesses, Including Entries and Exits

2.4 Agricultural Production

This section of the regional economic impact assessment uses the latest agricultural data released by the ABS (2015-16) to identify the volume and value of key agricultural commodities produced within Isaac LGA and MIW SA4. Key agricultural commodities are defined as those commodities which account for a significant proportion of production value in Queensland.

2.4.1 Volume of Agricultural Commodities Produced

In 2015-16, the three most significant broadacre crops produced in Isaac LGA (in terms of proportion of total Queensland production) were:

- Sorghum: 128,066 tonnes, accounting for 10.9% of Queensland sorghum production;
- Chickpeas: 14,046 tonnes, accounting for 3.8% of Queensland chickpea production; and
- Oilseeds: 488 tonnes, accounting for 3.4% of Queensland oilseeds production.

In 2015-16, the three most significant broadacre crops produced in MIW SA4 (in terms of proportion of total Queensland production) were:

- Sugar cane: 6,434,232 tonnes, accounting for 19.9% of Queensland sugar cane production;

- Sorghum: 128,347 tonnes (virtually all produced within Isaac LGA), accounting for 10.9% of Queensland sorghum production; and
- Oilseeds: 1,134 tonnes, accounting for 7.9% of Queensland oilseed production.

Isaac LGA accounted for 6.4% of the total volume of broadacre crops produced within MIW SA4 and 1.2% of the total volume of broadacre crops in Queensland.

Table 2-8 reports the total volume of broadacre crops produced within Isaac LGA and MIW SA4 in 2015-16 relative to total Queensland broadacre crop production.

Table 2-8 Volume of broadacre crops produced within Isaac LGA and MIW SA4 relative to Queensland (t), 2015-16

Broadacre crops	Isaac LGA		MIW SA4	
	Volume (t)	% of Qld	Volume (t)	% of Qld
Sorghum	128,066	10.9%	128,347	10.9%
Chickpeas	14,046	3.8%	14,058	3.8%
Oilseeds	488	3.4%	1,134	7.9%
Maize	4,834	2.9%	4,840	3.0%
Other pulses	225	2.9%	225	2.9%
Mung beans	2,597	2.6%	3,950	3.9%
Wheat	12,778	1.0%	13,068	1.0%
Sugar cane	260,920	0.8%	6,434,232	19.9%
Oats	12	0.1%	12	0.1%
Barley	176	0.0%	367	0.1%
Other cereal	0	0.0%	0	0.0%
Rice	0	0.0%	288	2.6%
Lupins	0	0.0%	8	28.3%

Source: ABS (2018b) Agricultural Commodities

In 2015-16, the three most significant hay and silage items produced in Isaac LGA (in terms of proportion of total Queensland production) included:

- Other crops for hay: 7,829 tonnes, accounting for 9.8% of Queensland production;
- Other pastures for hay: 6,444 tonnes, accounting for 4.4% of Queensland production; and
- Crops for silage: 18,846 tonnes, accounting for 3.4% of Queensland production.

In 2015-16, the three most significant hay and silage items produced in MIW SA4 (in terms of proportion of total Queensland production) included:

- Other crops for hay: 8,347 tonnes, accounting for 10.5% of total Queensland production;
- Other pastures for hay: 11,990 tonnes, accounting for 8.2% of Queensland production; and
- Crops for silage: 19,513 tonnes, accounting for 3.5% of Queensland production.

In total, Isaac LGA accounted for 83.1% of the total volume of hay and silage items produced within MIW SA4 and 3.2% of the total volume of hay and silage items produced in Queensland.

Table 2-9 reports the total volume of hay and silage items produced within Isaac LGA and MIW SA4 in 2015-16 relative to total Queensland hay and silage production.

Table 2-9 Volume of hay and silage items produced within Isaac LGA and MIW SA4 relative to Queensland (t), 2015-16

Hay and silage	Isaac LGA		MIW SA4	
	Volume (t)	% of Qld	Volume (t)	% of Qld
Other crops for hay	7,829	9.8%	8,347	10.5%
Other pasture for hay	6,444	4.4%	11,990	8.2%
Crops for silage	18,846	3.4%	19,513	3.5%
Lucerne for hay	1,199	0.7%	1,615	0.9%
Cereal for hay	915	0.6%	929	0.6%

Source: ABS (2018b) Agricultural Commodities

In 2015-16, the two most significant fruit and nut items produced, relative to the total volume of Queensland production, in MIW SA4 included:

- Mangoes: 3,572 tonnes, accounting for 12.0% of Queensland production; and
- Kiwifruit: 15 tonnes, accounting for 4.2% of Queensland production.

In 2015-16, there were 37 tonnes of bananas produced within Isaac LGA, which accounted for less than 0.0001% of total Queensland banana production (348,104 tonnes).

Table 2-10 reports the total volume of fruit and nut items produced within Isaac LGA and MIW SA4 in 2015-16 relative to total Queensland fruit and nut production.

Table 2-10 Volume of fruit and nut items produced within Isaac LGA and MIW SA4 relative to Queensland (t), 2015-16

Fruit and nuts	Isaac LGA		MIW SA4	
	Volume (t)	% of Qld	Volume (t)	% of Qld
Mangoes	0	0.0%	3,572	12.0%
Bananas	37	0.0%	53	0.0%
Strawberries	5	0.0%	45	0.0%
Pineapples	0	0.0%	29	0.0%
Kiwifruit	0	0.0%	15	4.2%
Macadamias	0	0.0%	8	0.0%
Limes	0	0.0%	8	0.1%
Mandarins	2	0.0%	2	0.0%
Avocados	0	0.0%	1	0.0%
Lemons	0	0.0%	0	0.0%
Oranges	0	0.0%	0	0.0%

Source: ABS (2018b) Agricultural Commodities

In 2015-16, the three most significant vegetables produced in MIW SA4 (in terms of proportion of total Queensland production) included:

- Capsicums: 13,038 tonnes, accounting for 53.4% of Queensland production;
- Tomatoes: 32,815 tonnes, accounting for 49.0% of Queensland production; and
- Beans: 3,217 tonnes, accounting for 15.5% of Queensland production.

The total volume of vegetable production in MIW SA4 accounted for 16.0% of total vegetable production in Queensland in 2015-16. In 2015-16, there was no significant production of vegetables within Isaac LGA.

Table 2-11 reports the total volume of vegetables produced within Isaac LGA and MIW SA4 in 2015-16 relative to total Queensland vegetable production.

Table 2-11 Volume of vegetables produced within Isaac LGA and MIW SA4 relative to Queensland (t), 2015-16

Vegetables	Isaac LGA		MIW SA4	
	Volume (t)	% of Qld	Volume (t)	% of Qld
Capsicums	0	0.0%	13,038	53.4%
Tomatoes	0	0.0%	32,815	49.0%
Beans	0	0.0%	3,217	15.5%
Pumpkins	0	0.0%	5,535	12.6%
Melons	0	0.0%	2,732	3.5%
Sweet corn	0	0.0%	43	0.1%
Lettuces	0	0.0%	1	0.0%
Broccoli	0	0.0%	1	0.0%
Cabbages	0	0.0%	1	0.0%

Source: ABS (2018b) Agricultural Commodities

In 2015-16, the two most significant livestock commodities produced, relative to total Queensland production, in Isaac LGA included:

- Meat cattle: 866,106 head, accounting for 8.3% of Queensland production; and
- Dairy cattle: 2,456 head, accounting for 1.6% of Queensland production.

In 2015-16, the three most significant livestock commodities produced, relative to total Queensland production, in MIW SA4 included:

- Meat cattle: 1,179,957 head, accounting for 11.4% of Queensland production;
- Dairy cattle: 3,807 head, accounting for 2.5% of Queensland production; and
- Poultry for laying: 21,641 head, accounting for 0.5% of Queensland production.

In total, Isaac LGA accounted for 72.0% of the total volume of livestock commodities produced within MIW SA4 and 5.0% of the total volume of livestock in Queensland.

Table 2-12 reports the total volume of livestock commodities produced within Isaac LGA and MIW SA4 in 2015-16 relative to total Queensland production.

Table 2-12 Volume of livestock commodities produced within Isaac LGA and MIW SA4 relative to Queensland (head), 2015-16

Livestock	Isaac LGA		MIW SA4	
	Number	% of Qld	Number	% of Qld
Meat cattle	866,106	8.3%	1,179,957	11.4%
Dairy cattle	2,456	1.6%	3,807	2.5%
Poultry for laying	11	0.0%	21,641	0.5%
Sheep and lambs	85	0.0%	1,154	0.1%
Pigs	18	0.0%	200	0.0%

Source: ABS (2018b) Agricultural Commodities

2.4.2 Value of Agricultural Commodities Produced

In 2015-16, Isaac LGA produced agricultural commodities which had a total value of approximately $549.7 million and accounted for 4.2% of the total value of agricultural commodities produced in Queensland. Agricultural commodities produced within MIW SA4 in 2015-16 had a total value of $1,119.8 million ($1.1 billion) and accounted for 8.5% of the total value of all agricultural commodities produced in Queensland.

In 2015-16, the three key broadacre crops produced, relative to the total value of Queensland production, in Isaac LGA included:

- Sorghum: $33.94 million, accounting for 10.9% of the value of Queensland production;
- Chickpeas: $11.03 million, accounting for 3.8% of the value of Queensland production; and
- Oilseeds: $0.41 million, accounting for 3.4% of the value of Queensland production.

In 2015-16, the three most significant broadacre crops produced, relative to the total value of Queensland production, in MIW SA4 included:

- Sugar cane: $241.04 million, accounting for 19.9% of the value of Queensland production;
- Sorghum: $34.01 million (virtually all sourced from Isaac LGA), accounting for 10.9% of the value of Queensland production; and
- Oilseeds: $0.95 million, accounting for 7.9% of the value of Queensland production.

In total, Isaac LGA accounted for 21.4% of the total value of broadacre crops produced within MIW SA4 and 2.5% of the total value of broadacre crops produced in Queensland.

Table 2-13 reports on the total value of broadacre crops produced within Isaac LGA and MIW SA4 in 2015-16 relative to Queensland.

Table 2-13 Value of broadacre crop production within Isaac LGA and MIW SA4 relative to Queensland ($m), 2015-16

Broadacre crops	Isaac LGA		MIW SA4	
	Value ($m)	% of Qld	Value ($m)	% of Qld
Sorghum	$33.94	10.9%	$34.01	10.9%
Chickpeas	$11.03	3.8%	$11.04	3.8%
Oilseeds	$0.41	3.4%	$0.95	7.9%
Maize	$1.53	2.9%	$1.54	3.0%
Other pulses	$0.11	2.9%	$0.11	2.9%
Mung beans	$3.04	2.6%	$4.62	3.9%
Wheat	$3.73	1.0%	$3.81	1.0%
Sugar cane	$9.77	0.8%	$241.04	19.9%
Oats	$0.00	0.1%	$0.00	0.1%
Barley	$0.05	0.0%	$0.10	0.1%
Other cereals	$0.00	0.0%	$0.00	0.0%
Other crops	$0.00	0.0%	$0.25	12.3%
Rice	$0.00	0.0%	$0.12	2.6%
Lupins	$0.00	0.0%	$0.00	28.3%

Source: ABS (2018c) Value of Agricultural Commodities Produced

In 2015-16, the two most valuable hay and silage items produced, relative to the total value of Queensland production, in Isaac LGA included:

- Other crops for hay: $1.87 million, accounting for 9.8% of the value of Queensland production; and
- Other pastures for hay $1.28 million, accounting for 4.4% of the value of Queensland production.

In 2015-16, the two most significant hay and silage items produced in MIW SA4, relative to the total value of Queensland production, included:

- Other crops for hay: $2.00 million, accounting for 10.5% of the value of Queensland production; and
- Other pasture for hay: $2.38 million, accounting for 8.2% of the value of Queensland production.

In total, Isaac LGA accounted for 73.4% of the total value of hay and silage items produced within MIW SA4 and 2.7% of the total value of hay and silage items produced in Queensland. Table 2-14 reports on the total value of hay and silage items produced within Isaac LGA and MIW SA4 in 2015-16 relative to Queensland.

Table 2-14 Value of hay and silage production within Isaac LGA and MIW SA4 relative to Queensland ($m), 2015-16

Hay and silage	Isaac LGA		MIW SA4	
	Value ($m)	% of Qld	Value ($m)	% of Qld
Other crops for hay	$1.87	9.8%	$2.00	10.5%
Other pasture for hay	$1.28	4.4%	$2.38	8.2%
Lucerne for hay	$0.38	0.7%	$0.51	0.9%
Cereal for hay	$0.22	0.6%	$0.22	0.6%

Source: ABS (2018c) Value of Agricultural Commodities Produced

In 2015-16 the three most valuable fruit and nut commodities produced within MIW SA4 relative to the total value of Queensland fruit and nut production included:

- Mangoes: $10.04 million, accounting for 12.0% of the value of Queensland production;
- Kiwifruit: $0.04 million, accounting for 4.2% of the value of Queensland production; and
- Other orchard fruits: $0.44 million, accounting for 2.0% of the value of Queensland production.

In 2015-16 there were no significant fruit and nut items produced in Isaac LGA in terms of its total value relative to Queensland.

Table 2-15 reports on the total value of fruit and nut production within Isaac LGA and MIW SA4 in 2015-16 relative to Queensland.

Table 2-15 Value of fruit and nut production within Isaac LGA and MIW SA4 relative to Queensland ($m), 2015-16

Fruit and nuts	Isaac LGA		MIW SA4	
	Value ($m)	% of Qld	Value ($m)	% of Qld
Mangoes	$0.00	0.0%	$10.04	12.0%
Kiwifruit	$0.00	0.0%	$0.04	4.2%
Other orchard fruits	$0.10	0.4%	$0.44	2.0%
Other fruit	$0.00	0.0%	$0.07	0.4%
Strawberries	$0.03	0.0%	$0.28	0.2%
Bananas	$0.04	0.0%	$0.06	0.0%
Macadamias	$0.00	0.0%	$0.04	0.0%
Limes	$0.00	0.0%	$0.03	0.1%
Pineapples	$0.00	0.0%	$0.02	0.0%
Avocados	$0.00	0.0%	$0.01	0.0%
Mandarins	$0.00	0.0%	$0.00	0.0%
Lemons	$0.00	0.0%	$0.00	0.0%
Oranges	$0.00	0.0%	$0.00	0.0%

Source: ABS (2018c) Value of Agricultural Commodities Produced

In 2015-16 the three most valuable vegetable commodities produced within MIW SA4 relative to the total value of Queensland vegetable production included:

- Capsicums: $29.68 million, accounting for 53.4% of the value of Queensland production;
- Tomatoes: $60.34 million, accounting for 49.1% of the value of Queensland production; and
- Beans: $15.05 million, accounting for 15.5% of the value of Queensland production.

The total value of vegetables produced in MIW SA4 in 2015-16 amounted to $140.84 million, representing 24.3% of the total value of vegetable production in Queensland. In 2015-16 there were no significant vegetable commodities produced in Isaac LGA in terms of its total value relative to Queensland.

Table 2-16 reports on the total value of vegetable production within Isaac LGA and MIW SA4 in 2015-16 relative to Queensland.

Table 2-16 Value of vegetable production within Isaac LGA and MIW SA4 relative to Queensland ($m), 2015-16

Vegetables	Isaac LGA		MIW SA4	
	Value ($m)	% of Qld	Value ($m)	% of Qld
Capsicums	$0.00	0.0%	$29.68	53.4%
Tomatoes	$0.00	0.0%	$60.34	49.1%
Beans	$0.00	0.0%	$15.05	15.5%
Pumpkins	$0.00	0.0%	$4.47	12.6%
Melons	$0.00	0.0%	$2.26	3.5%
Sweet corn	$0.00	0.0%	$0.07	0.1%
Cauliflowers	$0.00	0.0%	$0.00	0.0%
Broccoli	$0.00	0.0%	$0.00	0.0%
Cabbages	$0.00	0.0%	$0.00	0.0%

Source: ABS (2018c) Value of Agricultural Commodities Produced

In 2015-16, the most valuable livestock product produced in Isaac LGA and MIW SA4 was milk, at a total value of production of $1.86 million and $3.94 million respectively, which represented 0.8% and 1.7% of the total value of milk production in Queensland for that year.

Table 2-17 reports on the total value of livestock items produced within Isaac LGA and MIW SA4 in 2015-16 relative to Queensland.

Table 2-17 Value of livestock products within Isaac LGA and MIW SA4 relative to Queensland ($m), 2015-16

Livestock products	Isaac LGA		MIW SA4	
	Value ($m)	% of Qld	Value ($m)	% of Qld
Milk	$1.86	0.8%	$3.94	1.7%
Wool	$0.00	0.0%	$0.04	0.1%
Eggs	$0.00	0.0%	$1.00	0.5%

Source: ABS (2018c) Value of Agricultural Commodities Produced

In 2015-16 the key livestock for slaughter commodity produced in both Isaac LGA and MIW SA4 in terms of its total value relative to Queensland, was cattle and calves. Cattle and calves for slaughter had a total value of $480.30 million in Isaac LGA and $655.79 million in MIW SA4, which represented 8.2% and 11.2% of the total value of cattle and calves for slaughter in Queensland respectively.

Table 2-18 reports on the total value of livestock for slaughter items produced within Isaac LGA and MIW SA4 in 2015-16 relative to Queensland.

Table 2-18 Value of livestock for slaughter products within Isaac LGA and MIW SA4 relative to Queensland ($m), 2015-16

Livestock for slaughter	Isaac LGA		MIW SA4	
	Value ($m)	% of Qld	Value ($m)	% of Qld
Cattle and calves	$480.30	8.2%	$655.79	11.2%
Goats	$0.00	0.0%	$0.09	0.2%
Poultry	$0.00	0.0%	$0.62	0.1%
Sheep and lambs	$0.00	0.0%	$0.04	0.1%
Pigs	$0.01	0.0%	$0.11	0.0%

Source: ABS (2018c) Value of Agricultural Commodities Produced

2.5 Project Development Pipeline

This analysis identified 31 major projects within the MIW SA4 that were recently approved but yet to commence operation and those which the EIS is under preparation. Of the 31 projects identified, there were 23 coal, mineral and gas projects, three rail projects, three water projects and two accommodation resort projects.

Table 2-19 summarises each project within the development pipeline, including details on proponents, general description and status.

Table 2-19 Development pipeline within MIW SA4

Project	Proponent	Location	Project details	Status
Coal, mineral and gas projects				
Abbot Point Coal Terminal Expansion	Ports Corporation of Queensland Limited	Port of Abbot Point, 25km north-west of Bowen	Duplication of existing infrastructure, doubling capacity from 25 mtpa to 50 mtpa	Approved with conditions (2007)
Alpha Coal Project	Hancock Coal Pty Ltd	38km northwest of Alpha	Open cut coal mine, 30mtpa, 495km of railway, port facility	Approved with conditions (2014)
Byerwen Coal Project	Byerwen Coal Pty Ltd	20km west of Glenden, 140km west of Mackay	Open cut coal mine, 10mtpa, two train loading facilities	Approved with conditions (2014)
Carborough Downs Mine Expansion	Carborough Downs Coal Management Pty Ltd	150km southwest of Mackay	Increase production from 1.9mtpa to 5mtpa	Approved with conditions (2010)
Carmichael Coal Mine and Rail	Adani Mining Pty Ltd	160km Northwest of Clermont	Underground and open cut coal mine, 60mtpa, 189km railway line, processing plant	Approved with conditions (2015)
China Stone Coal Project	MacMines Austasia Pty Ltd	300km west of Mackay	Greenfield coal mine, 38mtpa of thermal coal, accommodation village, airstrip, preparation plant	EIS active (2018)
Codrilla Coal Mine	BB Interests Pty Ltd	120km southwest of Mackay	Open cut coal mine, 3.2mtpa for 13.5 years	Approved with conditions (2012)
Eagle Downs Coal Mine	Bowen Central Coal Joint Venture Parties	20km southeast of Moranbah	Longwall coal mine, 7mtpa for up to 50 years	Approved with conditions (2010)
Ellensfield Coal Mine	Ellensfield Coal Management Pty Ltd	35km northeast of Moranbah	Longwall coal mine, 3mtpa of coking and thermal coal, 15 power generation modules of 1-3 MW capacity	Approved with conditions (2012)
Hillalong Coal Project	Queensland Coal Exploration Pty Ltd	60km northwest of Nebo	Underground and open cut coal mine, 4.2mtpa,	Approved with conditions (2017)
Integrated Isaac Plains	IP Coal and Vale Australia Pty Ltd	10km southeast of Moranbah	Extension to existing mine from 2mtpa to 4mtpa for at least 15 years	Approved with conditions (2012)
Kevin's Corner Project	Hancock Galilee Pty Ltd	160km west of Emerald	Underground and open cut coal mine, 30mtpa, 17.8km rail spur, airstrip	Approved with conditions (2017)
Lake Lindsay Coal	Anglo Coal Pty Ltd	25km southeast of Middlemount	Open cut coal mine, 6mtpa of black coal for up to 30 years	Approved with conditions (2013)
Middlemount Coal Stage 2	Middlemount Coal Pty Ltd	6km southwest of Middlemount	Expansion of existing mine from 1.8mtpa to 5.4mtpa for approximately 23 years	Approved with conditions (2012)
Millenium Expansion	Millennium Coal Pty Ltd	22km east of Moranbah	Expansion of existing mine from 1.9mtpa to 5.5mtpa for 17 years, upgrade of power supply	Approved with conditions (2011)
Moranbah Ammonium Nitrate	Dyno Nobel Asia Pacific Ltd	4.5km northwest of Moranbah	.35mtpa, manufacturing facility for ammonium nitrate prill and ammonium nitrate emulsion	Approved with conditions (2008)
Moranbah South	Anglo Coal and Exxaro Australia Pty Ltd	3km southeast of Moranbah	18mtpa RoM for more than 30 years	Approved with conditions (2014)
New Lenton Coal	New Lenton Coal Pty Ltd	65km north of Moranbah	Open cut coal mine, 8mtpa coking and thermal coal for 25 years	EIS in preparation (2018)

Project	Proponent	Location	Project details	Status
Newlands Coal Extension	Xstrata Coal Queensland Pty Ltd	Near Glenden, 140km west of Mackay	Expansion of existing open cut coal mine up to 5mtpa RoM for 22 years	Approved with conditions (2013)
Olive Downs Project	Pembroke Resources South Pty Ltd	40km southeast of Moranbah	Open cut coal mine, 14mtpa coking coal, 18km rail spur and loop, pipeline connecting to Eungella pipeline	EIS active (2018), expected completion 2025
Red Hill Mining Lease	BMA Coal Operations	20km north of Moranbah	Underground coking coal mine, 14mtpa, expansion of two existing coking coal mines	Approved with conditions (2015)
Saraji East (this Project)	BMA Coal Operations Pty Ltd	3km north of Dysart	Greenfield underground coal mine, up to 7mtpa of metallurgical coal over 20 years, accommodation facility, rail spur	EIS in preparation (2018)
Styx Coal Project	Fairway Coal Pty Ltd and Central Queensland Coal Pty Ltd	25km northwest of Marlborough (Livingstone Shire)	Open cut coal mine, 10mtpa of thermal and coking coal for 20 years, preparation plants	EIS active (2018)
Other projects				
Connors River Dam and Pipelines	SunWater Ltd	110km east of Moranbah, 70km south of Marina	Roller-compacted concrete dam, fauna transfer device, pipeline, upgrade access roads	Approved with conditions (2017)
Guthalungra Aquaculture	MBD Energy (Pacific Reef) Pty Ltd	Near Guthalungra, adjacent to Elliot River	Prawn aquaculture, 800 ha total, 259 ponds, pipelines to Abbot Bay	Approved with conditions (2015)
Jilalan Rail Yard	Aurizon Holding Limited	3km south of Marina	Bypass tracks, locomotive provisioning facility, wagon maintenance facility	Approved with conditions (2008)
Lindeman Great Barrier Reef Resort	White Horse Australia Lindeman Pty Ltd	13km southeast of Hamilton Island	Expansion of existing resort	EIS active (2018)
North Galilee Basin Rail Project	Adani Mining Pty Ltd	Mistake Creek to Port of Abbot Point	310km rail line connecting Northern Galilee Basin to Port of Abbot Point	Approved with conditions (2017)
Northern Missing Link	Queensland Rail	North Goonyella to Newlands	69km rail link in the northern Bowen Basin coalfields	Approved with conditions (2006)
Port of Hay Point Capital Dredging	Ports Corporation of Queensland	38km south of Mackay	300-500 m wide, 9.5km long departure path	Approved with conditions (2005)
Shute Harbour Marina	Shute Harbour Marina Development Pty Ltd	10km southeast of Airlie Beach	Commercial, retail and dining precinct, 70 apartments in resort	Approved with conditions (2014)

Source: DSDMIP (2018a) Current EIS Projects, DSDMIP (2018b) Completed EIS Projects, DEHP (2018a) Current EIS Processes, DEHP (2018b) Completed, Withdrawn and Lapsed EIS Processes

2.6 Existing and Projected Coal Production

Saleable coal production within the MIW region has increased from 205.7 million tonnes in 2012-13 to 237.6 million tonnes in 2016-17 or 4.9% per annum. Saleable coal production volumes were highest in both the MIW region and Queensland in 2014-15. The MIW region increased its share of total Queensland saleable coal production from 63% in 2012-13 to 66% in 2016-17.

Table 2-20 reports saleable coal production by mine within the MIW region, benchmarked to Queensland between 2012-13 and 2016-17.

Table 2-20 Production of saleable coal by individual mines (million tonnes), MIW region, financial years ending 2013 to 2017

Project	2012-13	2013-14	2014-15	2015-16	2016-17
Blair Athol	1.4	-	-	-	-
Burton Coal	1.5	2.2	1.2	1.2	0.8
Carborough Downs	2.2	2.2	2.8	2.4	2.1
Caval Ridge	-	1.2	6.3	6.9	6.3
Clermont Coal	10.3	12.1	12.3	13.6	11.2
Collinsville Opencut	3.8	1.8	3.4	1.5	1.5
Coppabella	3.9	3.8	4.1	3.2	3.2
Curragh	10.6	12.3	12.2	10.6	12.0
Daunia	1.0	4.4	4.8	5.3	5.2
Drake Mine	-	-	0.5	1.9	3.6
Ensham OC	4.4	4.9	3.7	4.9	5.0
Foxleigh	2.8	2.7	3.1	2.7	3.1
German Creek	1.3	0.7	0.3	-	-
German Creek - Aquila	0.3	0.2	-	-	-
German Creek - Grasstree	2.6	4.6	6.3	7.9	5.7
German Creek - Lake Lindsay	4.1	4.3	4.8	4.4	3.1
Goonyella - Riverside	12.4	14.4	16.9	18.0	14.7
Grosvenor	-	-	0.1	0.9	2.1
Hail Creek	7.1	7.7	9.5	9.5	9.2
Isaac Plains	2.0	2.0	1.2	0.2	1.2
Jax Mine	0.4	0.1	-	-	-
Jellinbah East	4.8	5.0	4.5	5.2	4.8
Lake Vermont	4.8	7.5	8.3	9.0	8.8
Middlemount	1.9	3.7	4.0	4.2	3.9
Millennium	3.2	3.5	3.7	3.9	2.8
Moorvale	2.5	2.6	3.1	2.2	2.3
Moranbah North	5.1	5.1	5.4	4.7	6.1
Newlands	0.9	-	0.7	1.6	1.7

Project	2012-13	2013-14	2014-15	2015-16	2016-17
Newlands Eastern Creek	1.7	3.4	3.3	1.9	2.2
Newlands Northern u/g	2.6	2.3	1.9	1.8	0.4
Newlands Wollombi	1.8	0.7	0.4	0.3	1.3
North Goonyella	3.3	2.1	2.6	2.0	1.7
Peak Downs	9.1	9.4	10.1	10.0	12.1
Poitrel	2.7	3.1	3.5	3.5	3.2
Saraji	6.7	8.8	9.0	8.4	9.5
Sonoma Coal	2.5	3.4	3.7	2.4	1.2
South Walker Creek	4.3	5.1	5.2	5.2	5.1
MIW Region total	**129.9**	**147.4**	**162.8**	**161.4**	**157.1**
Queensland total	**205.7**	**228.9**	**243.6**	**241.8**	**237.6**

Source: DNRM (2017) Coal Industry Review Tables

Table 2-21 reports the coal projects that were identified in the development pipeline (outlined in Section 2.5) and is indicative of the potential future production of saleable coal within the MIW region. If all projects reported in Table 2-21 were to proceed, this would represent additional coal production of approximately 278 million tonnes per annum.

Table 2-21 Coal projects in the development pipeline

Coal project	Location	Project details
Alpha Coal Project	38km northwest of Alpha	Open cut coal mine, 30mtpa, 495km of railway, port facility
Byerwen Coal Project	20km west of Glenden, 140km west of Mackay	Open cut coal mine, 10mtpa, two train loading facilities
Carborough Downs Mine Expansion	150km southwest of Mackay	Increase production from 1.9mtpa to 5mtpa
Carmichael Coal Mine and Rail	160km Northwest of Clermont	Underground and open cut coal mine, 60mtpa, 189km railway line, processing plant
China Stone Coal Project	300km west of Mackay	Greenfield coal mine, 38mtpa of thermal coal, accommodation village, airstrip, preparation plant
Codrilla Coal Mine	120km southwest of Mackay	Open cut coal mine, 3.2mtpa for 13.5 years
Eagle Downs Coal Mine	20km southeast of Moranbah	Longwall coal mine, 7mtpa for up to 50 years
Ellensfield Coal Mine	35km northeast of Moranbah	Longwall coal mine, 3mtpa of coking and thermal coal, 15 power generation modules of 1-3 MW capacity
Hillalong Coal Project	60km northwest of Nebo	Underground and open cut coal mine, 4.2mtpa,
Integrated Isaac Plains	10km southeast of Moranbah	Extension to existing mine from 2mtpa to 4mtpa for at least 15 years
Kevin's Corner Project	160km west of Emerald	Underground and open cut coal mine, 30mtpa, 17.8km rail spur, airstrip
Lake Lindsay Coal	25km southeast of Middlemount	Open cut coal mine, 6mtpa for up to 30 years
Middlemount Coal Stage 2	6km southwest of Middlemount	Expansion of existing mine from 1.8mtpa to 5.4mtpa for approximately 23 years
Millenium Expansion	22km east of Moranbah	Expansion of existing mine from 1.9mtpa to 5.5mtpa for 17 years, upgrade of power supply
Moranbah South	3km southeast of Moranbah	18mtpa RoM for more than 30 years
New Lenton Coal	65km north of Moranbah	Open cut coal mine, 8mtpa coking and thermal coal for 25 years
Newlands Coal Extension	Near Glenden, 140km west of Mackay	Expansion of existing open cut coal mine up to 5mtpa RoM for 22 years
Olive Downs Project	40km southeast of Moranbah	Open cut coal mine, 14mtpa coking coal, 18km rail spur and loop, pipeline connecting to Eungella pipeline
Red Hill Mining Lease	20km north of Moranbah	Underground coking coal mine, 14mtpa, expansion of two existing coking coal mines
Saraji East	3km north of Dysart	Greenfield underground coal mine, 7mtpa of metallurgical coal over 20 years, accommodation facility, rail spur
Styx Coal Project	25km northwest of Marlborough (Livingstone Shire)	Open cut coal mine, 10mtpa of thermal and coking coal for 20 years, preparation plants

2.7 Commercial Accommodation Assessment

The Queensland Government Statistician's Office (QGSO) regularly prepares an assessment of the non-resident workforce within the Bowen Basin at the LGA level, including details on the capacity of workers accommodation villages (WAV) and hotel/motel rooms. The total Worker Accommodation Village (WAV) bed capacity in IRC increased substantially from 15,590 beds in 2011 to 21,745 beds in 2013 and subsequently decreased to 18,510 beds in 2017. The number of hotel/motel rooms in IRC peaked in 2012 at 770 rooms.

Table 2-22 reports the bed capacity for workers accommodation villages and hotels and motels within Isaac Regional Council between 2011 and 2017.

Table 2-22 WAV, hotel and motel accommodation capacity, Isaac Regional Council, 2011-2017

	2011	2012	2013	2014	2015	2016	2017
WAV bed capacity	15,590	19,515	21,745	19,895	19,620	19,105	18,510
Hotel/motel rooms	670	770	760	745	745	675	745

Source: QGSO (various years) Bowen Basin Population Report

2.8 Residential, Commercial and Industrial Property Markets

Over the past ten years, there were 2,944 residential property sales, 83 commercial property sales and 31 industrial property sales in IRC (refer to Table 2-23).

The residential property market in IRC peaked in 2011-12 in terms of both volume and value of sales. The median sales price in IRC peaked in 2011-12 at $504,500 and has since fallen significantly to $148,000 in 2017-18. The total value of commercial property sales peaked in 2012-13 and the total value of industrial property sales peaked in 2009-10. On a per square metre basis, commercial property market prices in IRC were highest in 2011-12 ($428 per square metre) and industrial property market prices were highest in 2013-14 ($497 per square metre[7]).

[7] This result must be interpreted with caution as there was only one industrial property sale in this year.

Table 2-23 Residential, commercial and industrial property markets, Isaac Regional Council, financial years ending 2008-09 to 2017-18

	Volume of sales			Value of sales ($m)			Median sale price			Median price per sqm		
	Residential	Commercial	Industrial	Residential	Commercial	Industrial	Residential	Commercial	Industrial	Residential	Commercial	Industrial
2008-09	314	16	3	$126.9	$7.6	$1.0	$397,500	$378,000	$148,500	$472	$188	$44
2009-10	292	4	5	$116.0	$2.4	$4.6	$397,500	$480,000	$1,050,000	$502	$76	$25
2010-11	428	7	2	$177.1	$4.8	$1.8	$440,000	$430,000	$913,000	$518	$302	$128
2011-12	896	16	3	$445.5	$13.4	$1.2	$504,500	$567,204	$341,000	$723	$428	$17
2012-13	209	9	1	$88.5	$34.1	$0.2	$399,000	$1,550,000	$200,000	$480	$249	$10
2013-14	117	5	1	$49.6	$5.9	$0.9	$280,000	$390,000	$890,000	$364	$341	$497
2014-15	110	6	2	$46.9	$1.8	$0.2	$225,000	$295,000	$77,750	$183	$171	$39
2015-16	118	8	2	$41.1	$11.0	$2.2	$138,390	$432,500	$1,100,000	$136	$124	$29
2016-17	238	6	7	$76.0	$3.9	$2.0	$155,000	$614,450	$250,000	$184	$198	$177
2017-18	222	6	5	$66.1	$27.8	$2.6	$148,000	$581,250	$310,000	$170	$254	$66

Source: Pricefinder data output (2018)

2.8.1 Median Weekly Residential Rents

In line with the significant downturn in the residential property market in IRC, median weekly rents have also decreased, but have subsequently stabilised. The median weekly rent for three bedroom houses in IRC decreased from $500 per week in the December quarter 2012 to $200 per week in the June quarter 2016 and have since increased to $250 per week in the September quarter 2018. The median weekly rent for four bedroom houses in IRC decreased from $650 per week in the December quarter 2012 to $290 per week in the September quarter 2018. The median weekly rent for three bedroom townhouses in IRC decreased from $545 per week in the December quarter 2012 to $250 per week in the March quarter 2016, and has subsequently increased to $350 per week in the September quarter 2018.

Figure 2-10 Median weekly rents – selected property types, Isaac Regional Council, December Quarter 2012 to September Quarter 2018

Source: Residential Tenancies Australia (RTA) (2018) Median rents quarterly data

2.9 Economic Baseline Summary

The economic baseline analysis identified the following trends within Isaac LGA and MIW SA4:

Population

- The resident population of Isaac LGA is anticipated to increase at an average annual rate of 1.2% per annum between 2016 and 2036;
- The resident population of MIW SA4 is anticipated to increase at an average annual rate of 1.5% per annum between 2016 and 2036; and
- The working age population of the three regions analysed is anticipated to increase at a higher rate than the total population between 2016 and 2036.

Average age of residents

- The average age of residents in Isaac LGA increased from 31.1 years in 2006 to 32.1 years in 2016;
- The average age of residents in MIW SA4 increased from 35.5 years in 2006 to 37.2 years in 2016; and
- The average age of residents in Isaac LGA and MIW SA4 was lower than the state average in 2016.

Age profile

- In 2016, Isaac LGA had a significantly lower proportion of persons aged 15-19 years, females aged 45-64 years and persons aged 65 years and over relative to the state average; and
- In 2016, Isaac LGA had a significantly higher proportion of persons aged 0-14 years, persons aged 25-34 years and males aged 35-54 years.

Family composition

- Between 2006 and 2016, Isaac LGA had a significantly higher incidence of couple families with children relative to MIW SA4 and Queensland, though the incidence of this family type decreased over the period; and
- The proportion of single parent families and lone person households in Isaac LGA increased between 2006 and 2016.

Household income

- Average household incomes were significantly higher in Isaac LGA ($2,257 per week in 2016) relative to MIW SA4 ($1,734 per week in 2016) and Queensland ($1,691 per week in 2016) between 2006 and 2016 though decreased between 2011 and 2016;
- The average annual change in average household incomes in Isaac LGA between 2006 and 2016 was 1.7%;
- The average annual change in average household incomes in MIW SA4 between 2006 and 2016 was 2.6%; and
- The average annual change in average household incomes in Queensland between 2006 and 2016 was 3.5%.

Labour market trends

- The unemployment rate in Isaac LGA has been consistently lower and its labour force participation rate consistently higher than MIW SA4 and Queensland between 2010 and 2017;
- The unemployment rate increased marginally in Isaac LGA, MIW SA4 and Queensland between 2010 and 2017; and
- The size of the labour force in both Isaac LGA and MIW SA4 decreased between 2013-14 and 2015-16 but showed signs of recovery in 2016-17 with labour force growth of 2.4% and 3.9% respectively.

Employment by industry

- In 2016 the most significant industry of employment for residents of Isaac LGA was the mining industry, accounting for 37.7% of all employment;
- In 2016 the mining industry was the most significant industry of employment for residents of MIW SA4, accounting for 14.4% of all employment; and
- In 2016 the most significant industry of employment for residents of Queensland was the health care and social assistance industry, accounting for 13.0% of all employment.

Occupation

- In Isaac LGA, the most common occupation grouping was lower blue collar workers (35.3% of workers), whereas employed persons within MIW SA4 and Queensland were most commonly lower white collar workers (29.2% and 35.3% of workers, respectively).

Qualifications

- In 2016, 41.8% of the resident population of Isaac LGA aged 15 years and above held a post-school qualification, as compared with 43.1% and 48.3% in MIW SA4 and Queensland respectively; and
- The incidence of persons holding a certificate was higher in Isaac LGA (26.4%) and MIW SA4 (26.4%) than Queensland (21.3%) in 2016.

Business activity

- As of June 2017, there was a total of 1,637 registered businesses operating within Isaac LGA, of which 1,017 were classified as sole traders, 592 businesses employed between 1 and 19 workers and 28 businesses employed between 20 and 199 workers;
- As of June 2017, there was a total of 14,631 registered businesses operating within MIW SA4, of which 8,794 were classified as sole traders, 5,456 businesses employed between 1 and 19 workers, 372 businesses employed between 20 and 199 workers and nine businesses employed 200 or more workers; and
- As of June 2017, there was a significantly higher representation of registered businesses in Isaac LGA and MIW SA4 operating within the agriculture, forestry and fishing industry relative to Queensland.

Agricultural production

- In 2015-16 Isaac LGA produced agricultural commodities which had a value of $549.71 million, accounting for 49.1% of the total value of agricultural commodities produced in MIW SA4 and, 4.2% of the total value of agricultural commodities produced in Queensland; and
- The most significant agricultural commodities produced in Isaac LGA in 2015-16 were cattle and calves for slaughter with 866,106 head, which had a value of $480.30 million or 8.2% of Queensland meat cattle and calf production, and sorghum, producing 128,066 tonnes which had a value of $33.94 million or 10.9% of Queensland sorghum production.

Gross regional product

- As of 2010-11 MIW SA4 had a nominal GRP of $22.8 billion, as compared to $6.3 billion in 2000-01, which represented an average annual growth rate of 13.7%; and
- The most significant contribution to MIW SA4 GRP was the mining industry, amounting to $12.4 billion which represented 54.2% of total nominal GRP.

Development pipeline

- The analysis identified 31 major projects within MIW SA4 which were approved recently but have not begun operations and those which the EIS is in preparation and are likely to commence operations in the next several years;
- Of the 31 projects identified, 23 were coal, mineral and gas projects, three were rail projects, three were water projects and two were resort projects.

Existing and projected coal production

- Total coal production in Queensland increased from 205.7 million tonnes in 2012-13 to 237.6 million tonnes in 2016-17, and MIW SA4 increased its share of Queensland production from 63% (129.9 million tonnes) in 2012-13 to 66% (157.1 million tonnes) in 2016-17; and
- If all the coal projects identified in the development pipeline become operational, this would equate to an additional 278 million tonnes of coal production per annum within MIW SA4.

Workers accommodation

- Total WAV bed capacity within IRC increased from 15,590 beds in 2011 to 21,745 beds in 2013, though capacity subsequently decreased to 18,510 beds in 2017; and
- Hotel and motel room capacity within IRC increased from 670 rooms in 2011 to 745 rooms in 2017.

Residential, commercial and industrial property markets

- The residential property market experienced a significant downturn after 2011-12. In 2017-18 though prices and annual sales have stabilised recently at a median sale price in the order of $150,000 and ~230 sales per annum;
- Median weekly residential rents have decreased significantly between 2012 and 2018, though have recently shown signs of modest recovery. As of the September quarter 2018, the median weekly rents for three bedrooms houses, four bedroom houses and three bedroom townhouses were $250 per week, $290 per week and $350 per week respectively.

Section 3 Regional Economic Impact Assessment

3.1 Overview of Regional Impact Approach

This section estimates the direct and indirect economic impacts of the Project during the construction and operation phases on the regional, state and national economies.

The assessment utilises an input-output approach and estimates impact in terms of output, household incomes, employment and value added. These four different measures of economic impact are summarised in Table 3-1.

Table 3-1 Measures of economic impact

Impact Measure	Description
Output	The output impact measures the increase in gross sales throughout the entire economy by aggregating all individual transactions (direct and indirect) resulting from the economic stimulus. The output impact provides an indication of the degree of structural dependence between sectors of the economy. However, output impacts are regarded as overstating the impact on the economy as they count all goods and services used in one stage of production as an input to later stages of production, hence counting their contribution more than once.
Household Incomes	The household income impact measures the additional wages, salaries and supplements paid to households associated with the industry under consideration and with other industries benefiting from the stimulus to the economy.
Employment	The employment impact measures the number of full-time equivalent (FTE) positions for one year created directly and indirectly by the stimulus[8]. However, the short-term response to increased demand may be that existing employees work overtime. Consequently, actual levels of employment generated (in terms of persons employed) will tend to be lower than those estimated by the input-output analysis. This short-term employment response (of working additional overtime) will be more prevalent where the demand stimulus is likely to be temporary and short lived, or where there is limited spare capacity in the economy (that is, when the economy is at or near full employment).
Value Added	The value added or Gross Regional Product (GRP) impact measures only the net activity at each stage of production resulting from a stimulus. GRP is defined as the addition of consumption, investment and government expenditure, plus net exports (exports minus imports) from a region. The value added (or GRP) impact is the preferred measure for the assessment of contribution to the economy from a stimulus or impact, and as such should be used to describe the net impact of the event. Value added is the measure of economic impact resulting from a stimulus that is preferred by economists.

Source: Jensen and West (2001)

The total economic impact of a stimulus or activity comprises the following effects:

- Direct or initial effect, being the stimulus for the economic impact. This is typically described as the change in sales or contribution to final demand by the stimulus or activity; and
- Flow on effects, comprising production induced effects and consumption induced effects, these being:
  - First round production effects: purchases of inputs required from other industry sectors in the economy to produce the additional output generated by the stimulus or activity
  - Industrial support production effects: second, third and subsequent round industrial flow on effects stimulated by the purchases made in the first round

[8] Therefore, if impacts are to be spread over a number of years, the FTE estimate (which relates to the annual equivalent) should be divided by the number of years over which the impact will be spread (in the absence of a clearly defined staging program) to provide an indicative ongoing employment estimate over the life of the impact.

- Consumption induced effects: purchases made by households upon receiving additional income from labour payments stemming from the production of additional output generated by the stimulus or activity under assessment.

The extent of these impacts can be represented by multipliers calculated in aggregate for various regional, state or national economies. There are commonly four multipliers used to measure impact, being output, household income, employment and value added.

Two sets of multipliers can be generated, namely:

- Type 1 Multipliers, which estimate the direct and production induced impacts of a stimulus or activity; and
- Type 2 Multipliers, which estimate the direct, production induced, and consumption induced impacts of a stimulus or activity.

Type 1 Multipliers are used in the analysis of this Project. Queensland Treasury's preference is for use of only Type 1 Multipliers, given that Type 2 Multipliers typically overstate the extent of consumption-induced impacts of any given stimulus or activity[9].

The regional input-output approach has several limitations, which may result in overestimation of impacts, including:

- The absence of capacity constraints such that the supply of each good is perfectly elastic, implying that each industry can supply whatever quantity is demanded of it and there are no budget constraints;
- The assumed linearity and homogeneity of the input function, which implies constant returns to scale and no substitution between inputs. This occurs because the approach assumes inputs purchased by each industry are a function only of the level of output of that industry;
- Each commodity, or type of commodity, is supplied by a single industry sector, implying there is only one method used to produce each commodity and each sector has only a single primary output;
- The assumption that the economy is in equilibrium at given prices and that the economy is not subject to other external influences; and
- The additivity assumption suggests the total effect of carrying on several types of production is the sum of the separate effects, which is not a true reflection of economic systems.

The limitations are typically most relevant when introducing a wholly new economic driver to a State or regional economy that may result in significant structural change. However, it is considered that the introduction of a new coal mine (such as the Project) to the mature coal and coal logistics sector in Queensland does not fit this criterion.

3.2 Project Expenditures

BMA has provided indicative capital and operating expenditures for the Project which have been used as inputs to the estimation of the regional, state and national stimulus generated by the Project.

3.2.1 Construction Costs

The construction costs associated with the Project are estimated at $1,313.0 million, comprising:

- $420.2 million incurred within MIW SA4;
- $538.3 million incurred within the Rest of Queensland;
- $91.9 million incurred within the Rest of Australia; and
- $262.6 million incurred overseas.

[9] Refer to http://www.qgso.qld.gov.au/products/reports/overview-econ-impact-analysis/overview-econ-impact-analysis.pdf

Construction costs are anticipated to be incurred over a three-year period and are anticipated to be highest during the second year of construction (Table 3-2).

Project expenditures incurred overseas represent direct imports and as such do not make an economic contribution at a regional, state or national level and hence are excluded from the economic impact analysis.

Table 3-2 Capital expenditures 2020-21 to 2022-23

	Year 1	Year 2	Year 3	Total
MIW SA4	$168.1	$189.1	$63.0	$168.1
Rest of Queensland	$215.3	$242.3	$80.8	$215.3
Rest of Australia	$36.8	$41.4	$13.8	$36.8
International	$105.0	$118.2	$39.4	$105.0
Total	**$525.2**	**$590.9**	**$197.0**	**$1,313.0**

Source: Expenditure estimates provided by BMA

3.2.2 Operational Costs

Total operational costs are estimated at $5,984.2 million over the life of the Project, comprising:

- $2,582.4 million incurred within MIW SA4;
- $1,480.6 million incurred within the Rest of Queensland;
- $1,641.4 million incurred within the Rest of Australia; and
- $8.0 million incurred overseas.

A breakdown of operational costs likely to be incurred in MIW SA4, Rest of Queensland, Rest of Australia, Internationally and total are reported in Table 3-3.

Table 3-3 Total annual operational expenditures ($m) by region, Saraji East Coal Project

	Business Purchases	Employment Cost	Maintenance and Overhaul Costs	Accommodation costs	Total
MIW SA4					
Average annual expenditure	$59.8	$50.1	$24.6	$8.1	$142.6
Total expenditure	$1,195.2	$1,002.9	$492.8	$161.6	$2,852.4
Rest of Queensland					
Average annual expenditure	$57.0	$8.8	$8.2	-	$74.0
Total expenditure	$1,139.4	$177.0	$164.3	-	$1,480.6
Rest of Australia					
Average annual expenditure	$82.1	-	-	-	$82.1
Total expenditure	$1,641.3	-	-	-	$1,641.3
International					
Average annual expenditure	$0.4	-	-	-	$0.4
Total expenditure	$8.0	-	-	-	$8.0
Total					
Average annual expenditure	**$199.2**	**$59.0**	**$32.9**	**$8.1**	**$299.1**
Total expenditure	**$3,983.9**	**$1,179.8**	**$657.1**	**$161.6**	**$5,982.4**

Source: BMA cost estimates

3.3 Economic Impact Assessment

3.3.1 Regional, State and National Economic Impacts During Construction

This section reports the results of the economic contribution analysis pertaining to the construction related expenditures, which are specified for the regional, state and national economies individually. The results of the analysis are represented by the multipliers described above, namely contribution to output, household income, employment and value added.

3.3.1.1 Output

The total output impacts for the MIW SA4, Rest of Queensland and Rest of Australia economies resulting from the construction phase of the Project are estimated at:

- MIW SA4 -Total contribution to output of $674.7 million, comprising $420.2 million in direct contribution and $million indirectly;
- Rest of Queensland – Total contribution to output of $1,013.7 million, comprising $538.3 million in direct contribution and $475.3 million indirectly; and
- Rest of Australia – Total contribution to output of $185.3 million, comprising $91.9 million in direct contribution and $93.4 million indirectly.

Output impacts are anticipated to be most significant within the construction, mining and manufacturing sectors at the regional, state and national level.

Table 3-4 to Table 3-6 report the contribution to output resulting from construction related expenditures within the MIW SA4, Rest of Queensland and Rest of Australian economy respectively over the construction period[10].

Table 3-4 Contribution to output ($m), MIW SA4, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$1.4
Mining	$159.3
Manufacturing	$148.7
Electricity, Gas, Water & Waste Services	$20.9
Construction	$257.0
Wholesale Trade	$12.5
Retail Trade	$3.2
Accommodation & Food Services	$4.5
Transport, Postal & Warehousing	$21.8
Information Media and Telecommunications	$1.0
Financial & Insurance Services	$2.8
Rental, Hiring & Real Estate Services	$11.0
Professional, Scientific & Technical Services	$16.0
Administrative & Support Services	$6.8
Public Administration & Safety	$1.9
Education & Training	$0.0
Health Care & Social Assistance	$0.0
Arts & Recreation Services	$0.1
Other Services	$5.8
Direct	**$420.2**
Indirect	**$254.5**
Total	**$674.7**

Source: CDM Smith analysis

[10] Assumed to be 2020-21 to 2022-23

Table 3-5 Contribution to output ($m), Rest of Queensland, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$2.6
Mining	$176.6
Manufacturing	$176.0
Electricity, Gas, Water & Waste Services	$42.8
Construction	$402.7
Wholesale Trade	$21.8
Retail Trade	$7.7
Accommodation & Food Services	$6.3
Transport, Postal & Warehousing	$36.8
Information Media and Telecommunications	$7.5
Financial & Insurance Services	$15.2
Rental, Hiring & Real Estate Services	$22.3
Professional, Scientific & Technical Services	$60.5
Administrative & Support Services	$18.9
Public Administration & Safety	$6.2
Education & Training	$0.0
Health Care & Social Assistance	$0.2
Arts & Recreation Services	$0.7
Other Services	$9.0
Direct	**$538.3**
Indirect	**$475.3**
Total	**$1,013.7**

Source: CDM Smith analysis

Table 3-6 Contribution to output ($m), Rest of Australia, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$0.6
Mining	$24.1
Manufacturing	$39.3
Electricity, Gas, Water & Waste Services	$7.7
Construction	$67.3
Wholesale Trade	$5.1
Retail Trade	$1.6
Accommodation & Food Services	$1.1
Transport, Postal & Warehousing	$6.6
Information Media and Telecommunications	$2.7
Financial & Insurance Services	$4.6
Rental, Hiring & Real Estate Services	$3.8
Professional, Scientific & Technical Services	$13.9
Administrative & Support Services	$3.9
Public Administration & Safety	$1.3
Education & Training	$0.0
Health Care & Social Assistance	$0.0
Arts & Recreation Services	$0.2
Other Services	$1.6
Direct	**$91.9**
Indirect	**$93.4**
Total	**$185.3**

Source: CDM Smith analysis

3.3.1.2 Household Income

During the construction phase of the Project, household income impacts for the MIW SA4, Rest of Queensland and Rest of Australia economies are estimated at:

- MIW SA4 -Total contribution to household income of $140.3 million, comprising $84.7 million in direct contribution and $55.5 million indirectly;
- Rest of Queensland – Total contribution to household income of $213.7 million, comprising $102.2 million in direct contribution and $111.5 million indirectly; and
- Rest of Australia – Total contribution to household income of $40.6 million, comprising $18.1 million in direct contribution and $22.5 million indirectly.

The industries that are likely to contribute to regional incomes most significantly are the construction industry, the manufacturing industry and the mining industry.

Table 3-7 to Table 3-9 report the contribution to household income resulting from construction related expenditures within the MIW SA4, Rest of Queensland and Rest of Australian economies respectively over the construction period.

Table 3-7 Contribution to household income ($m), MIW SA4, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$0.2
Mining	$26.1
Manufacturing	$37.4
Electricity, Gas, Water & Waste Services	$2.6
Construction	$48.3
Wholesale Trade	$3.9
Retail Trade	$1.2
Accommodation & Food Services	$1.3
Transport, Postal & Warehousing	$5.0
Information Media and Telecommunications	$0.2
Financial & Insurance Services	$0.8
Rental, Hiring & Real Estate Services	$2.2
Professional, Scientific & Technical Services	$5.4
Administrative & Support Services	$3.1
Public Administration & Safety	$0.9
Education & Training	$0.0
Health Care & Social Assistance	$0.0
Arts & Recreation Services	$0.0
Other Services	$1.8
Direct	**$84.7**
Indirect	**$55.5**
Total	**$140.3**

Source: CDM Smith analysis

Table 3-8 Contribution to household income ($m), Rest of Queensland, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$0.3
Mining	$28.0
Manufacturing	$41.1
Electricity, Gas, Water & Waste Services	$5.3
Construction	$74.4
Wholesale Trade	$6.7
Retail Trade	$3.0
Accommodation & Food Services	$1.9
Transport, Postal & Warehousing	$8.3
Information Media and Telecommunications	$1.2
Financial & Insurance Services	$4.4
Rental, Hiring & Real Estate Services	$4.3
Professional, Scientific & Technical Services	$20.4
Administrative & Support Services	$8.5
Public Administration & Safety	$3.0
Education & Training	$0.0
Health Care & Social Assistance	$0.1
Arts & Recreation Services	$0.2
Other Services	$2.9
Direct	**$102.2**
Indirect	**$111.5**
Total	**$213.7**

Source: CDM Smith analysis

Table 3-9 Contribution to household income ($m), Rest of Australia, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$0.1
Mining	$3.8
Manufacturing	$9.3
Electricity, Gas, Water & Waste Services	$1.0
Construction	$12.4
Wholesale Trade	$1.6
Retail Trade	$0.6
Accommodation & Food Services	$0.3
Transport, Postal & Warehousing	$1.5
Information Media and Telecommunications	$0.4
Financial & Insurance Services	$1.3
Rental, Hiring & Real Estate Services	$0.7
Professional, Scientific & Technical Services	$4.7
Administrative & Support Services	$1.7
Public Administration & Safety	$0.6
Education & Training	$0.0
Health Care & Social Assistance	$0.0
Arts & Recreation Services	$0.0
Other Services	$0.5
Direct	**$18.1**
Indirect	**$22.5**
Total	**$40.6**

Source: CDM Smith analysis

3.3.1.3 Employment

During the construction phase, the average yearly contribution to employment made by expenditures pertaining to construction related activities at the regional, state and national level are estimated at:

- MIW SA4- average employment contribution of 445 FTEs, comprising 226 direct FTEs and 219 indirect FTEs;
- Rest of Queensland - average employment contribution of 719 FTEs, comprising 236 direct FTEs and 483 indirect FTEs;
- Rest of Australia – average employment contribution of 143 FTEs, comprising 46 direct FTEs and 97 indirect FTEs.

Employment impacts are anticipated to be highest in the manufacturing and construction sectors for all regions analysed.

Table 3-10 to Table 3-12 report the average yearly contribution to employment resulting from construction related expenditures within the MIW SA4, Rest of Queensland and Rest of Australian economies.

Table 3-10 Contribution to employment (FTEs), MIW SA4, construction phase

	Average Impact Over Construction Period
Agriculture, Forestry & Fishing	2
Mining	74
Manufacturing	172
Electricity, Gas, Water & Waste Services	8
Construction	80
Wholesale Trade	13
Retail Trade	8
Accommodation & Food Services	9
Transport, Postal & Warehousing	21
Information Media and Telecommunications	1
Financial & Insurance Services	2
Rental, Hiring & Real Estate Services	7
Professional, Scientific & Technical Services	23
Administrative & Support Services	8
Public Administration & Safety	4
Education & Training	0
Health Care & Social Assistance	0
Arts & Recreation Services	0
Other Services	14
Direct	**226**
Indirect	**219**
Total	**445**

Source: CDM Smith analysis

Table 3-11 Contribution to employment (FTEs), Rest of Queensland, construction phase

	Average Impact Over Construction Period
Agriculture, Forestry & Fishing	3
Mining	77
Manufacturing	180
Electricity, Gas, Water & Waste Services	16
Construction	173
Wholesale Trade	22
Retail Trade	20
Accommodation & Food Services	14
Transport, Postal & Warehousing	37
Information Media and Telecommunications	5
Financial & Insurance Services	10
Rental, Hiring & Real Estate Services	15
Professional, Scientific & Technical Services	85
Administrative & Support Services	25
Public Administration & Safety	12
Education & Training	0
Health Care & Social Assistance	1
Arts & Recreation Services	1
Other Services	22
Direct	**236**
Indirect	**483**
Total	**719**

CDM Smith analysis

Table 3-12 Contribution to employment (FTEs), Rest of Australia, construction phase

	Average Impact Over Construction Period
Agriculture, Forestry & Fishing	1
Mining	11
Manufacturing	42
Electricity, Gas, Water & Waste Services	3
Construction	30
Wholesale Trade	5
Retail Trade	4
Accommodation & Food Services	2
Transport, Postal & Warehousing	7
Information Media and Telecommunications	2
Financial & Insurance Services	3
Rental, Hiring & Real Estate Services	3
Professional, Scientific & Technical Services	20
Administrative & Support Services	5
Public Administration & Safety	3
Education & Training	0
Health Care & Social Assistance	0
Arts & Recreation Services	0
Other Services	4
Direct	**46**
Indirect	**97**
Total	**143**

Source: CDM Smith analysis

3.3.1.4 Value Added

During the construction phase of the Project total value added impacts for the MIW SA4, Rest of Queensland and Rest of Australia economies are estimated at:

- MIW SA4 -Total contribution to value added of $258.8 million, comprising $151.7 million in direct contribution and $107.0 million indirectly;
- Rest of Queensland – Total contribution to value added of $389.6 million, comprising $195.1 million in direct contribution and $194.6 million indirectly; and
- Rest of Australia – Total contribution to value added of $72.4 million, comprising $33.3 million in direct contribution and $39.2 million indirectly.

Value added impacts are anticipated to be highest within the construction, mining and manufacturing sectors in all regions analysed.

Table 3-13 to Table 3-15 report the contribution to value added resulting from construction related expenditures within the MIW SA4, Rest of Queensland and Rest of Australian economies.

Table 3-13 Contribution to value added ($m), MIW SA4, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$0.6
Mining	$67.5
Manufacturing	$53.8
Electricity, Gas, Water & Waste Services	$6.7
Construction	$89.2
Wholesale Trade	$5.9
Retail Trade	$1.8
Accommodation & Food Services	$2.2
Transport, Postal & Warehousing	$9.8
Information Media and Telecommunications	$0.5
Financial & Insurance Services	$1.8
Rental, Hiring & Real Estate Services	$4.0
Professional, Scientific & Technical Services	$8.0
Administrative & Support Services	$3.5
Public Administration & Safety	$1.1
Education & Training	$0.0
Health Care & Social Assistance	$0.0
Arts & Recreation Services	$0.0
Other Services	$2.7
Direct	**$151.7**
Indirect	**$107.0**
Total	**$258.8**

Source: CDM Smith analysis

Table 3-14 Contribution to value added ($m), Rest of Queensland, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$1.2
Mining	$73.9
Manufacturing	$60.2
Electricity, Gas, Water & Waste Services	$14.1
Construction	$136.7
Wholesale Trade	$10.2
Retail Trade	$4.4
Accommodation & Food Services	$3.0
Transport, Postal & Warehousing	$16.1
Information Media and Telecommunications	$3.3
Financial & Insurance Services	$9.1
Rental, Hiring & Real Estate Services	$9.3
Professional, Scientific & Technical Services	$30.2
Administrative & Support Services	$9.9
Public Administration & Safety	$3.5
Education & Training	$0.0
Health Care & Social Assistance	$0.1
Arts & Recreation Services	$0.3
Other Services	$4.2
Direct	**$195.1**
Indirect	**$194.6**
Total	**$389.6**

Source: CDM Smith analysis

Table 3-15 Contribution to value added ($m), Rest of Australia, construction phase

	Total Impact Over Construction Period
Agriculture, Forestry & Fishing	$0.3
Mining	$10.3
Manufacturing	$13.6
Electricity, Gas, Water & Waste Services	$2.6
Construction	$22.8
Wholesale Trade	$2.4
Retail Trade	$0.9
Accommodation & Food Services	$0.5
Transport, Postal & Warehousing	$2.9
Information Media and Telecommunications	$1.2
Financial & Insurance Services	$2.9
Rental, Hiring & Real Estate Services	$1.6
Professional, Scientific & Technical Services	$7.0
Administrative & Support Services	$2.0
Public Administration & Safety	$0.7
Education & Training	$0.0
Health Care & Social Assistance	$0.0
Arts & Recreation Services	$0.1
Other Services	$0.7
Direct	**$33.3**
Indirect	**$39.2**
Total	**$72.4**

Source: CDM Smith analysis

3.3.2 Economic Impacts of Operation

This section of the report provides an overview of the likely contribution to the regional, state and national economy during the operational phase of the Project[11].

3.3.2.1 Output

Total output impacts from the Project during the operational phase are estimated to be:

- MIW SA4 – Total output contribution of $5,341.2 million, comprising $2,852.4 million in direct output contribution and $2,488.8 million in indirect output contribution;
- Rest of Queensland – Total output contribution of $2,466.1 million, comprising $1,480.6 million in direct output contribution and $985.5 million in indirect output contribution; and
- Rest of Australia – Total output contribution of $2,912.2 million, comprising $1,641.3 million in direct output contribution and $1,270.8 million in indirect output contribution.

[11] The operational phase of the project is anticipated to be 2022-23 to 2041-42.

Within the MIW SA4 economy, contribution to output is likely to be greatest from the mining industry, accounting for 43% of all output impacts over the operational phase of the Project, with the wholesale trade industry also likely to be a significant contributor to output. Within the Rest of Queensland economy, the wholesale trade industry is likely to be the most significant contributor to output, accounting for 43% of all output effects over the operational phase of the Project. Within the Rest of Australia economy, the wholesale trade industry is also likely to be the most significant contributor to output, accounting for 45% of all output effects over the operational phase of the Project.

Figure 3-1 illustrates the direct and indirect contribution to output within MIW SA4 during the operational phase of the Project.

Figure 3-1 Contribution to output ($m), MIW SA4, operational phase, 2022-23 to 2041-42

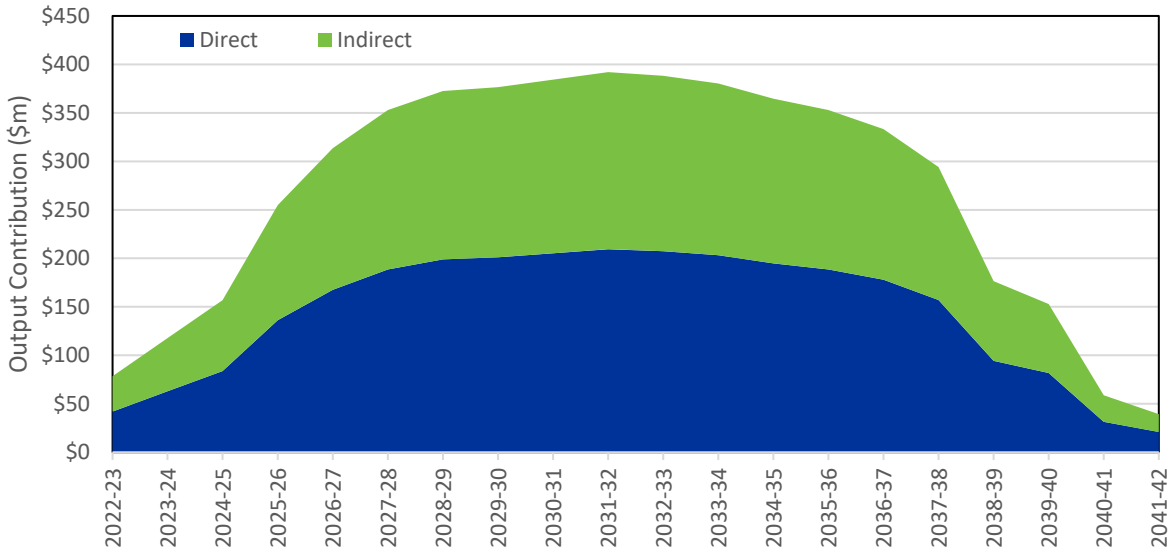


Table 3-16 to Table 3-18 report the total output contribution within the MIW SA4, Rest of Queensland and Rest of Australian economies respectively between 2023 and 2046.

Table 3-16 Contribution to output ($m), MIW SA4, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$1.3	$26.0
Mining	$114.4	$2,288.8
Manufacturing	$8.2	$164.2
Electricity, Gas, Water & Waste Services	$5.0	$100.3
Construction	$13.3	$266.8
Wholesale Trade	$70.2	$1,403.7
Retail Trade	$1.5	$29.0
Accommodation & Food Services	$3.0	$60.8
Transport, Postal & Warehousing	$14.0	$279.5
Information Media and Telecommunications	$0.5	$10.4
Financial & Insurance Services	$1.6	$32.8
Rental, Hiring & Real Estate Services	$6.3	$125.8
Professional, Scientific & Technical Services	$6.0	$119.3
Administrative & Support Services	$3.2	$64.1
Public Administration & Safety	$0.8	$15.8
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.3
Arts & Recreation Services	$0.1	$1.9
Other Services	$17.6	$351.6
Direct	**$142.6**	**$2,852.4**
Indirect	**$124.4**	**$2,488.8**
Total	**$267.1**	**$5,341.2**

Source: CDM Smith analysis

Table 3-17 Contribution to output ($m), Rest of Queensland, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.7	$13.6
Mining	$12.8	$256.1
Manufacturing	$6.0	$119.5
Electricity, Gas, Water & Waste Services	$5.0	$99.4
Construction	$3.6	$72.8
Wholesale Trade	$52.5	$1,050.3
Retail Trade	$1.2	$24.2
Accommodation & Food Services	$0.8	$16.9
Transport, Postal & Warehousing	$7.0	$140.7
Information Media and Telecommunications	$1.6	$31.3
Financial & Insurance Services	$2.6	$52.7
Rental, Hiring & Real Estate Services	$6.0	$119.7
Professional, Scientific & Technical Services	$7.2	$143.1
Administrative & Support Services	$3.0	$61.0
Public Administration & Safety	$0.7	$13.3
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.6
Arts & Recreation Services	$0.1	$2.6
Other Services	$12.4	$248.3
Direct	**$74.0**	**$1,480.6**
Indirect	**$49.3**	**$985.5**
Total	**$123.3**	**$2,466.1**

Source: CDM Smith analysis

Table 3-18 Contribution to output ($m), Rest of Australia, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.8	$16.7
Mining	$2.4	$47.6
Manufacturing	$7.5	$149.2
Electricity, Gas, Water & Waste Services	$6.8	$135.2
Construction	$4.3	$85.8
Wholesale Trade	$65.5	$1,311.0
Retail Trade	$1.6	$31.6
Accommodation & Food Services	$0.9	$17.2
Transport, Postal & Warehousing	$8.2	$164.3
Information Media and Telecommunications	$3.6	$72.5
Financial & Insurance Services	$5.2	$103.6
Rental, Hiring & Real Estate Services	$6.9	$137.2
Professional, Scientific & Technical Services	$11.1	$222.0
Administrative & Support Services	$4.1	$82.1
Public Administration & Safety	$0.9	$17.3
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.9
Arts & Recreation Services	$0.2	$3.6
Other Services	$15.7	$314.1
Direct	**$82.1**	**$1,641.3**
Indirect	**$63.5**	**$1,270.8**
Total	**$145.6**	**$2,912.2**

Source: CDM Smith analysis

3.3.2.2 Household Income

Total household income contribution within the regional, state and national economy during the operational phase of the Project is estimated at:

- MIW SA4 – Total household income contribution of $1,207.4 million, comprising $682.4 million in direct household income contribution and $525.0 million in indirect household income contribution;
- Rest of Queensland – Total household income contribution of $658.3 million, comprising $418.4 million in direct household income contribution and $239.9 million in indirect household income contribution; and
- Rest of Australia – Total household income contribution of $809.2 million, comprising $491.6 million in direct household income contribution and $317.6 million in indirect household income contribution.

Within the MIW SA4 economy, contribution to household income is likely to be greatest from the wholesale trade and mining sectors. Household income impacts are anticipated to be most significant in the wholesale trade sector for both the Rest of Queensland and the Rest of Australia economies.

Figure 3-2 illustrates the direct and indirect contribution to income within MIW SA4 during the operational phase of the Project.

Figure 3-2 Contribution to household income ($m), MIW SA4, operational phase

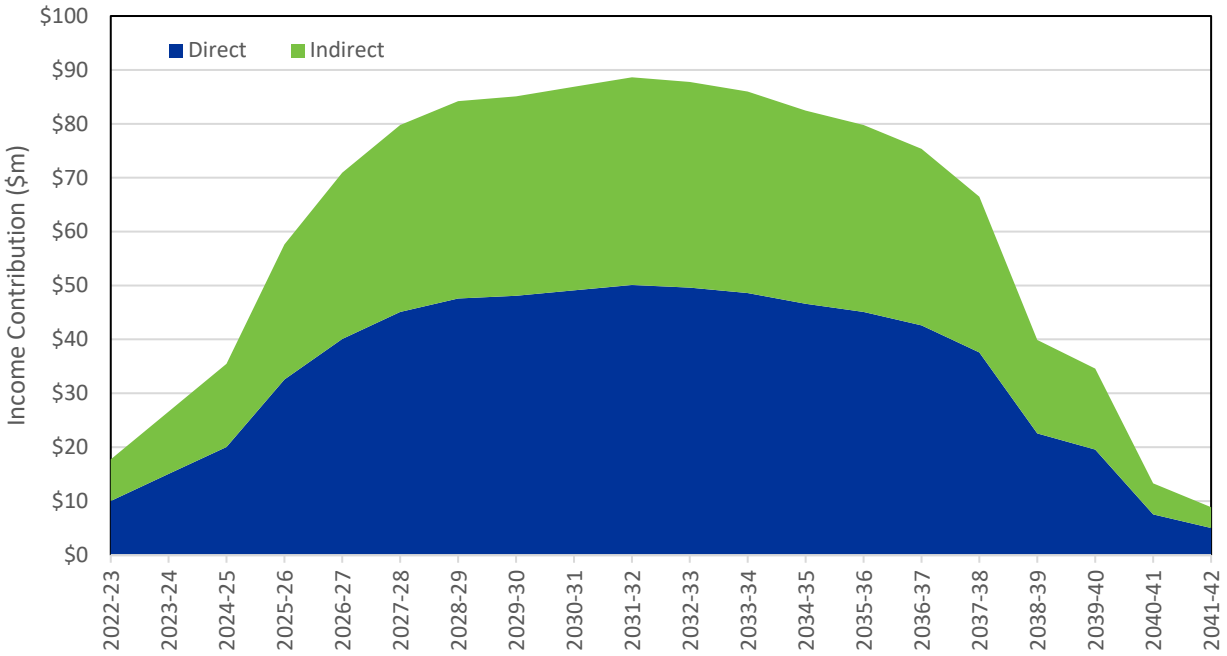


Table 3-19 to Table 3-21 report the total contributions made to income within the MIW SA4, Rest of Queensland and Rest of Australia economies respectively between 2022-23 and 2041-42.

Table 3-19 Contribution to household income ($m), MIW SA4, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.1	$2.6
Mining	$18.7	$374.0
Manufacturing	$1.6	$32.9
Electricity, Gas, Water & Waste Services	$0.8	$15.3
Construction	$2.0	$40.4
Wholesale Trade	$21.7	$433.5
Retail Trade	$0.6	$11.1
Accommodation & Food Services	$0.8	$17.0
Transport, Postal & Warehousing	$3.2	$63.2
Information Media and Telecommunications	$0.1	$1.8
Financial & Insurance Services	$0.5	$9.4
Rental, Hiring & Real Estate Services	$1.2	$24.5
Professional, Scientific & Technical Services	$2.0	$40.0
Administrative & Support Services	$1.4	$28.9
Public Administration & Safety	$0.4	$7.6
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.2
Arts & Recreation Services	$0.0	$0.4
Other Services	$5.2	$104.6
Direct	**$34.1**	**$682.4**
Indirect	**$26.2**	**$525.0**
Total	**$60.4**	**$1,207.4**

Source: CDM Smith analysis

Table 3-20 Contribution to household income ($m), Rest of Queensland, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.1	$1.3
Mining	$2.0	$40.0
Manufacturing	$1.1	$22.1
Electricity, Gas, Water & Waste Services	$0.8	$15.1
Construction	$0.6	$12.3
Wholesale Trade	$16.2	$324.4
Retail Trade	$0.5	$9.3
Accommodation & Food Services	$0.3	$5.0
Transport, Postal & Warehousing	$1.5	$30.5
Information Media and Telecommunications	$0.3	$5.2
Financial & Insurance Services	$0.8	$15.6
Rental, Hiring & Real Estate Services	$1.1	$21.4
Professional, Scientific & Technical Services	$2.4	$48.5
Administrative & Support Services	$1.3	$26.6
Public Administration & Safety	$0.3	$6.4
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.4
Arts & Recreation Services	$0.0	$0.6
Other Services	$3.7	$73.6
Direct	**$20.9**	**$418.4**
Indirect	**$12.0**	**$239.9**
Total	**$32.9**	**$658.3**

Source: CDM Smith analysis

Table 3-21 Contribution to household income ($m), Rest of Australia, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.1	$1.6
Mining	$0.3	$6.6
Manufacturing	$1.4	$28.1
Electricity, Gas, Water & Waste Services	$1.0	$20.9
Construction	$0.7	$14.4
Wholesale Trade	$20.2	$404.9
Retail Trade	$0.6	$12.1
Accommodation & Food Services	$0.3	$5.3
Transport, Postal & Warehousing	$1.8	$35.4
Information Media and Telecommunications	$0.6	$11.9
Financial & Insurance Services	$1.5	$29.2
Rental, Hiring & Real Estate Services	$1.2	$24.3
Professional, Scientific & Technical Services	$3.8	$75.8
Administrative & Support Services	$1.8	$36.0
Public Administration & Safety	$0.4	$8.3
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.5
Arts & Recreation Services	$0.0	$0.8
Other Services	$4.6	$92.9
Direct	**$24.6**	**$491.6**
Indirect	**$15.9**	**$317.6**
Total	**$40.5**	**$809.2**

Source: CDM Smith analysis

3.3.2.3 Employment

The Project is expected to contribute significantly to employment at the regional, state and national level. Contribution to employment during the operational phase of the Project is anticipated to average:

- MIW SA4 – Average employment contribution of 683 FTEs, comprising 385 direct FTEs and 299 indirect FTEs;
- Rest of Queensland –Average employment contribution of 407 FTEs, comprising 253 direct FTEs and 153 indirect FTEs; and
- Rest of Australia – Average employment contribution of 508 FTEs, comprising 307 direct FTEs and 201 indirect FTEs.

The wholesale trade industry is likely to be the greatest contributor to employment during the operational phase of the Project across all regions analysed.

Figure 3-3 illustrates the direct and indirect contribution to employment within MIW SA4 during the operational phase of the Project.

Figure 3-3 Contribution to employment (FTEs), MIW SA4, operational phase

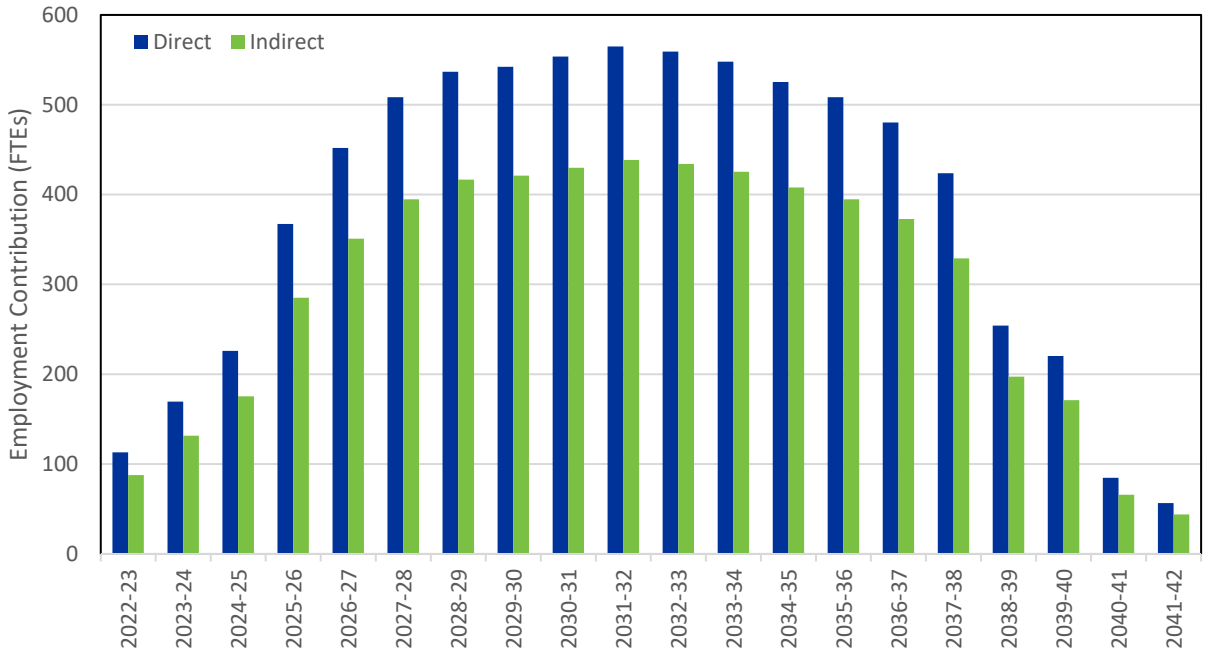


Table 3-22 to Table 3-24 report the total contribution to employment resulting from operational activity by year within MIW SA4, Rest of Queensland and Rest of Australia respectively.

Table 3-22 Contribution to employment (FTEs), MIW SA4, operational phase

	Average Annual Contribution
Agriculture, Forestry & Fishing	4
Mining	157
Manufacturing	19
Electricity, Gas, Water & Waste Services	9
Construction	27
Wholesale Trade	212
Retail Trade	11
Accommodation & Food Services	18
Transport, Postal & Warehousing	38
Information Media and Telecommunications	1
Financial & Insurance Services	3
Rental, Hiring & Real Estate Services	13
Professional, Scientific & Technical Services	25
Administrative & Support Services	13
Public Administration & Safety	5
Education & Training	0
Health Care & Social Assistance	0
Arts & Recreation Services	1
Other Services	128
Direct	**385**
Indirect	**299**
Total	**683**

Source: CDM Smith analysis

Table 3-23 Contribution to employment (FTEs), Rest of Queensland, operational phase

	Average Annual Contribution
Agriculture, Forestry & Fishing	2
Mining	16
Manufacturing	14
Electricity, Gas, Water & Waste Services	9
Construction	10
Wholesale Trade	159
Retail Trade	9
Accommodation & Food Services	6
Transport, Postal & Warehousing	20
Information Media and Telecommunications	3
Financial & Insurance Services	6
Rental, Hiring & Real Estate Services	13
Professional, Scientific & Technical Services	30
Administrative & Support Services	14
Public Administration & Safety	4
Education & Training	0
Health Care & Social Assistance	0
Arts & Recreation Services	1
Other Services	91
Direct	**253**
Indirect	**153**
Total	**407**

Source: CDM Smith analysis

Table 3-24 Contribution to employment (FTEs), Rest of Australia, operational phase

	Average Annual Contribution
Agriculture, Forestry & Fishing	3
Mining	3
Manufacturing	18
Electricity, Gas, Water & Waste Services	12
Construction	12
Wholesale Trade	198
Retail Trade	12
Accommodation & Food Services	6
Transport, Postal & Warehousing	24
Information Media and Telecommunications	7
Financial & Insurance Services	11
Rental, Hiring & Real Estate Services	15
Professional, Scientific & Technical Services	47
Administrative & Support Services	18
Public Administration & Safety	5
Education & Training	0
Health Care & Social Assistance	0
Arts & Recreation Services	1
Other Services	115
Direct	**307**
Indirect	**201**
Total	**508**

Source: CDM Smith analysis

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3.3.2.4 Value Added

Total contribution to value added during the operational phase of the Project is estimated to be:

- MIW SA4 – Total contribution to value added of $2,313.9 million, comprising $1,227.4 million directly and $1,086.5 million indirectly;
- Rest of Queensland – Total contribution to value added of $1,122.0 million, comprising $683.0 million directly and $439.0 million indirectly; and
- Rest of Australia – Total contribution to value of added of $1,352.4 million, comprising $774.8 million in direct contribution and $577.6 million indirectly.

Figure 3-4 illustrates the direct and indirect contribution to value added within MIW SA4 during the operational phase of the Project.

Figure 3-4 Contribution to value added ($m), MIW SA4, operational phase

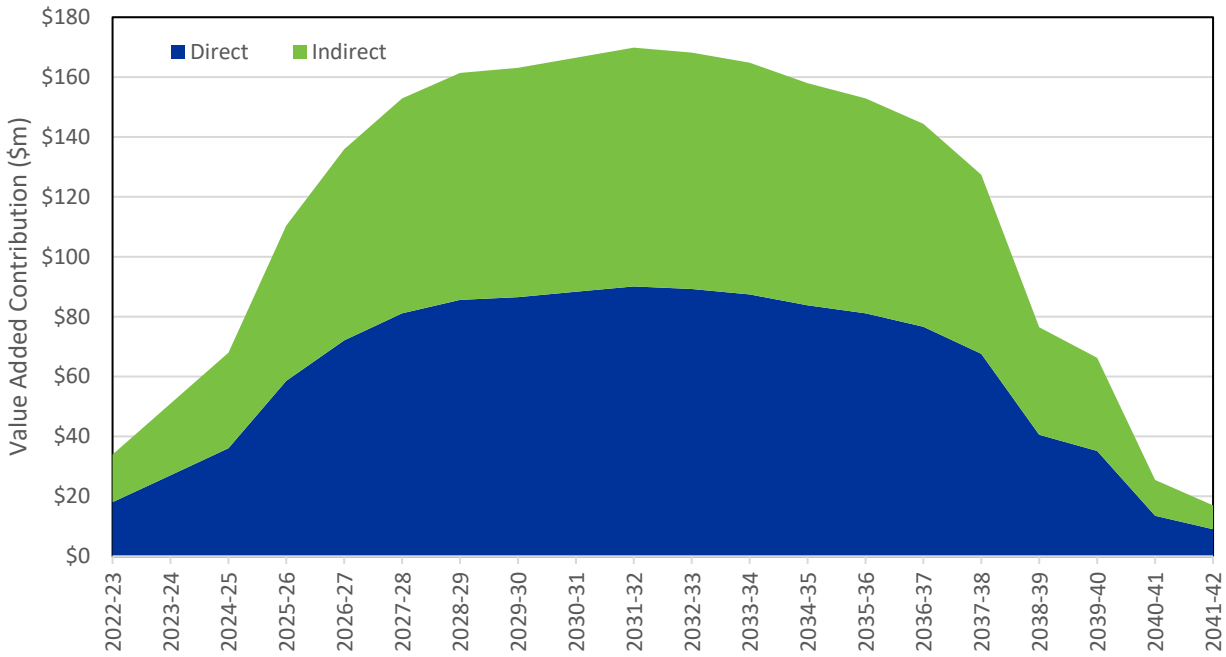


Table 3-25 to Table 3-27 report the total contribution to value added resulting from operational activity by year within MIW SA4, Rest of Queensland and Rest of Australia respectively between 2022-23 and 2041-42.

Table 3-25 Contribution to value added ($m), MIW SA4, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.6	$11.3
Mining	$47.9	$958.2
Manufacturing	$2.5	$50.5
Electricity, Gas, Water & Waste Services	$2.6	$52.5
Construction	$3.9	$77.7
Wholesale Trade	$33.0	$659.3
Retail Trade	$0.8	$16.5
Accommodation & Food Services	$1.5	$29.4
Transport, Postal & Warehousing	$6.3	$125.1
Information Media and Telecommunications	$0.2	$4.9
Financial & Insurance Services	$1.0	$20.7
Rental, Hiring & Real Estate Services	$2.5	$50.4
Professional, Scientific & Technical Services	$3.0	$59.5
Administrative & Support Services	$1.7	$33.6
Public Administration & Safety	$0.4	$8.8
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.2
Arts & Recreation Services	$0.0	$0.7
Other Services	$7.7	$154.5
Direct	**$61.4**	**$1,227.4**
Indirect	**$54.3**	**$1,086.5**
Total	**$115.7**	**$2,313.9**

Source: CDM Smith analysis

Table 3-26 Contribution to value added ($m), Rest of Queensland, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.3	$6.2
Mining	$5.5	$109.3
Manufacturing	$1.7	$33.3
Electricity, Gas, Water & Waste Services	$2.6	$52.0
Construction	$1.1	$22.2
Wholesale Trade	$24.7	$493.4
Retail Trade	$0.7	$13.8
Accommodation & Food Services	$0.4	$8.0
Transport, Postal & Warehousing	$3.1	$61.9
Information Media and Telecommunications	$0.7	$14.3
Financial & Insurance Services	$1.6	$31.4
Rental, Hiring & Real Estate Services	$2.8	$55.1
Professional, Scientific & Technical Services	$3.6	$71.7
Administrative & Support Services	$1.6	$31.4
Public Administration & Safety	$0.4	$7.5
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.5
Arts & Recreation Services	$0.1	$1.0
Other Services	$5.5	$109.2
Direct	**$34.1**	**$683.0**
Indirect	**$22.0**	**$439.0**
Total	**$56.1**	**$1,122.0**

Source: CDM Smith analysis

Table 3-27 Contribution to value added ($m), Rest of Australia, operational phase

	Average Annual Contribution	Total Contribution
Agriculture, Forestry & Fishing	$0.4	$7.7
Mining	$1.3	$25.0
Manufacturing	$2.1	$42.1
Electricity, Gas, Water & Waste Services	$3.6	$72.6
Construction	$1.3	$26.0
Wholesale Trade	$30.8	$615.8
Retail Trade	$0.9	$18.0
Accommodation & Food Services	$0.4	$8.1
Transport, Postal & Warehousing	$3.6	$72.4
Information Media and Telecommunications	$1.6	$33.0
Financial & Insurance Services	$3.2	$63.9
Rental, Hiring & Real Estate Services	$3.2	$63.8
Professional, Scientific & Technical Services	$5.6	$111.6
Administrative & Support Services	$2.1	$42.3
Public Administration & Safety	$0.5	$9.8
Education & Training	$0.0	$0.0
Health Care & Social Assistance	$0.0	$0.7
Arts & Recreation Services	$0.1	$1.5
Other Services	$6.9	$138.3
Direct	**$38.7**	**$774.8**
Indirect	**$28.9**	**$577.6**
Total	**$67.6**	**$1,352.4**

Source: CDM Smith analysis

3.4 Value of Coal Exported

The Project is anticipated to produce approximately 109.7 million tonnes of metallurgical coal over a twenty year production schedule, comprising a mix of hard coking coal, semi soft coking coal and pulverised coal injection coal. The composition of the coal produced at the Project is yet to be determined.

Advice from BMA has indicated that approximately half of all coal exports are likely to be low volatile coking coal. For completeness, the assessment has provided two scenarios when calculating the value of coal exported, these being:

- Base case: Analysis assumes all coal exported is semi soft coking coal (semi soft coking coal attracts the lowest export price); and
- Alternative scenario: Analysis assumes that 50% of the coal exported is semi soft coking coal, with the remaining 50% of the coal exported classified as low volatile coking coal (LVCC).

In estimating the anticipated export price, export value and royalties payable over the production schedule for the Project, the assessment has utilised forecasts for the semi soft coking coal price (which represents the lower end of expected values) and adjusted these values to obtain likely estimates for the low volatile coking coal price. Advice from BMA has indicated that LVCC typically achieves a 15% price premium relative to semi soft coking coal.

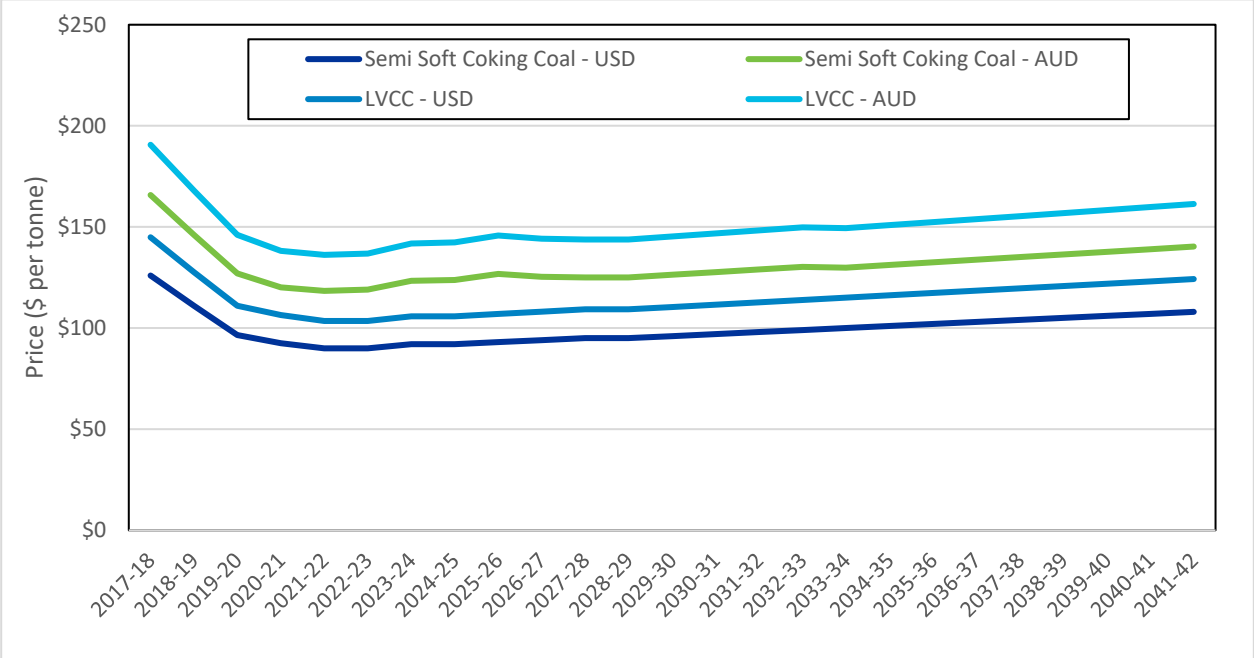
Australia's major coking coal markets are China, Japan and India, and as such the demand sourced from these economies is a key driver of prices. In the short to medium term, KPMG (2018) forecast a semi soft coking coal price of ~US$126 per tonne in 2018, decreasing to US$90 per tonne in 2022. Price decreases in the short to medium term are anticipated with increased supply and weakening demand in China likely to outweigh increasing demand in India (Office of the Chief Economist, 2018).

In the longer term, the real semi soft coking coal price is anticipated to increase to ~US$108 per tonne by 2041-42[12]. In the longer term (2032-33 to 2041-42), the semi soft coking coal price in Australian dollars is anticipated to be relatively stable (at approximately AU$130-AU$140 per tonne[13]), due to the interrelationship between the AUD/USD exchange rate and coking coal and iron ore prices[14]. The low volatile coking coal price is estimated at AU$137 in 2022-23, increasing to AU$161 by 2041-42.

Figure 3-5 provides a summary of the forecast semi soft coking coal export price and the low volatile coking coal export price in both Australian dollars and US dollars for the operational phase of the project (i.e. from 2022-23 to 2041-42).

[12] Informed by KPMG (2018)
[13] In the 2018 to 2022 period, KPMG forecast an average semi soft coking coal price of AU$135 per tonne.
[14] Coking coal and iron ore are two of Australia's key export commodities and have a significant influence on the AUD/USD exchange rate (coking coal and iron ore are traded globally in USD).

Figure 3-5 Projected Real Semi Soft Coking Coal Price and Low Volatile Coking Coal Price, 2017-18 to 2041-42



Source: KPMG (2018) and CDM Smith analysis

The total export value of the coal produced is estimated to be $14.3 billion to $15.3 billion over the life of the Project. Assuming Queensland coal mining royalty rates remain unchanged, this will yield royalties of approximately $1.2 billion to $1.3 billion over the life of the Project.

It is pertinent to note that both exchange rates and commodity prices, including coal, are subject to fluctuations and shocks, so these estimates are intended to be indicative only, based on the current trade environment.

Table 3-28 outlines the anticipated production, export value and royalties generated over the life of the Project under both coal export scenarios.

Table 3-28 Anticipated production, export value and royalties payable over the life of the Project

	Production of saleable coal (Mt)	Export value (AUD $m)	Total royalties payable (AUD $m)
Base Case			
Average	5.5	$713.9	$59.1
Total	109.7	$14,278.5	$1,181.5
Alternative Scenario			
Average	5.5	$767.5	$65.8
Total	109.7	$15,349.3	$1,315.4

Source: KPMG (2018) and CDM Smith analysis

3.5 Opportunity Cost of the Project

The opportunity cost of any given Project is generally defined as the next best alternative use of the resources that will be foregone because of the Project. Thus, in MIW SA4, the most common economic use of the land is for cattle grazing.

The production parameters for cattle grazing in the MIW region are typically:

- Average production cycle: ~3 years;
- Slaughter value: ~$1,500 per head;
- Stocking rate: ~2 head per hectare; and
- Gross margin: ~15%.

The Project footprint is estimated to be 3,541 hectares and the analysis has conservatively assumed that cattle can be grazed over the entire mine lease area. As the Project represents an underground coal mine, it has been assumed that cattle grazing on the site can continue, but over a smaller area due to subsidence. The assessment has assumed that up to 20% of the Project footprint will be disturbed resulting from subsidence.

Therefore, the opportunity cost of the Project is terms of annual output foregone and annual gross margin foregone is estimated to be approximately $0.71 million and $0.11 million, respectively.

3.6 Ecosystem Services Foregone

The Project is likely to disrupt and adversely impact a regional ecosystem which provides a habitat for a number of species, ranging from Least Concern to Endangered. However, as required by state and commonwealth legislation, the Project must have a net gain for conservation of vegetation communities. The total regional ecosystem impacted by the Project is estimated to be 1,261 hectares.

There will also be 2,280 hectares of non-remnant vegetation disturbed by the Project.

Details on the regional ecosystem impacted by the Project is provided in Table 3-29, with more detailed information contained within the Terrestrial Ecology chapter of the EIS.

Table 3-29 Regional Ecosystems Impacted by the Project

RE Code	VM Act Status	Description	Impacted area (ha)
11.3.1	Endangered	Open forest dominated by Acacia harpophylla and/or Casuarina cristata (particularly in southern parts), with or without scattered emergent Eucalyptus spp. such as E. coolabah, E. largiflorens, E. populnea, E. orgadophila, and E. woollsiana. A low tree layer dominated by Geijera parviflora and Eremophila mitchellii is usually present. The vegetation sometimes occurs as low open forest or woodland. Tree height generally about 11-15m and the low tree (to tall shrub) understorey layer is between 2 and 8m high (where present). Ground cover is generally sparse. Associated with Cainozoic alluvial plains which may be occasionally flooded. Landforms range from level to very gently sloping plains, alluvial flats, drainage floors, back-swamps and abandoned channels. Associated soils are predominantly deep to very deep cracking clays, sometimes with gilgai or texture contrast soils with sandy surface (particularly where Eucalyptus populnea is present). (BVG1M: 25a)	0

RE Code	VM Act Status	Description	Impacted area (ha)
11.3.2	Of concern	Eucalyptus populnea woodland to open woodland. E. melanophloia may be present and locally dominant. There is sometimes a distinct low tree layer dominated by species such as Geijera parviflora, Eremophila mitchellii, Acacia salicina, Acacia pendula, Lysiphyllum spp., Cassia brewsteri, Callitris glaucophylla and Acacia excelsa. The ground layer is grassy dominated by a range of species depending on soil and management conditions. Species include Bothriochloa decipiens, Enteropogon acicularis, Aristida ramosa and Tripogon loliiformis. Occurs on Cainozoic alluvial plains with variable soil types including texture contrast, deep uniform clays, massive earths and sometimes cracking clays. (BVG1M: 17a)	74
11.3.4	Of concern	Eucalyptus tereticornis woodland to open forest. Other tree species that may be present and locally dominant include E. camaldulensis, Corymbia tessellaris, E. coolabah, C. clarksoniana, E. populnea or E. brownii, E. melanophloia, E. platyphylla or Angophora floribunda. E. crebra and Lophostemon suaveolens may be locally dominant (subregion 14). A shrub layer is usually absent, and a tall grassy ground layer is often prominent, and may include any of Bothriochloa bladhii subsp. bladhii, Aristida spp., Heteropogon contortus, Dichanthium spp. and Themeda triandra. Heavily grazed areas tend to have shorter or annual grasses such as Dactyloctenium radulans or Bothriochloa spp. Occurs on Cainozoic alluvial plains and terraces. Occurs on variety of soils, including deep cracking clays, medium to fine textured soils, and deep texture-contrast soils. (BVG1M: 16c)	1
11.3.25	Least concern	Eucalyptus camaldulensis or E. tereticornis open forest to woodland. Other tree species such as Casuarina cunninghamiana, E. coolabah, Melaleuca bracteata, Melaleuca viminalis, Livistona spp. (in north), Melaleuca spp. and Angophora floribunda are commonly present and may be locally dominant. An open to sparse, tall shrub layer is frequently present dominated by species including Acacia salicina, A. stenophylla or Lysiphyllum carronii. Low shrubs are present, but rarely form a conspicuous layer. The ground layer is open to sparse and dominated by perennial grasses, sedges or forbs such as Imperata cylindrica, Bothriochloa bladhii, B. ewartiana, Chrysopogon fallax, Cyperus dactylotes, C. difformis, C. exaltatus, C. gracilis, C. iria, C. rigidellus, C. victoriensis, Dichanthium sericeum, Leptochloa digitata, Lomandra longifolia or Panicum spp. Occurs on fringing levees and banks of major rivers and drainage lines of alluvial plains throughout the region. Soils are very deep, alluvial, grey and brown cracking clays with or without some texture contrast. These are usually moderately deep to deep, soft or firm, acid, neutral or alkaline brown sands, loams or black cracking or non-cracking clays, and may be sodic at depth (Burgess 2003). (BVG1M: 16a)	79
11.3.27b	Least concern	Freshwater wetlands. Vegetation is variable including open water with or without aquatic species and fringing sedgelands and eucalypt woodlands. Occurs in a variety of situations including lakes, billabongs, oxbows and depressions on floodplains. (BVG1M: 34d) Vegetation ranges from open water +/- aquatics and emergents such as Potamogeton crispus, Myriophyllum verrucosum, Chara spp., Nitella spp. Nymphaea violacea, Ottelia ovalifolia, Nymphoides indica, N. crenata, Potamogeton tricarinatus, Cyperus difformis, Vallisneria caulescens and Hydrilla verticillata. Often with fringing woodland, commonly Eucalyptus camaldulensis or E. coolabah but also a wide range of other species including Eucalyptus platyphylla, E. tereticornis, Melaleuca spp., Acacia holosericea or other Acacia spp. Occurs on billabongs. Lacustrine wetland (e.g. lake). (BVG1M: 34d)	11
11.4.4	Least concern	Tussock grassland dominated by Dichanthium spp. +/- Astrebla spp. (mainly A. lappacea and A. pectinata). Other grasses frequently present include Thellungia advena, Panicum spp. and Aristida spp. Forbs and annual grasses may become common with seasonal rains. Occasional shrubs and trees may be present in places. Occurs on flat to gently undulating clay plains formed from Cainozoic or weathered basalt unconsolidated sediments. Soils are generally moderate to deep to very deep dark grey self-mulching cracking clays with linear gilgai. Gravel or stone may be present in some areas. (BVG1M: 30b)	0

RE Code	VM Act Status	Description	Impacted area (ha)
11.4.8	Endangered	Woodland to open forest dominated by Eucalyptus cambageana and Acacia harpophylla or, sometimes in the north, A. argyrodendron. E. thozetiana is sometimes present on shallower soils. There is a moderately dense low tree layer (5m high) layer dominated by species such as Eremophila mitchellii and a low shrub layer (2m high) dominated by species such as Carissa ovata and Geijera parviflora. Occurs on level to gently undulating plains formed from Cainozoic deposits. Associated soils are usually deep texture contrast with thin loamy or sandy surface horizons overlying strongly alkaline clay subsoils. Surface or subsurface gravel is common. (BVG1M: 25a)	225
11.4.9	Endangered	Open forest, occasionally woodland, dominated by Acacia harpophylla usually with a low tree mid-storey of Terminalia oblongata and Eremophila mitchellii. Casuarina cristata sometimes replaces Acacia harpophylla in the overstorey and Lysiphyllum cunninghamii sometimes co-dominates. Other low tree or shrub species such as Alectryon diversifolius, Carissa ovata, Pittosporum spinescens, Ehretia membranifolia, Geijera parviflora and Flindersia dissosperma may occur in the mid-storey or low shrub layer. Acacia harpophylla trees have been recorded as 11- 17m high, the mid-storey layer 2- 8m high and the low shrub layer 1-2m high. Occurs on level to gently undulating Cainozoic plains, including weathered basalt. Associated soils are predominantly moderately deep to deep cracking clays that may be brown, red-brown or grey-brown, and with much surface gravel in some areas. (BVG1M: 25a)	33
11.4.13	Least concern	Eucalyptus orgadophila open woodland. Associated species include Corymbia dallachiana and C. erythrophloia. Scattered shrubs and low tress are often present including Alectryon diversifolius, Vachellia bidwillii, Cassia brewsteri and Atalaya hemiglauca. The ground layer is dominated by tussock grasses such as Dichanthium sericeum, Bothriochloa ewartiana, Heteropogon contortus, Panicum queenslandicum and Themeda triandra. Occurs on Cainozoic clay plains. The soils associated with this regional ecosystem are often derived from weathered basalt. (BVG1M: 11a)	38
11.5.3	Least concern	Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana +/- C. dallachiana and occasionally E. cambageana or E. brownii dominate the tree layer (14m median height and 11-15m range) woodland. Localised areas may be dominated by E. melanophloia, occasionally E. crebra and other canopy species. There is generally a distinctive low tree layer (8, 6-11m high) dominated by species such as Eremophila mitchellii, Geijera parviflora, Archidendropsis basaltica, Erythroxylum australe, Cassia brewsteri, Ventilago viminalis and occasionally Allocasuarina luehmannii or Callitris glaucophylla. A low shrub layer (2-6m high) dominated by species such as Carissa ovata, Erythroxylum australe, Capparis lasiantha is also often present. Occurs on flat to gently undulating plains formed from Cainozoic sediments. Associated soils are generally deep texture contrast with thick sandy surface horizons with some deep red earths. (BVG1M: 17a)	800
		Non-remnant vegetation	2,280
Total			**3,541**

The loss of habitat areas can be categorised as a non-market disbenefit. Guidelines prepared by the Queensland Government[15] set out a range of tools for estimating the value of such non-market benefits as follows:

- Methods based on market prices, for example taking the value of an externality (such as the loss of habitat areas) as equal to the cost of its prevention, its effect on economic production or its effect on loss of individual income via negative health impacts or the costs of activities necessary to avert a negative impact;
- Surrogate or proxy market methods, for example, valuing noise impacts by reference to variations in house prices (hedonic pricing), or valuing a wilderness area by inference from the costs individuals incur in travelling to it; and

[15] Available at: https://s3.treasury.qld.gov.au/files/paf-cost-benefit-analysis.pdf

- Survey-based methods which seek to obtain individuals' valuations of impacts using question and answer and related data modelling techniques. Examples include contingent valuation and choice modelling.

Each of these methods has advantages and disadvantages in terms of simplicity, reliability, cost and certainty. Contingent valuation for example is adaptable to a range of impact scenarios in terms of type and extent, but the process is expensive and the results can be subjected to conjecture if respondents are unable to comprehend the impact under investigation or the nature of the questioning. Similarly, proxy methods can be expensive and may be constrained by the explanatory power of the available data (such as data reflecting variations in house prices according to environmental attributes). At the other end of the spectrum, some of the methods based on market prices are simple and inexpensive and may be appropriate where the range of potential mitigation strategies are limited or the necessity to avoid a negative impact is not in dispute.

This study uses the 'benefit transfer' technique, in which valuations obtained from primary research conducted for other projects is applied to the project in question.

Environmental values for habitats affected by development can be categorised as being either:

- Use values, being those values derived from physical use of the environmental resources, including commercial activities, such as commercial fishing or tourism, and non-commercial activities, such as recreation;
- Non-use values, which refer to:
  - Ecological function values: the value of the ecological services or functions provided by an environmental resource, such as provision of fish habitats and biodiversity
  - Option values: the benefit derived from maintaining the right to use the resources without necessarily doing so
  - Quasi-option values: the benefit derived from delaying a decision to develop an environmental resource to obtain better information regarding the impacts of that development on the resource
  - Vicarious use values: the value derived by individuals in knowing that others are using the environmental resource
  - Bequest values: the value of maintaining environmental values for the benefit of future generations
  - Existence values: the value derived by members of the community from the knowledge that areas of environmental value exist.

This study adopts the benefit transfer approach utilising parameters values identified in Costanza et al (2014) and De Groot et al (2012), adjusted to 2018 Australia dollars, rounded to the nearest $100. The ecosystem services values applied in this analysis are as follows:

- Forest: $4,700 per hectare per year;
- Woodland: $2,400 per hectare per year;
- Wetland: $38,500 per hectare per year; and
- Grassland: $6,200 per hectare per year.

Based on the above assumptions, the Project is anticipated to have an adverse ecosystem services impact of $4.2 million per annum.

Table 3-30 Estimated Annual Value of Ecosystems Impacted by the Project ($m), 2018 dollars

Biome	Impacted Area (ha)	Ecosystem Service Value (2018 AUD/ha/year)	Annual Ecosystem Value ($m)
Forest	338	$4,700	$1.6
Woodland	912	$2,400	$2.2
Wetland	11	$38,500	$0.4
Grassland	0	$6,200	$0.0
Total	**1,261**		**$4.2**

Note: For the purposes of this assessment, RE 11.3.4, 11.3.25 and 11.4.8 have been conservatively classified as forest.
Source: CDM Smith estimates, based on Costanza et al (2014) and De Groot et al (2012)

3.7 Assessment of Project Impacts

The Project is anticipated to result in a range of beneficial impacts including:

- Economic stimulus to the regional, state and national economies during the construction and operational phases of the Project;
- Significant export revenues from coal produced over the life of the Project estimated to be in the order of $14.9 billion, which assuming royalty rates remain unchanged, would yield royalties of approximately $1.3 billion over the life of the Project
- Increased employment opportunities within Central Queensland which would serve to reduce unemployment within the region;
- Opportunities for suppliers in the MIW region to support the construction and operation of the Project;

The Project is anticipated to result in a range of adverse impacts including:

- Opportunity cost of the Project in terms of foregone output from cattle grazing in the order of $0.71 million per annum which represents $0.11 million per annum in gross annual margin foregone;
- Loss of ecosystem services within areas directly impacted by the Project's operation with a value estimated at $4.20 million per annum, based on directly impacted forestry, woodland, wetland and grassland habitats of 1,261 hectares;
- Tightening of the local and regional labour market potentially resulting in increased labour costs;
- Potential for skills shortages;
- Potential for inflationary pressure in the MIW residential, commercial and industrial property markets; and
- Increased burden on MIW infrastructure, such as road networks.

The assessment of impacts utilises a risk-based assessment framework based on the anticipated interaction of probability and consequence of impacts occurring.

Table 3-31 summarises the descriptors of the likelihood of an event occurring, where Table 3-38 summarises the descriptors of the consequence of the impact occurring.

Table 3-31 Qualitative Measures of Likelihood

Descriptor	Description
Almost certain	It is expected to occur in most circumstances
Likely	It will probably occur in most circumstances
Possible	It might occur at some time
Unlikely	It could occur but is not expected
Rare	It may only occur in very exceptional circumstances
Remote	It has not previously manifested but is not inconceivable

Source: Queensland Treasury (2011) A Guide to Risk Management

Table 3-32 Qualitative measures of consequence

Descriptor	Description of beneficial impacts	Description of adverse impacts
Negligible	Very insignificant impacts, which would be unlikely to be measurable against benchmarks	Very insignificant impacts, which would be unlikely to be measurable against benchmarks
Minor	Impacts may be detectable but result in only minimal changes to the established environment with the magnitude of impact being small relative to the broader context of the population/area being impacted. Benefits maintained over the short term without extended management and/or works	Impacts may be detectable but result in only minimal changes to the established environment with the magnitude of impact being small relative to the broader context of the population/area being impacted. Return to pre-impact levels achievable and expected to occur over the short term once management initiatives are implemented.
Moderate	Detectable impacts resulting in significant changes to the environment. The benefit is maintained over the medium term with minimal management and/or works.	Detectable impacts resulting in significant changes to the environment. Management initiatives can result in recovery in the medium term.
Major	Broader and longer term impacts likely to result in a highly changed environment. The benefit is maintained over the longer term with minimal management and/or works.	Broader and longer term impacts likely to result in a highly changed environment. Long term and sustained effort required to affect a recovery.
Extraordinary	Broader and longer term impacts likely to result in a highly changed environment. The benefit is maintained over the longer term without management and/or works.	Broader and longer term impacts likely to result in a highly changed environment. Recovery to pre-impact levels unlikely to occur despite mitigation and intervention.

Source: Queensland Treasury (2011) A Guide to Risk Management

The interaction of likelihood and consequence determine the extent of impact. Table 3-33 outlines the matrix of interactions between different likelihoods and levels of consequence, which determine the level of impact.

Table 3-33 Qualitative impact assessment matrix

Likelihood	Consequence				
	Negligible	Minor	Moderate	Major	Extraordinary
Remote	Very low	Very low	Very low	Low	Medium
Rare	Very low	Very low	Low	Medium	Medium
Unlikely	Very low	Low	Low	Medium	High
Possible	Very low	Low	Medium	High	High
Likely	Low	Medium	Medium	High	Very high
Almost certain	Low	Medium	High	Very high	Very high

Source: Queensland Treasury (2011) A Guide to Risk Management

Table 3-34 provides an assessment of the anticipated positive (+ve) economic impacts resulting from the Project.

Table 3-34 Assessment of positive economic impacts

Description of impact	Likelihood	Consequence	Impact
Economic stimulus to the regional economy during construction and operation • Regionally based project expenditures during the construction phase are estimated to make contributions to value added in the MIW region at an average of $86.3 million per year between 2020-21 and 2022-23, including $50.6 million in direct value added; and • Regionally based project expenditures during the operation phase are estimated to make contributions to value added in the MIW region at an average of $115.7 million per year over years 1 to 20, including $61.4 million in direct value added.	Almost certain	Moderate	High (+ve)
Economic stimulus to the state economy during construction and operation • State based project expenditures during the construction phase are estimated to make contributions to GRP at an average of $129.9 million per year over years one to three, including $65.0 million in direct value added; and • State based project expenditures during the operation phase are estimated to make contributions to GRP at an average of $56.1 million per year over years 1 to 20, including $34.1 million in direct value added.	Almost certain	Minor	Low (+ve)
Economic stimulus to the national economy during construction and operation • Project expenditures incurred interstate during the construction phase are estimated to make contributions to GRP at an average of $24.1 million per year over years one to three, including $11.1 million in direct value added; and • Project expenditures incurred interstate during the operation phase are estimated to make contributions to GRP at an average of $67.6 million per year over years 1 to 20, including $38.7 million in direct value added.	Almost certain	Minor	Low (+ve)

Description of impact	Likelihood	Consequence	Impact
Increased regional supply chain and employment opportunities throughout construction and operation The project is anticipated to generate additional regional supply chain activity. The volume of this activity is represented by the output measure. During the operational phase of the Project, total output impacts pertaining to the MIW region, are estimated at an average of $267.1 million per annum, including $142.6 million in direct impacts. The employment support generated by this local supply chain activity is estimated at an average of 683 FTEs per annum, including 385 direct FTEs per annum.	Almost certain	Moderate	High (+ve)

Table 3-35 provides an assessment of the anticipated adverse economic impacts resulting from the Project.

Table 3-35 Assessment of adverse economic impacts[16]

Description of impact	Likelihood	Consequence	Impact
Opportunity cost of the project The opportunity cost of the Project in terms of alternative economic uses (ie. cattle) estimated by foregone output is estimated to be approximately $0.71 million per annum, which represents an average annual gross margin of approximately $0.11 million.	Almost certain	Minor	Medium (-ve)
Loss of ecosystem services[17] Based on a total area of 1,261 hectares of directly impacted forestry, woodland, wetland and grassland habitat, the Project is anticipated to have adverse ecosystem services impacts of $4.2 million per annum.	Almost certain	Moderate	High (-ve)
Increased inflationary pressure in the regional labour markets The Project is anticipated to generate a significant amount of employment demand throughout its construction and operational phases. In the event that the regional economy was facing an employment constraint, this additional employment would have the potential to create inflationary pressure in the labour market. However, labour markets in the MIW region generally have excess capacity and as such the potential for this adverse impact to materially add to wage inflation at a regional or state level is considered low.	Unlikely	Minor	Low (-ve)
Potential for inflationary pressure in local residential, commercial and industrial property markets Projects that generate significant employment and supply chain demand can have impacts on local and regional property markets in the form of inflationary pressure. It is considered that the potential of the Project to manifest these pressures is low.	Unlikely	Minor	Low (-ve)
Increased burden on local and regional infrastructure The Project is likely to generate impact on local and regional transport infrastructure throughout its development and operation. The Project will contribute to increased traffic volumes on the road network, as well as increased utilization regional rail networks	Almost certain	Minor	Low (-ve)

[16] The assessment of adverse economic impacts was made on a pre-mitigation basis and legislation requires BMA to mitigate adverse impacts. Mitigation actions undertaken by BMA will be implemented as part of the Project and will be compliant with the legislative requirements.

[17] Following (post) mitigation efforts made by BMA, state and commonwealth legislation requires a net gain in conservation outcomes of vegetation communities for the Project.

3.8 Mitigation Measures

The Project is anticipated to result in a range of adverse economic impacts which will largely be offset by opportunities created by the Project. These adverse economic impacts will likely only be experienced during the life of the Project which is expected to be 23 years (three year construction phase and 20 year operational phase). Management of these risks are required in order to mitigate any potential negative economic consequences, which would entail:

- Loss of ecosystem services based on the total area directly impacting the identified habitats. Mitigation measures to address these consequences are provided in Chapter 6 of the EIS.
- The opportunity cost of the Project in terms of lost cattle grazing opportunities (although these will be offset by the improvement of the economic conditions and opportunities in the region);
- Tightening of the local and regional labour markets potentially resulting in increased labour costs unless and until labour market responds with additional supply
- Potential short-term worsening of skills shortages in the construction sector during the construction phase
- Potential localised inflation in residential, commercial and industrial property markets; and
- Increased burden on local and regional infrastructure, including transport networks.

3.8.1 Impacts Requiring Mitigation

3.8.1.1 Increased labour costs and skills shortages

As stated above, the Project has the potential to increase labour costs within the region, particularly during the construction phase. To mitigate this potential impact the following actions are recommended:

- Promote the additional purchasing opportunities that the Project will generate to the 200 plus Local Buy Program registered businesses which make up a key component of BMA's existing local supplier base. The advanced promotion of the additional opportunities will enable local businesses to plan and then secure purchase orders and thereby support the further expansion and development of the local labour force and its skills base;
- Work with BMA's local partners in the Local Buying Program to deliver training programs to raise skill levels of existing and new small business and other workers attracted to the region as a result of the supply opportunities generated by the project; and
- Maintain and expand the focus of BHP's Community Development Management Plans (CDMP) and related social investment spending on local education and training programs. This will include the employment of additional apprenticeships to be part of the Project's operational workforce. This represents a strong contribution to mitigating the potential risks of future skills shortages.

3.8.1.2 Localised inflation in the housing market

The Project will include, if required, an accommodation facility which may consist of a temporary construction village and a separate permanent operation village to support the construction and operational stages. As such the potential for inflationary pressure in the local or regional housing market will be mitigated. BMA advises that the reference to "if required" means that it is committed to ensuring its workforce is suitably accommodated while also not causing substantial accommodation prices inflation to the detriment of people seeking affordable accommodation. As at 2018, there are unoccupied existing dwellings in the IRC area. If this situation was to continue, the proposed accommodation facility may not be required. However, in the past, there have been periods when there has not been any surplus accommodation available in the region to readily absorb the substantial increase in demand that is associated with a new project. This is particularly the case when other projects are advanced by other proponents at the same time. As BMA cannot control these externally determined factors, it is considered prudent to plan for a new

facility in case it is required given accommodation market conditions at the unknown time in the future when the project is executed.

Note: BMA included an operational accommodation village within the scope of the Project at the commencement of the EIS, but following consideration of Social Impact Assessment (SIA) related consultation with the OCG and the IRC after completion of this section of the EIS, it became evident to BMA that these key stakeholders did not agree that the proposed operational village was warranted. As a result, BMA is not further pursuing approval of the operational village as part of the EIS process.

3.8.1.3 Increased burden on local and regional infrastructure

The Project will involve the relocation of the existing water pipeline and existing 132 kilovolt (kV) powerline into a new infrastructure and transport corridor. The Project will likely contribute to increased traffic volumes on the road network, thereby accelerating deterioration of the network. The Project will also increase the utilisation of the Goonyella railway network for the haulage of coal to Hay Point and Dalrymple Bay coal terminals. The network is expected to be able to accommodate the project's production. An explanation of the road network actions to be undertaken by BMA to ensure adverse impacts are mitigated is provided in the Transport and Traffic chapters of the EIS.

Section 4 Cost Benefit Analysis

The cost benefit analysis identifies the present value of costs and benefits over the life of the Project, presented in real dollar values. This section outlines the assumptions utilised in the cost benefit analysis and assesses the Project over a range of discount rates, with key decision criteria reported include net present value and benefit cost ratio. In addition, the economic robustness of the Project is assessed through scenario testing.

4.1 Assumptions

4.1.1 Project Costs

BMA estimates that total Project costs are anticipated to be $7.4 billion over the life of the Project. This estimate is inclusive of construction costs, operational costs and the cost of make good agreements[18]. Detailed information relating to construction and operational costs for the Project are contained within Section 3.2 of the report.

4.1.2 Project Benefits / Disbenefits

The following benefit / disbenefit streams have been identified for the Project:

- Value of coal production (less haulage costs);
- Greenhouse gas emissions;
- Opportunity cost of alternative land use; and
- Value of ecosystems foregone.

Overall, the net benefits of the Project were estimated to be $12.7 billion - $13.8 billion over the life of the Project.

4.2 Results

4.2.1 Project Life

The assessment assumes the construction phase of the Project commences in 2020-21 and occurs over three years to 2022-23. The operational phase of the project commences in 2022-23 and ceases in 2041-42.

4.2.2 Discount Rates

The cost benefit analysis for the Project considers a number of non-market goods and as such the appropriate test discount rates need to be consistent with real discount rates used for public projects derived from social time preference or social opportunity cost rates.

A range of discount rates are used by government assessment agencies for the purposes of project evaluation as summarised in Table 4-1. This analysis utilises the real discount rates of 4%, 7% and 10%, which are consistent with the range of discount rates used by Infrastructure Australia.

[18] The cost of make-good agreements provided by BMA incorporate road compensation contributions, groundwater and surface water impacts. The make-good agreement value excludes greenhouse gas emissions and the cost of offsets to address adverse impacts on vegetation communities / habitat.

Table 4-1 Alternative Discount Rates Adopted by Australian and State Government Agencies

Agency	Real Discount Rate	Notes
NSW	7%	Sensitivity range of 4% to 10%
Infrastructure Australia	4% & 7%	-
Victoria	7%	For roads
Productivity Commission	8%	-
Office of Best Practice Regulation (C'wealth)	7%	Sensitivity range of 3% to 11%

4.2.3 Summary of Results

4.2.3.1 Base Case Scenario

Table 4-2 summarises the findings of the cost benefit analysis and Table 4-3 provides a summary of the cost and benefit streams over the life of the Project. Under all real discount rates analysed, the Project provides a positive net benefit, with the benefit cost ratio ranging between 1.3 and 1.5.

Table 4-2 Cost Benefit Analysis Results, Base Case Scenario

Cost / Benefit Stream	Net Present Value ($m) under Real Discount Rate		
	4%	**7%**	**10%**
Project Costs ($m)	$5,056.6	$3,959.5	$3,197.4
Project Benefits / Disbenefits ($m)	$7,764.2	$5,568.0	$4,107.2
Net benefit	$2,707.6	$1,608.5	$909.7
Benefit cost ratio	1.5	1.4	1.3

Source: CDM Smith estimates

Table 4-3 Cost Benefit Analysis, Summary Streams ($m), Base Case Scenario, life of Project[19]

	Average Annual Cost / Benefit	Total Cost / Benefit
Project Costs ($m)		
Construction costs	$437.7	$1,313.0
Operational costs	$299.1	$5,982.4
Make good agreements	$5.0	$100.0
Total	$336.2	$7,395.4
Project Benefits / Disbenefits ($m)		
Value of Production (less haulage costs)	$659.1	$13,181.5
Greenhouse gas emissions	-$18.3	-$366.0
Opportunity cost of alternative land use	-$0.7	-$15.6
Loss of vegetation communities	-$4.2	-$92.4
Total	$577.6	$12,707.4
Net Benefit	**$241.5**	**$5,312.0**

[19] Assumed to be 2020-21 to 2041-42

Note: Averages are calculated only for the years in which a cost/benefit is incurred (e.g. construction costs are averaged over a three year period).
Source: CDM Smith estimates

4.2.3.2 Alternative Scenario

Table 4-4 summarises the findings of the cost benefit analysis and Table 4-5 provides a summary of the cost and benefit streams over the life of the Project. Under all real discount rates analysed, the Project provides a positive net benefit, with the benefit cost ratio ranging between 1.4 and 1.7.

Table 4-4 Cost Benefit Analysis Results, Alternative Scenario

Cost / Benefit Stream	Net Present Value ($m) under Real Discount Rate		
	4%	7%	10%
Project Costs ($m)	$5,056.6	$3,959.5	$3,197.4
Project Benefits / Disbenefits ($m)	$8,419.8	$6,039.0	$4,455.3
Net benefit	$3,363.2	$2,079.5	$1,257.8
Benefit cost ratio	1.7	1.5	1.4

Source: CDM Smith estimates

Table 4-5 Cost Benefit Analysis, Summary Streams ($m), Alternative Scenario, life of Project[20]

	Average Annual Cost / Benefit	Total Cost / Benefit
Project Costs ($m)		
Construction costs	$437.7	$1,313.0
Operational costs	$299.1	$5,982.4
Make good agreements	$5.0	$100.0
Total	$336.2	$7,395.4
Project Benefits / Disbenefits ($m)		
Value of Production (less haulage costs)	$712.6	$14,252.3
Greenhouse gas emissions	-$18.3	-$366.0
Opportunity cost of alternative land use	-$0.7	-$15.6
Loss of vegetation communities	-$4.2	-$92.4
Total	$626.3	$13,778.3
Net Benefit	**$290.1**	**$6,382.9**

Note: Averages are calculated only for the years in which a cost/benefit is incurred (e.g. construction costs are averaged over a three year period).
Source: CDM Smith estimates

4.2.4 Sensitivity Testing

Scenario testing was also undertaken in addition to the main case analysis outlined above to test the economic robustness of the Project under both coal production scenarios (i.e. base case scenario and alternative scenario). The three scenario tests identified included:

- An increase in project costs of 10%;

[20] Assumed to be 2020-21 to 2041-42

- A decrease in project benefits of 10%; and
- A combined increase in project costs of 10% and a decrease in project benefits of 10%.

4.2.4.1 Base Case Scenario

Table 4-6 summarises the cost benefit analysis results for the sensitivity tests under the base case scenario. The net present value under all scenarios remains positive under all real discount rates analysed.

Table 4-6 NPV Results of Sensitivity Testing, Base Case Scenario

Scenario test	Net Present Value ($m) under Real Discount Rate		
	4%	7%	10%
Increase in costs (10%)	$2,201.9	$1,212.6	$590.0
Decrease in benefits (10%)	$1,931.2	$1,051.7	$499.0
Combined	$1,425.5	$655.8	$179.3

Source: CDM Smith estimates

4.2.4.2 Alternative Scenario

Table 4-7 summarises the cost benefit analysis results for the sensitivity tests under the alternative scenario. The net present value under all scenarios remain positive under all real discount rates analysed.

Table 4-7 NPV Results of Sensitivity Testing, Alternative Scenario

Scenario test	Net Present Value ($m) under Real Discount Rate		
	4%	7%	10%
Increase in costs (10%)	$2,857.5	$1,683.6	$938.1
Decrease in benefits (10%)	$2,521.2	$1,475.6	$812.3
Combined	$2,015.5	$1,079.7	$492.6

Source: CDM Smith estimates

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